COLLEGE OF ENGINEERING AND SCIENCE HANDBOOK 2017

DISCLAIMER

The information contained in Victoria University's 2017 College of Engineering and Science was current at 28 November 2016

In today's university environment, changes to courses occur far more frequently than in the past. For current information on Victoria University's courses, readers are advised to access the University's online courses database at www.vu.edu.au/courses

If you have difficulty in accessing this material electronically, please phone (03)9919 6100 for assistance.

IMPORTANT INFORMATION

The course details in this handbook (Plus details of all other Victoria University courses) can also be searched on the University's online courses database at www.vu.edu.au/courses

This handbook can be downloaded as a pdf file from the Victoria University website at www.vu.edu.au/courses/course-handbooks-and-guides

Published by Victoria University

PO Box 14428

Melbourne VIC 8001 Australia

WWW.VU.EDU.AU

HOW TO USE THIS HANDBOOK

Victoria University's 2017 College of Engineering and Science Handbook is designed to provide students with detailed information on course structures and unit details for undergraduate and postgraduate courses offered by the college in 2017.

The definition of fields used in course tables throughout this handbook include:

Credit Point – the number of credit points a unit contributes towards the total points needed to complete a course.

PLEASE NOTE

This handbook provides a guide to courses available within Victoria University's College of Engineering and Science in 2017.

Although all attempts have been made to make the information as accurate as possible, students should check with the college that the information is accurate when planning their courses.

NOTE: Prospective students are strongly advised to search the University's online courses database at www.vu.edu.au/courses for the most up-to-date list of courses.

This handbook includes descriptions of courses that may later be altered or include courses that may not be offered due to unforseen circumstances, such as insufficient enrolments or changes in teaching personnel. The fact that details of a course are included in this handbook can in no way be taken as creating an obligation on the part of the University to teach it in any given year or in the manner described. The University reserves the right to discontinue or vary courses at any time without notice.

OTHER INFORMATION

Information about course fees, articulation and credit transfer, recognition of prior learning, admission and enrolment procedures, examinations, and services available to students can be accessed on the University's website or by contacting the University directly.

CONTENTS

College of Engineering and Science

Below are details of courses offered by the College of Engineering and Science in 2017.

This information is also available online on the University's searchable courses database at www.vu.edu.au/courses

NOTE: Courses available to international students are marked with the (I) symbol.

Master of Engineering (Building Fire Safety and Risk Engineering)

Course Code: EMQB
Campus: Werribee.

About this course: The course provides opportunities for professional people to develop advanced technical skills in fire safety engineering discipline; develop their understanding of legislation and management relevant to this discipline; develop ability to plan, co-ordinate and apply rational engineering principles and techniques to demonstrate cost-effective fire safety system designs for buildings; apply and extend research and reporting skills and gain specialist knowledge of a topic relevant to fire safety.

Course Objectives: The course provides opportunities for professional people to:

- Develop advanced technical knowledge and skills in the specialist discipline of fire science and technology and apply to a range of building and structural settings;
- Uunderstand and apply legislation and fire safety engineering design codes;
- As a team member develop the ability to plan, co-ordinate, complete and evaluate complex projects, taking into consideration social, economic, cultural and environmental impacts;
- Apply the techniques and advanced modelling tools to analyse effectiveness of proposed fire safety design solutions;
- Reflect how engineers apply rational engineering principles and techniques to identify cost-effective fire safety system designs;
- Adopt sound research methodologies in the independent investigation of building and occupant characteristics and associated hazards;
- Communicate verbally and in writing utilising a range of professional formats to a variety of associates including peers, professional and industry representatives and community members;
- Apply the skills learnt within the course to a realistic research project;
- Gain industry experience;
- Demonstrate critical reflection of own learning goals and strategies in relation to career advancement.

Careers: It is expected that graduates of the Master of Building Fire Safety and Risk Engineering will be able to design and analyse performance based fire safety engineering solutions for buildings and gain specialist knowledge of a topic relevant to fire safety. They may receive following certifications from various state statutory bodies: Fire Safety Professional in Queensland. Registered Building Practitioner (Fire Safety Engineer) in Victoria if they previously have bachelor degrees in engineering. Prospective students are requested to check with their state statutory bodies (such as Building Practitioners Board in Victoria) for any additional requirement. Alternatively Master of Building Fire Safety and Risk Engineering is a pathway to further study and research through Masters by Research or/and PhD.

Course Duration: 2 years

Admission Requirements International: To qualify for admission to the course applicants are expected to have a four-years degree in engineering or a three-years degree in science plus two years relevant work experience.

Admission Requirements Mature Age: To qualify for admission to the course applicants are expected to have completed a Graduate Certificate in Performance-Based Building in Fire Codes with honours average or a four-years degree in engineering or a three-years degree in science plus two years relevant work experience

COURSE STRUCTURE

To attain the Master of Building Fire Safety and Risk Engineering, students will be required to complete 192 credits points, consisting of:

- Nine (9) Core units of study (8 x 12 credit points units and 1 x 24 credit point unit);
- One (1) Industrial Experience (VQB5773) unit (24 credit points), and;
- Two (2) Research Project (VQT6061 and VQT6062) units (24 credit points each).

The course is offered over three years on a part-time basis (may be extended to four years) or 18-24 months on a full-time basis.

Year 1, Semester 1

VQB5611	Risk Assessment and Human Behaviour	12
VQB5612	Scientific Principles for Fire Professionals	12

Year 1, Semester 2

VQB5641	Fire Safety Systems Design	12
VQB5642	Performance Codes Methodology and Structure	12

Students can exit with Graduate Certificate if the above units are completed.

VQB5773	Industrial Experience On Fire Safety	24

Summer Units:

VQB5781	Mathematics for Fire Safety Engineers	12
VQB5791	Mechanics of Thermo-Fluids and Solids for Fire Safety Engineers	12

Students who have an engineering or science degree may receive recognition of prior

learning (RPL) for VQB5781 and VQB5791.

Year 2, Semester 1

VQB5751	Fire Technology Modelling	12
VQB5761	Fire Safety Systems Modelling	12

The following is available for full time students across semesters 1 & 2

VQT6061	Building Fire Research A	24

Year 2, Semester 2

VQB5771	Fire Safety Engineering Application	24
VQT6062	Building Fire Research B	24

Master of Engineering (By Research)

Course Code: ERIT
Campus: Werribee, Footscray Park.

About this course: Masters Degree (Research) in the field of Engineering The Masters Degree (Research) allows you to develop your knowledge and skills in planning and executing a substantial piece of original research in an area that is of interest to you and to the University, industry and the community, with the assistance of an experienced research supervisory team. This degree requires you to apply an advanced body of knowledge in a range of contexts for research and scholarship and potentially as a pathway to a PhD or Professional Doctorate. It involves supervised study and research, through completion of a major research thesis in an approved thesis format for examination, as well as research training and independent study. Feedback is provided face-to-face and online by the supervisory team, and co-curricular opportunities for receiving feedback are available through activities in which you are strongly encouraged to participate, such as involvement in support and adjunct programs offered by the university or externally; collaborative publication of academic articles with supervisors and peers; presentation at academic conferences including those organised within VU for graduate researchers and staff; and other presentations to a variety of audiences. This course is normally a 2 year (full time) and 4 year (part time) research-based degree.

Course Objectives: The course objectives are to produce graduates who have the following knowledge and skills:

- a body of knowledge that includes the understanding of recent developments in one or more discipline
- advanced knowledge of research principles and methods applicable to the field of work or learning
- cognitive skills to demonstrate mastery of theoretical knowledge and to reflect critically on theory and its application
- cognitive, technical and creative skills to investigate, analyse and synthesise complex information, problems, concepts and theories and to apply established theories to different bodies of knowledge or practice
- cognitive, technical and creative skills to generate and evaluate complex ideas and concepts at an abstract level
- cognitive and technical skills to design, use and evaluate research and research method
- communication and technical skills to present a coherent and sustained argument and to disseminate research results to specialist and non-specialist audience
- technical and communication skills to design, evaluate, implement, analyse, theorise and disseminate research that makes a contribution to knowledge

This knowledge and these skills will be demonstrated through the planning and execution of a substantial piece of research

- with creativity and initiative
- with a high level of personal autonomy and accountability, demonstrating expert judgement, adaptability and responsibility as a learner.

Careers: PhD or Professional Doctorate, research assistant, research technician.

Course Duration: 2 years

Admission Requirements International: In addition to meeting the University requirements (See: Admission Requirements - Other) international applicants who will be studying in Australia must satisfy the English language qualifying requirement for gaining an entry visa to Australia for applicants from their country.

Admission Requirements Other: (a) Academic achievement and preparation to a level that is sufficient to undertake masters level research demonstrated in any one or more of the following: i. Qualified, at minimum, for a bachelors degree at a standard considered by the University to be sufficiently meritorious (normally Distinction average in the final year); or ii. Qualified for any other award judged by the University to be of a relevant and appropriate standard and have: •Produced evidence of professional experience; and •Fulfilled any other conditions relating to prerequisite studies which the University may impose. (b) Demonstrated competency in English sufficient to work at research masters level, through meeting one or more of the following criteria: i. Successful completion of one of the degrees stipulated under a) i) – ii) above with English as the language of instruction and assessment and undertaken in a predominantly English speaking context; or ii. Been taught for two of the past five years at a tertiary institution where English was the primary language of instruction; or iii. Achieved an overall band score of not less than 6.5 in an International English Language Testing Service (IELTS) test with no individual band score below 6.0; or iv. Achieved a score of not less than 92 and no section score less than 22 in the internet-based Teaching of English Foreign Language (TOEFL) test; or v. Documented evidence of English proficiency equivalent to the above.

COURSE STRUCTURE

The standard duration of a Masters Degree (Research) is two years of full-time study or part-time equivalent, although in certain circumstances the degree may be completed in eighteen months. In some cases the student may be required to complete approved coursework units such as laboratory skills or research design as part of the Masters Degree (Research).

FULL TIME

COLLEGE OF ENGINEERING AND SCIENCE

Civil & Building Engineering stream:

Year 1, Semester 1

VCC8001	Research Thesis Full Time	48

Year 1, Semester 2

VCC8002	Research Thesis Full Time	48

Year 2, Semester 1

VCC8001	Research Thesis Full Time	48

Year 2, Semester 2

VCC8002	Research Thesis Full Time	48

Electrical Engineering stream:

Year 1, Semester 1

VEE8001	Research Thesis 1 Full Time	48

Year 1, Semester 2

VEE8002	Research Thesis 2 Full Time	48

Year 2, Semester 1

VEE8001	Research Thesis 1 Full Time	48

Year 2, Semester 2

VEE8002	Research Thesis 2 Full Time	48

Mechanical Engineering stream:

Year 1, Semester 1

VMR8001	Research Thesis 1 Full Time	48

Year 1, Semester 2

VMR8002	Research Thesis 2 Full Time	48

Year 2, Semester 1

VMR8001	Research Thesis 1 Full Time	48

Year 2, Semester 2

VMR8002	Research Thesis 2 Full Time	48

Packaging Stream:

Year 1, Semester 1

VPP8001	Research Thesis 1 Full Time	48

Year 1, Semester 2

VPP8002	Research Thesis 2 Full Time	48

Year 2, Semester 1

VPP8001	Research Thesis 1 Full Time	48

Year 2, Semester 2

VPP8002	Research Thesis 2 Full Time	48

Transportation stream:

Year 1, Semester 1

VPT8001	Research Thesis 1 Full Time	48

Year 1, Semester 2

VPT8002	Research Thesis 2 Full Time	48

Year 2, Semester 1

VPT8001	Research Thesis 1 Full Time	48

Year 2, Semester 2

VPT8002	Research Thesis 2 Full Time	48

Physics stream:

Year 1, Semester 1

RPH8001	Research Thesis 1 Full Time	48

Year 1, Semester 2

RPH8002	Research Thesis 2 Full Time	48

Year 2, Semester 1

RPH8001	Research Thesis 1 Full Time	48

Year 2, Semester 2

RPH8002	Research Thesis 2 Full Time	48

ENVIRONMENTAL AND RISK ENGINEERING:

Year 1, Semester 1

VQT8001	Research Thesis 1 Full Time	48

Year 1, Semester 2

VQT8002	Research Thesis 2 Full Time	48

Year 2, Semester 1

VQT8001	Research Thesis 1 Full Time	48

Year 2, Semester 2

VQT8002	Research Thesis 2 Full Time	48

PART TIME

COLLEGE OF ENGINEERING AND SCIENCE

Civil & Building Engineering stream:

Year 1, Semester 1

VCC8011	Research Thesis (Part-Time)	24

Year 1, Semester 2

VCC8012	Research Thesis (Part Time)	24

Year 2, Semester 1

VCC8011	Research Thesis (Part-Time)	24

Year 2, Semester 2

VCC8012	Research Thesis (Part Time)	24

Year 3, Semester 1

VCC8011	Research Thesis (Part-Time)	24

Year 3, Semester 2

VCC8012	Research Thesis (Part Time)	24

Year 4, Semester 1

VCC8011	Research Thesis (Part-Time)	24

Year 4, Semester 2

VCC8012	Research Thesis (Part Time)	24

Electrical Engineering stream:

Year 1, Semester 1

VEE8011	Research Thesis 1 Part Time	24

Year 1, Semester 2

VEE8012	Research Thesis 2 Part Time	24

Year 2, Semester 1

VEE8011	Research Thesis 1 Part Time	24

Year 2, Semester 2

VEE8012	Research Thesis 2 Part Time	24

Year 3, Semester 1

VEE8011	Research Thesis 1 Part Time	24

Year 3, Semester 2

VEE8012	Research Thesis 2 Part Time	24

Year 4, Semester 1

VEE8011	Research Thesis 1 Part Time	24

Year 4, Semester 2

VEE8012	Research Thesis 2 Part Time	24

Mechanical Engineering stream:

Year 1, Semester 1

VMR8011	Research Thesis 1 Part Time	24

Year 1, Semester 2

VMR8012	Research Thesis 2 Part Time	24

Year 2, Semester 1

VMR8011	Research Thesis 1 Part Time	24

Year 2, Semester 2

VMR8012	Research Thesis 2 Part Time	24

Year 3, Semester 1

VMR8011	Research Thesis 1 Part Time	24

Year 3, Semester 2

VMR8012	Research Thesis 2 Part Time	24

Year 4, Semester 1

VMR8011	Research Thesis 1 Part Time	24

Year 4, Semester 2

VMR8012	Research Thesis 2 Part Time	24

Packaging Stream:

Year 1, Semester 1

VPP8011	Research Thesis 1 Part Time	24

Year 1, Semester 2

VPP8012	Research Thesis 2 Part Time	24

Year 2, Semester 1

VPP8011	Research Thesis 1 Part Time	24

Year 2, Semester 2

VPP8012	Research Thesis 2 Part Time	24
Year 3, Semester 1		
VPP8011	Research Thesis 1 Part Time	24
Year 3, Semester 2		
VPP8012	Research Thesis 2 Part Time	24
Year 4, Semester 1		
VPP8011	Research Thesis 1 Part Time	24
Year 4, Semester 2		
VPP8012	Research Thesis 2 Part Time	24
Transportation stream:		
Year 1, Semester 2		
VPT8011	Research Thesis 1 Part Time	24
Year 2, Semester 2		
VPT8012	Research Thesis 2 Part Time	24
Year 2, Semester 1		
VPT8011	Research Thesis 1 Part Time	24
Year 2, Semester 2		
VPT8012	Research Thesis 2 Part Time	24
Year 3, Semester 1		
VPT8011	Research Thesis 1 Part Time	24
Year 3, Semester 2		
VPT8012	Research Thesis 2 Part Time	24
Year 4, Semester 1		
VPT8011	Research Thesis 1 Part Time	24
Year 4, Semester 2		
VPT8012	Research Thesis 2 Part Time	24
Physics stream:		
Year 1, Semester 1		
RPH8011	Research Thesis 1 Part Time	24
Year 1, Semester 2		
RPH8012	Research Thesis 2 Part Time	24
Year 2, Semester 1		
RPH8011	Research Thesis 1 Part Time	24
Year 2, Semester 2		
RPH8012	Research Thesis 2 Part Time	24
Year 3, Semester 1		
RPH8011	Research Thesis 1 Part Time	24
Year 3, Semester 2		
RPH8012	Research Thesis 2 Part Time	24
Year 4, Semester 1		
RPH8011	Research Thesis 1 Part Time	24
Year 4, Semester 2		
RPH8012	Research Thesis 2 Part Time	24
ENVIRONMENTAL AND RISK ENGINEERING:		
Year 1, Semester 1		
VQT8011	Research Thesis 1 Part Time	24
Year 1, Semester 2		
VQT8012	Research Thesis 2 Part Time	24
Year 2, Semester 1		
VQT8011	Research Thesis 1 Part Time	24
Year 2, Semester 2		
VQT8012	Research Thesis 2 Part Time	24
Year 3, Semester 1		
VQT8011	Research Thesis 1 Part Time	24
Year 3, Semester 2		
VQT8012	Research Thesis 2 Part Time	24
Year 4, Semester 1		
VQT8011	Research Thesis 1 Part Time	24
Year 4, Semester 2		
VQT8012	Research Thesis 2 Part Time	24

Graduate Certificate in Performance-Based Building & Fire Codes

Course Code: ETQB
Campus: Werribee.

About this course: The Graduate Certificate in Performance Based Building and Fire Codes is designed to present the concepts behind fire safety engineering, such that graduates have an appreciation and an understanding of what should be included into a fire safety engineering design, in addition to acquiring some of the techniques available for carrying out the necessary calculations to demonstrate that an adequate level of safety has been achieved. The approach adopted in the presentation of the course material does not presuppose detailed knowledge and, as such, will be suitable for building surveyors and building engineers from other disciplines, as well as consolidating the knowledge of fire safety practitioners. The course does not teach engineering design, but sets out to illustrate for those who will be involved in assessing such designs, the approach to adopt, what to look for, questions to ask and how to reach a conclusion.

Course Objectives: The course aims to enable building surveyors and other allied professionals to:

- make professional use of performance-based building codes;
- employ the concepts and alternative acceptable frameworks for performance-based codes, with particular, but not exclusive, emphasis given to fire safety engineering design;
- acquire appropriate knowledge and skills necessary for the assessment and application of performance-based building and fire codes;
- explain the basic physics and chemistry governing ignition, fire growth and spread, smoke movement and fire extinguishment and structural behaviour during fire;
- apply relevant concepts concerning occupant communication and response in relation to fire cues;
- discuss basic fire safety engineering analysis through the use of assessment tools;
- develop a professional approach to performance-based codes and a recognition of when to assess designs which are within a person's field of expertise and when to refer designs to a more appropriately qualified assessor;
- develop an appreciation of the legal, statutory and design integrity requirements and the need for compliance of the design assumptions throughout the operational life of the building.

Careers: Enables a graduate (in conjunction with a Diploma in Building Surveying) to become a Relevant Building Surveyor (RBS) capable of determining compliance of an alternative building design solution.

Course Duration: 0.5 years

Admission Requirements Mature Age: To qualify for admission to the course, an applicant must have successfully completed a diploma in Building Surveying or an equivalent qualification and at least two years of relevant professional experience. Candidates with other academic qualifications can be admitted to the course provided they can demonstrate an equivalent combination of additional relevant professional experience and qualifications. A letter of recommendation and an interview may be required.

COURSE STRUCTURE

The course is offered on a part-time basis over one year, and is offered in block modules (four blocks of four to five days, a total of four blocks spread throughout the year). Students must complete 48 credit points.

Year 1, Semester 1

VQB5611	Risk Assessment and Human Behaviour	12
VQB5612	Scientific Principles for Fire Professionals	12

Year 1, Semester 2

VQB5641	Fire Safety Systems Design	12
VQB5642	Performance Codes Methodology and Structure	12

Assessment

Assessments will be conducted through a combination of assignments and an examination. Distribution of marks among each aspect of assessment is determined individually for each unit.

Guidelines on the use of electronic calculators and other electronic storage devices in examinations are provided in individual unit outlines distributed to students within the first two weeks of semester and included on final examination papers.

Electronic calculators and other electronic storage devices will not be permitted where the above provisions have not been met.

Bachelor of Science (Science For Teaching)

Course Code: NBAS
Campus: Werribee, Footscray Park.

About this course: The Bachelor of Science (Science for Teaching) will provide students aspiring to become specialist Maths/Science teachers with a solid foundation in Science and/or Maths and facilitate a seamless pathway to a Master of Teaching (Secondary). The degree will provide graduates with two Teaching Majors in Science and up to 3 teaching minors, enabling them to teach General Science to Year 10 and Science to VCE secondary levels. The flexible structure allows students to study a range of Science disciplines including Biology, Chemistry, Environmental Science and Mathematics as well as disciplines from other Colleges such as Business, Physical Education, English and Humanities.

Course Objectives: Graduates of this course will be able to:

- Demonstrate a critical understanding of the principles and concepts of mathematical and scientific knowledge and practical skills that underpin the profession of science in industrial and educational settings;
- Develop and apply in-depth knowledge of specialist areas, including accessing, analysing and evaluating information and resolving complex problems with creativity and intellectual independence;
- Apply independent, collaborative and interpersonal skills to effectively communicate contemporary changes in science, education and industry to wide ranging audiences;
- Critically review, analyse, adapt and apply broad and coherent theoretical and technical knowledge of scientific and mathematical principles in diverse contexts.

- Exhibit professional judgement, by adapting the knowledge and skills obtained to make effective decisions that reflect social, political and/or ethical contextual factors.
- Exercise high levels of cultural competence to work effectively in socially and culturally diverse communities and settings.

Careers: Graduates from this course may gain employment and develop careers in a range of scientific educational roles in industry, government, professional and community settings. Those who complete a Master of Teaching (Secondary), in addition to the Bachelor degree, will be qualified to register with the VIT to teach in secondary schools. Specialist units within the degree have been approved by the VIT as providing the requisite undergraduate units for specialist Maths and Science Teaching.

Course Duration: 3 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (EAL) or 20 in any other English and in a mathematics (any).

Admission Requirements International: Course is offered to international students with a minimum IELTS of 6.5

Admission Requirements Mature Age: Mature age entry is available through VTAC and applicants will be assessed based upon educational achievements and work experience

Admission Requirements VET: Students who have completed a Cert IV or Diploma in a related Science/Maths area will be eligible to apply for entry to the course and Diploma applicants may apply for recognition of prior learning.

COURSE STRUCTURE

To graduate with the NBAS Bachelor of Science (Science for Teaching), students must satisfy the following conditions: • Successfully complete units of study totalling 288 credit points (24 x 12 credit point units). Made up as follows: • Successfully complete 72 credit points (6 x12 credit point units) of core first year units and • Successfully complete 96 credit points (8 x 12 credit point units) comprising of 4 unit sequences in two of the three science teaching specialisation areas (Biology, Chemistry or Environmental Science) and • Successfully complete 120 credit points (10 x 12 credit point units) in other selected teaching specialisation areas (comprising 4 or 6 unit sequences chosen from the College of Education Teaching Specialisations document) in up to 3 discipline areas. Note • A maximum of 96 credit points of the above units (8 x 12 credit point units) can be selected from outside the College of Engineering and Science. • No more than 120 credit points (10 x 12 credit point units) of Year 1 (series 1000) units can be undertaken. • A minimum of 48 credit points (4 x 12 credit point units) must be at the third year level (Series 3000). • The VIT guidelines define a Major as 6 sequential units, a minor as 4 sequential units and a part as 2 sequential units. This course aligns to these requirements.

Year 1, Semester 1

RBF1310	Biology 1	12
RCS1601	Chemistry 1A	12
RCM1711	Mathematical Foundations 1	12

12 credit point unit from other teaching specialisation area

Year 1, Semester 2

RCM1613	Applied Statistics 1	12
RCS1602	Chemistry 1B	12
RBF1320	Biology 2	12

12 credit point unit from other teaching specialisation area

Year 2, Semester 1

12 credit point unit from specialisation 1

12 credit point unit from specialisation 2

24 credit points (2 units) from other teaching specialisation area

Year 2, Semester 2

12 credit point unit from specialisation 1

12 credit point unit from specialisation 2

24 credit points (2 units) from other teaching specialisation area

Year 3, Semester 1

12 credit point unit from specialisation 1

12 credit point unit from specialisation 2

24 credit points (2 units) from other teaching specialisation area

Year 3, Semester 2

12 credit point unit from specialisation 1

12 credit point unit from specialisation 2

24 credit points (2 units) from other teaching specialisation area

* Students must chose two specialisations and complete all 4 units (48 credit points) in each specialisation.

Choice of other teaching specialisation units is subject to availability

Minors

NMNCHE	Chemistry
NMNBIO	Biology
NMNENV	Environment

Bachelor of Building (Construction Management)

Course Code: NBBC
Campus: Footscray Park.

About this course: Building and Construction managers are responsible for design, development, construction and operation of civil engineering and large scale residential and commercial building projects. They requires skills in project planning, cost and quality management, construction techniques and materials, building law, building codes, industrial relations and personnel management. Graduates of this course are equipped to:

- Plan, construct and manage the delivery of efficient and effective strategies over the course of the construction process;
- Assess construction documentation for constructability and compliance with codes and standards;
- Communicate with technical professionals such as architects and engineers regarding design objectives;
- Formulate project cash flows and budgets with respect to project control at various stages of the construction process;
- Prepare tender documents, contract bidding, negotiation and sub-contractor selection;
- Supervise construction sites and personnel.

Course Objectives: On completion of their course, graduates will be able to:

- Plan, implement and manage the delivery of efficient and effective strategies over the course of construction processes in diverse contemporary contexts using independent thinking and judgement.
- Generate creative solutions to a range of complex construction problems, taking into account issues of constructability, financial and human resources, compliance with relevant codes and standards, ethics and environmental sustainability (commercial and environmental) with initiative and professional judgement.
- Critically evaluate sources and validity of information and use established processes for information management including international perspectives and codes of practice as appropriate.
- Advocate design and management objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms.
- Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks.
- Apply personal and interpersonal competencies including organisational and collaborative skills necessary to operate within broad parameters in the immensely divergent and complex global and Australian cultures.
- Negotiate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world.
- Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

Careers: Career opportunities for graduates completing this course include construction manager, project manager, quantity surveyor, building technician, building surveyor, building contractor, estimator, contract administrator, facilities manager and property developer. Graduates will have a wide range of employment opportunities and can work in both the private and public sectors for employers such as building proprietors, contractors, developers, government bodies and consultancy practices or be self-employed entrepreneurs. As key professionals in the construction industry, graduates will work closely with other professional disciplines, industry groups and development authorities. The course will also provide skills and knowledge that can be applied in other industries such as mining, petrochemicals and infrastructure development.

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (EAL) or 20 in any other English.

Admission Requirements International: Full-fee paying international students must have qualifications which are equivalent to those listed above. In addition, they must provide evidence of proficiency in the English language: IELTS - an overall band score of 6+ or equivalent, subject to individual profile.

Admission Requirements Mature Age: Mature age students demonstrating equivalence to the above can apply in the normal manner.

Admission Requirements VET: VE graduates with Diploma of Building and Construction (Building) (CPC50210) or equivalent will be granted a block exemption for 144 credit points, which is equivalent to the first 1.5 years or 3 semesters of full-time study). Other VE graduates will be considered for credit recognition based on previous study history.

COURSE STRUCTURE

To complete the Bachelor of Building (Construction Management) students will be required to complete 384 credit points (equivalent to 32 units) consisting of:

- 288 credit points (equivalent to 24 units) of Core Building and Construction Management units
- 48 credit points of Core studies
- 48 credit points (equivalent to 4 units) of Elective units (from the list below)

NBC1101	Maths for Builders	12
NBC1102	Building and Construction Structures	12
NBC1103	Basic Structural Mechanics	12
NBC1104	Structural Principles in Construction	12
NBC1105	Building and Construction Studies 1	12
NBC1106	Measurement and Estimating 1	12
NBC2101	Building and Construction Surveying	12
NBC2103	Measurement and Estimating 2	12
NBC2104	Building and Construction Studies 2	12
NBC3101	Project Management Practice	12
NBC3102	Building Development and Compliance 2	12
NBC3103	Project Management Principles	12
NBC3107	Procurement Management	12

NBC4101	Construction Management	12
NBC4102	Project Management and Information Technology	12
NBC4104	Building Life Cycle Costing	12
NBC4107	Major Project 1	12
NBC4108	Major Project 2	12
NEA2201	Building Development and Compliance	12
NEC2103	Engineering Materials & Construction	12
NEF1103	Engineering and the Community	12
NEF1204	Introduction to Engineering Design	12
NEF3101	Project Management	12
NEF3201	Engineering Management	12

Plus 48 credit points (4 units):

BAO1101	Accounting for Decision Making	12
BCO1102	Information Systems for Business	12
BLO1105	Business Law	12
RCM1613	Applied Statistics 1	12

Elective Units:

NEA2101	Architectural History and Design	12
NEA3202	Environmentally Sustainable Design 1	12
NEA4101	Environmentally Sustainable Design 2	12
ECB1131	Computer Network Concepts	12
ECB3255	Small IT Business Development	12
NEF1101	Engineering Mathematics 1	12
NEF1102	Engineering Physics 1	12
NEM2102	Introduction to Engineering Materials	12
NEM3201	Manufacturing Materials	12
NEE4207	Alternative Energy Systems and Power System Communication	12
NEF4105	Professional Engineering Practice	12

OR

Any 24 credit points (2 units) within Victoria University at the AQF 7 level, subject to approval by the Course Coordinator.

PLUS

24 credit points (equivalent to 2 units) selected from any other course offered by Victoria University, at AQF 7 Level (Bachelor Degree).

Bachelor of Building Design

Course Code: NBBD
Campus: Footscray Park.

About this course: The new Bachelor of Building Design program combines the creative practices of an architectural design studio with the cultural, social, technical and sustainable issues that are associated with the built environment. As a student in the new Bachelor of Building Design, you'll use innovative processes to solve problems creatively, and determine solutions for a better future. Modern computer labs, design studios, site visits and interaction with industry practitioners will take you into 'real life' situations with industry briefs. The Bachelor of Building Design program aims to inspire and exercise you in a wide and diverse range of experiences so as to develop an independent and creative approach to building design. In this three-year degree, you will study and develop skills in building design (architectural), building legislation and auditing, building codes, environmentally sustainable construction techniques and materials, building services, professional practice and communication to prepare you as a confident and capable building industry professional. You will also take classes alongside students from building design, construction management, building surveying and engineering programs. By studying in multidisciplinary teams in a studio-based learning environment you will work with allied professions in the building industry right from the beginning of your studies.

Course Objectives: On completion of NBBD Bachelor of Building Design, graduates will be able to:

- Plan, implement and manage the delivery of efficient and effective building design strategies over the course of building design and construction processes in diverse contemporary contexts using independent thinking and judgement.
- Generate creative solutions to a range of complex building design problems, taking into account issues of compliance with relevant codes and standards, building construction process, technical and innovative changes, ethics and environmental sustainability (commercial and environmental) with initiative and professional judgement.
- Critically evaluate sources and validity of information and use established processes for information management, integrating BIM and the latest architectural software, and including international perspectives and codes of practice as appropriate.
- Advocate building design objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional forms (oral, written, working drawings).
- Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks.
- Apply personal and interpersonal competencies including organisational and collaborative skills necessary to operate within broad parameters in the immensely divergent and complex global and Australian cultures.
- Negotiate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world.

- Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

Careers: Graduates of this program meet the academic requirements to apply for registration as a building practitioner with the Building Practitioners Board (BPB). Upon completion of the program graduates will satisfy the educational requirements for the Building Design - Open License. Graduates will have a wide range of employment opportunities and can work in both the private and public sectors for employers such as architects, building proprietors, contractors, developers, engineers, government bodies, consultancy practices and corporations with large building portfolios or be self-employed entrepreneurs. As key professionals in the building design and construction industry, graduates will work closely with other professional disciplines, industry groups and development authorities.

Course Duration: 3 years

Admission Requirements: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 25 in English (EAL) or at least 20 in any other English.

Admission Requirements International: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) OR Successful completion of an Australian Diploma or Advanced Diploma (or equivalent) PLUS IELTS (or equivalent): Overall score of 6 with no band less than 6.0

Admission Requirements Mature Age: Applicants with relevant work, education and/or community experience will be considered for admission to the course.

Admission Requirements VET: Successful completion of a cognate (similar discipline) Australian Diploma (or equivalent) or Advanced Diploma (or equivalent) will be granted advanced standing of a maximum of 96 credit points (Diploma) or 144 credit points (Advanced Diploma). Successful completion of a non-cognate (not similar) Australian (or equivalent) Diploma or Advanced Diploma will be granted advanced standing on a case by case basis.

Admission Requirements Other: Applicants that do not typically meet the standard requirements above, will be required to participate in an interview and demonstrate the following: - minimum of five (5) years work experience in the building industry; or - Diploma level qualifications in a building design or allied trade, along with relevant work experience of four (4) years or more.

COURSE STRUCTURE

To attain the Bachelor of Building Design, students will be required to complete two hundred and eighty-eight (288) credit points (equivalent to twenty-four (24) units in total), consisting of:

- Four (4) College Core units (equivalent to forty-eight (48) credit points);
- Eighteen (18) Professional Core units (equivalent to two hundred and sixteen (216) credit points), and;
- Two (2) Professional Capstone units (equivalent to twenty-four (24) credit points).

Year 1

Semester 1:

NBC1102	Building and Construction Structures	12
NBC1103	Basic Structural Mechanics	12
NBD1100	Built Environment Communication and Skills	12
NBD1101	Building Design Documentation	12

Semester 2:

NBC1100	Building Planning Process 1	12
NBC1104	Structural Principles in Construction	12
NBC1105	Building and Construction Studies 1	12
NBC1108	Building Assessment Process 1	12

Year 2

Semester 1:

NBC2101	Building and Construction Surveying	12
NBC2104	Building and Construction Studies 2	12
NBD2100	Built Environment 1	12
NEF3101	Project Management	12

Semester 2:

NBC2204	Building Systems and Services 1	12
NEA2101	Architectural History and Design	12
NEA3202	Environmentally Sustainable Design 1	12
NBD2200	Building Contract Documentation and Administration	12

Year 3

Semester 1:

NBC3205	Building Systems and Services 2	12
NBD3100	Built Environment 2	12
NBD3101	Environmentally Sustainable Design 2	12
NBD3102	Building Design Project 1	12

(NBD3102 is a Capstone Unit)

Semester 2:

NBC3204	Complex Construction	12
NBD3200	Urban Design and Development	12

NBD3201	Project Risk Management	12
NBD3202	Building Design Project 2	12

(NBD3202 is a Capstone Unit)

Bachelor of Building Surveying

Course Code: NBBS
Campus: Footscray Park.

About this course: Building Surveyors are responsible for assessing plans, conducting inspections, issuing building permits such as occupancy permits and interpreting building and construction regulations for residential and commercial buildings. They require skills in building legislation and auditing, building codes, sustainable construction techniques and materials, fire safety design, inspection procedures, building services and professional practice. Graduates of this course are equipped to:

- Plan, implement and manage the delivery of efficient and effective building surveying strategies over the course of the construction process;
- Interpret the appropriate building documentation and regulations;
- Assess building construction documentation for compliance with building legislations, codes and standards;
- Communicate with technical professionals such as builders, architects and engineers regarding design objectives.

Course Objectives: On completion of their course, graduates will be able to:

- Plan, implement and manage the delivery of efficient and effective building surveying strategies over the course of building construction processes in diverse contemporary contexts using independent thinking and judgement.
- Generate creative solutions to a range of complex building surveying problems, taking into account issues of compliance with relevant codes and standards, building construction process, technical and innovative changes, ethics and environmental sustainability (commercial and environmental) with initiative and professional judgement.
- Critically evaluate sources and validity of information and use established processes for information management.
- Advocate building surveying objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms.
- Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks.
- Apply personal and interpersonal competencies including organisational and collaborative skills necessary to operate within broad parameters in the immensely divergent and complex global and Australian cultures.
- Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

Careers: Graduates will have a wide range of employment opportunities and can work in both the private and public sectors for employers such as building proprietors, contractors, developers, government bodies and consultancy practices or be self-employed entrepreneurs. As key professionals in the construction industry, graduates will work closely with other professional disciplines, industry groups and development authorities.

Course Duration: 3 years

Admission Requirements: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 25 in English (EAL) or at least 20 in any other English.

Admission Requirements International: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) OR Successful completion of an Australian Diploma or Advanced Diploma (or equivalent) PLUS In addition, they must provide evidence of proficiency in the English language: IELTS - Overall score of 6 with no band less than 6.0, subject to individual profile.

Admission Requirements Mature Age: Mature age students demonstrating equivalence to the above can apply via direct entry.

Admission Requirements VET: Vocational Education (VE) graduates with Advanced Diploma of Building Surveying or equivalent will be granted a block exemption for 144 credit points, which is equivalent to the first 1.5 years or 3 semesters of full-time study). VE graduates with Diploma of Building Surveying or equivalent will be granted a block exemption for 96 credit points, which is equivalent to the first year or 2 semesters of full-time study). Other VE graduates will be considered for credit recognition based on previous study history.

Admission Requirements Other: Special entry applicants will be required to participate in an interview and demonstrate: - minimum of 5 years work experience in the building industry; or - Certificate IV level qualifications in a building or allied trade, along with relevant work experience of four years or more.

COURSE STRUCTURE

To attain the Bachelor of Building Surveying (NBBS), students will be required to complete 288 credit points (equivalent to 24 units), consisting of:

- 264 credit points (equivalent to 22 units) of Core Building Surveying units, and;
- 24 credit points (equivalent to 2 units) of Capstone units (NBC3110 Building Surveying Project 1 and NBC3220 Building Surveying Project 2).

Year 1

Semester 1:

NBC1101	Maths for Builders	12
NBC1102	Building and Construction Structures	12
NBC1103	Basic Structural Mechanics	12
NEF1103	Engineering and the Community	12

Semester 2:

NBC1100	Building Planning Process 1	12

NBC1104	Structural Principles in Construction	12
NBC1105	Building and Construction Studies 1	12
NBC1108	Building Assessment Process 1	12
Year 2		
Semester 1:		
NBC2104	Building and Construction Studies 2	12
NBC2108	Building Planning Process 2	12
NBC2109	Performance Based Solutions for Building	12
NBC2110	Building Assessment Process 2	12
Semester 2:		
BCO1102	Information Systems for Business	12
NBC2203	Building Planning Process 3	12
NBC2204	Building Systems and Services 1	12
NEA2201	Building Development and Compliance	12
Year 3		
Semester 1:		
NEC2103	Engineering Materials & Construction	12
NBC3102	Building Development and Compliance 2	12
NBC3110	Building Surveying Project 1	12
NEF3101	Project Management	12
Semester 2:		
NBC3203	Building Assessment Process 3	12
NBC3204	Complex Construction	12
NBC3205	Building Systems and Services 2	12
NBC3220	Building Surveying Project 2	12

Bachelor of Information Technology

Course Code: NBIT
Campus: Footscray Park, VU Sydney.

About this course: VU's Bachelor of Information Technology offers you a three-year degree in developing broad and coherent theoretical and technical knowledge and skills to gain a graduate-level position in the growing IT industry. The Bachelor of Information Technology is offered with a combination of core and elective subjects. You are able to obtain professional outcomes in a discipline area with flexibility and breadth options. Your qualification will have applications across a range of industry contexts including network design and implementation, system security consultancy, data modelling and database development, web and mobile application programming, network and database system administration, and information and communication technology (ICT) management. You will receive hands-on training and have opportunities to develop a body of experience, build useful systems, solve real-world problems and lead project teams by undertaking the capstone project in your final year.

Course Objectives: The NBIT Bachelor of Information Technology degree is designed to produce graduates as Information Technology Professionals with a competitive edge in their chosen career path, through lifelong learning and professional development activities, relevant workplace experience, and industry capstone projects in the final year. Upon successful completion of the NBIT Bachelor of Information Technology, graduates will be able to:

- Integrate and apply a broad and coherent body of knowledge of information technologies with depth in selected areas of study from the following areas: networking, security, virtualisation, enterprise network management, cloud, data analytics, ICT management, web application development, mobile application development and database;
- Analyse and adapt the latest information technologies with intellectual independence, self- learning capabilities and creativity to identify and solve real-world problems with sound decisions and judgement in a broad range of sectors including ICT, government, banking and finance, retail, education, health, media and manufacturing;
- Exhibit a range of technical, analytical, managerial, leadership and interpersonal skills; in depth understanding to the codes of ethics and conducts of IT professions; capacity to perform IT design and development practice in an independent or collaborative environment with a strong industry focus; and the responsibility and accountability as a lifelong learner for own learning and professional practice;
- Present solid foundation and strong practical skills with the ability of life-long learning for industry certifications from large reputable vendors both locally and overseas, such as CISCO Certified Network Associate (CCNA) and Microsoft Certified Technology Specialist (MCTS).

Careers: Completion of the course will prepare graduates for roles such as computing and network support, web-based programming, networking and systems administration, system security consultancy, database administration, I.T. business analysis, and project management in sectors including government, banking and finance, retail, and manufacturing.

Course Duration: 3 years

Admission Requirements: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 25 in English (EAL) or at least 20 in any other English; and a study score of at least 20 in any Mathematics.

Admission Requirements International: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Biology, Chemistry, Physics or Mathematics OR Successful completion of an Australian Diploma or Advanced Diploma (or equivalent); PLUS: IELTS (or equivalent): Overall score of 6 with no band less than 6.0.

Admission Requirements Mature Age: Applicants with relevant work, education and/or community experience will be considered for admission to the course.

Admission Requirements VET: Successful completion of a cognate (similar discipline) Australian Diploma or Advanced Diploma (or equivalent) will be granted advanced standing of a maximum 96 credit points (Diploma) or 144 credit points (Advanced Diploma).

COURSE STRUCTURE

To attain the Bachelor of Information Technology, students will be required to complete two hundred and eighty-eight (288) credit points (equivalent to twenty-four (24) units), consisting of:

- Ninety-six (96) credit points (equivalent to eight (8) units) of Common Core first year studies;

PLUS:

- Ninety-six (96) credit points (equivalent to eight (8) units) of Major studies (from the list below);
- forty-eight (48) credit points (equivalent to four (4) units) of Graduating Core studies;

AND:

- Forty-eight (48) credit points (equivalent to four (4) units) of Minor studies (discipline or breadth, from the list below).

Students that successfully complete the Common Core units (ninety-six (96) credit points, equivalent to eight (8) units) in their first year of studies have the option to either exit the program and graduate with the VDIT Diploma of Information Technology or articulate into another College of Engineering and Science course with credits from the first year units.

Common Core Units

Year 1, Semester 1:

NIT1101	Web Development and CMS	12
NIT1102	Introduction to Programming	12
NIT1103	Communication and Information Management	12
NIT1104	Computer Networks	12

Semester 2:

NIT1201	Introduction to Database Systems	12
NIT1202	Operating Systems	12
NIT1203	Introduction to Project Management	12
NIT1204	Web Application and Server Management	12

Majors

NMAWMD	Web and Mobile Application Development
NMANSC	Network and System Computing

Minors

ESPGLP	Global Leadership
NMIITC	Graduating Core
NMIASD	Software Development
NMIANM	Network Management
NMIICT	ICT Management

Bachelor of Pharmaceutical and Health Science

Course Code: NBPH
Campus: Footscray Park, St Albans.

About this course: The Bachelor of Pharmaceutical and Health Science links the health sciences related to drugs including metabolism, action and toxicology with the pharmaceutical science of drugs including drug design, synthesis and analysis both in-vivo and in products. The course allows students to gain expertise in the related areas of human health and disease and pharmaceutical chemistry and produces graduates with an integrated set of skills and knowledge allowing for broader career prospects in science industries such as pharmaceutical, biomedical, chemical, agricultural, cosmetics, food and beverage. This course does not allow practice as a pharmacist. Those students with scientific research in mind can progress into Honours and postgraduate studies (subject to performance in the degree program).

Course Objectives: On successful completion of NBPH Bachelor of Pharmaceutical and Health Science, graduates will be able to:

- Analyse the fundamental principles underpinning the knowledge and practice of human health and disease, and the development and testing of pharmaceutical products;
- Identify and solve problems with intellectual independence using the principles of pharmaceutical and health science in a range of situations related to health and drug interactions, taking into consideration social, cultural, economic and environmental factors;
- Research, interpret and critically evaluate (local, national and international) information in the discipline and assess its relevance to a range of situations including real case scenarios;
- Collect, interpret and analyse scientific data in order to solve problems in the pharmaceutical and Health Sciences and reflect upon the relevance of the outcomes for public health;
- Devise and apply scientific methodology, individually and with peers, to undertake laboratory exercises, scientific research and practical investigations, employing ethical principles and practice and industry and research protocols;
- Communicate effectively utilising a number of oral and written formats to a range of stakeholders including health practitioners, researchers, colleagues and peers.

Careers: The Bachelor of Pharmaceutical and Health Science, aims to produce graduates who have skills and knowledge in the areas of both Chemistry and Health, by combining the areas of human health and disease with the complementary areas

of pharmaceutical analysis and pharmaceutical design and synthesis. Possible careers for graduates from this course and are found in industry, government and education. Some possible examples include:

- Pharmaceutical Scientist;
- Pharmaceutical and Medical Supplies Specialist;
- Medical and Pharmaceutical Research;
- Hospital Scientist;
- Analytical Chemist;
- Forensic Scientist, and;
- Scientific Instrument Consultant.

Course Duration: 3 years

Admission Requirements: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 30 in English (EAL) or at least 25 in any other English; AND a study score of at least 25 in Chemistry; AND a study score of at least 25 in one of Biology or Health and Human Development.

Admission Requirements Mature Age: Applicants with relevant work, education and/or community experience in the Pharmaceutical/Chemical and/or Health industries, will be considered for admission to the course.

Admission Requirements VET: Students who have completed a Certificate IV in a related Science/Health area will be eligible to apply for entry to the course; OR Successful completion of a cognate (similar discipline) Australian Diploma or Advanced Diploma (or equivalent) will be granted advanced standing of a maximum of 96 credit points (Diploma) or 144 credit points (Advanced Diploma).

COURSE STRUCTURE

To attain the Bachelor of Pharmaceutical and Health Science, students will be required to complete a total of two hundred and eighty-eight (288) credit points (equivalent to twenty-three (23) units) of Core Studies.

Year 1, Semester 1

RCS1110	Chemistry for Biological Sciences A	12
HBM1002	Biological Systems	12
RBM1100	Functional Anatomy of the Trunk	12
RBM1518	Human Physiology 1	12

Year 1, Semester 2

RCS1120	Chemistry for Biological Sciences B	12
HBM1003	Applied Mathematics and Biostatistics	12
RBM1200	Functional Anatomy of the Limbs	12
RBM1528	Human Physiology 2	12

Year 2, Semester 1

RBM2530	Pathophysiology 1	12
RBM2560	Medical Biochemistry	12
NPU2101	Analytical Methods 1	12
NPU2104	Drug Discovery and Development	12

Year 2, Semester 2

RBM2540	Pathophysiology 2	12
HBM2105	Medical Microbiology and Immunity	12
NPU2102	Analytical Methods 2	12
NPU2103	Organic Synthesis	12

Year 3, Semester 1

RBM3720	Immunology	12
NPU3101	Pharmaceutical Regulatory Processes	12
NPU3102	Drug Design	12
NPU3103	Techniques in Pharmaceutical Synthesis	12

Year 3, Semester 2

RBM3800	Pharmacology	12
NPU3104	Drug Testing and Analysis	12
NPU3105	Project	24

Bachelor of Science

Course Code: NBSC
Campus: Werribee, Footscray Park.

About this course: The Bachelor of Science is a three year course with a common first year of units and a choice of discipline Majors and/or Minors in the later two years. Majors in the three science disciplines are listed below:

- Biotechnology;
- Chemistry;
- Ecology and Environmental Management.

In addition, students may elect to enhance their chosen science disciplines with a combination of two minors which will allow flexibility to add other studies of interest to their selected Major. Science Minors are listed below.

- Analytical Chemistry;
- Cell Biology/Microbiology;
- Ecology and Environmental Management;
- Environmental Science;
- Mathematics/Statistics;
- Molecular Biology;
- Pharmaceutical Chemistry;

- Physics.

**Note: Interested students may select a second Major in place of two Minors and graduate with two disciplines. The Bachelor of Science is industry focused, offers an intensive hands-on laboratory and fieldwork experience, has modern laboratories with state-of-the-art equipment, provides opportunities for industry projects and placements and overall better prepares students for careers in the science profession. Those students with scientific research in mind can progress into Honours and postgraduate studies (subject to performance in the degree program). Biotechnology Major Biotechnology involves the use of biological organisms, cells and their components for the benefit of society. It includes the application of the latest technologies to solve medical, environmental, industrial and agricultural problems. The biotechnology major prepares students for exciting careers in cutting edge science and culminates in a capstone research project wherein they can apply the knowledge and skills accumulated through the major to a real scientific problem. The biotechnology major provides in-depth education in many areas of modern biology including biochemistry, microbiology, molecular genetics, cell culture, immunology, genetic engineering and their applications in a broad range of fields including, medical, industrial, forensics, environmental, agricultural and food science. There is a strong emphasis on the development of laboratory-based skills for which the university is equipped with state-of-the-art facilities. Chemistry Major The chemistry major has a strong industry focus and will produce graduates that are 'work ready' by combining an extensive laboratory program with training on state-of-the-art equipment along with an industry placement program. The course combines studies in analytical, forensic and organic chemistry to develop measurement and investigative skills that are highly sought after by industry. After completing second year, students have the opportunity to work in one of over twenty chemical industries as part of their studies. The laboratory program includes hands-on training in modern analytical techniques including atomic absorption spectroscopy, inductively coupled plasma optical emission spectroscopy, gas chromatography including gas chromatography-mass spectrometry, liquid chromatography including liquid chromatography-mass spectrometry, ion chromatography, ultraviolet and visible spectroscopy, fluorescence spectroscopy and Fourier transform infra-red spectroscopy. Over a million dollars of state-of-the-art analytical equipment has recently been acquired and extensive training on this equipment including applications, theory of operation, optimisation, maintenance and troubleshooting forms a major part of second and third year studies. The laboratory program is designed to give our chemistry graduates a genuine head start into the work force. Ecology and Environmental Management Major Australia and the rest of the world face significant challenges in balancing the needs of a sustainable society while protecting the natural environment. The Ecology and Environmental Management major develops skills in environmental sciences that underpin achievable sustainability strategies. Subjects combine extensive practical experience in the field (terrestrial, marine and freshwater environments) and laboratory, with theory that is based on current research and management practices. In partnership with industry, government agencies, researchers and the community, this specialisation produces graduates that are 'work-ready'. An emphasis on environmental research methodology across all subjects also leads to a high uptake into more highly specialised honours and postgraduate research projects. The Ecology and Environmental Management major develops the knowledge and practical experience for working across social, environmental and economic contexts, to achieve ecological sustainability.

Course Objectives: On successful completion of this course, graduates will be able to:

- Locate, evaluate and apply scientific information efficiently and effectively;
- Identify and solve problems with intellectual independence using scientific principles in a range of situations taking into consideration social, cultural, economic and environmental factors;
- Exhibit high levels of numeracy skills in the analysis and interpretation of quantitative scientific data;
- Communicate effectively in spoken and written forms on a range of scientific and mathematical topics to peers, professional and community groups;
- Apply an evidence-based research approach, formulate and test hypotheses in a chosen scientific discipline;
- Respond with social and cultural awareness within local and global environments;
- Devise and apply scientific methodology, individually and with peers, to undertake laboratory exercises, scientific research and practical investigations, employing ethical principles and practice and industry and research protocols.

Careers: The Bachelor of Science will produce graduates with a thorough knowledge of contemporary science for careers in industry, government, community and education. The flexibility of the course allows students to customise their learning towards current and future career demands. Biotechnology graduates pursue careers in a variety of areas including medical and pharmaceutical research, forensic science, agriculture and aquaculture, the food and beverage industry and education. Industries that employ our chemistry graduates include: agricultural chemicals, brewing and wine, chemical analysis, cosmetics, dairy, environmental science and water, food, forensics, horticulture, industrial chemicals, materials and polymers, petrochemicals, pharmaceutical, scientific sales, state and federal government departments. Careers in ecology and environmental management include: landcare/bushcare coordinator; environment officer or environmental planner; restoration ecology and land management officer; marine and freshwater ecosystem management officer; environmental educator; botanist/zoologist/ecologist and ecological and resource assessor.

Course Duration: 3 years

Admission Requirements: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 25 in English (EAL) or at least 20 in any other English; and a study score of at least 20 in any Mathematics.

Admission Requirements Mature Age: Mature age entry is available and applicants will be assessed based upon educational achievements and relevant work experience in a scientific area.

Admission Requirements VET: Students who have completed a Certificate IV or Diploma in a related Science/Health area will be eligible to apply for entry to the course and Diploma applicants may apply for Advanced Standing within the course.

COURSE STRUCTURE

To attain the Bachelor of Science, students will be required to complete 288 credit points of study (equivalent to 24 units), consisting of:

- 96 credit points (equivalent to 8 units) of Core first year units, and;
- 96 credit points (equivalent to 8 units) of Major studies from the list below:

Biotechnology; Chemistry; Ecology and Environmental Management. AND:

- 96 credit points (equivalent to 8 units) of Major studies from the list below:

Biotechnology; Chemistry; Ecology and Environmental Management. OR:

- 96 credit points (equivalent to 8 units) of Minor studies from the list below:

Biotechnology Major - any of the following TWO (2) Minors can be chosen:

- Analytical Chemistry;
- Pharmaceutical Chemistry;
- Ecology and Environmental Management;
- Environmental Science OR Mathematics/Statistics OR Physics.

Chemistry Major - any of the following TWO (2) Minors can be chosen:

- Cell Biology/Microbiology;
- Molecular Biology;
- Ecology and Environmental Management;
- Environmental Science OR Mathematics/Statistics OR Physics.

Ecology and Environmental Management Major - any of the following TWO (2) Minors can be chosen:

- Analytical Chemistry;
- Pharmaceutical Chemistry;
- Cell Biology/Microbiology;
- Molecular Biology;
- Mathematics/Statistics OR Physics.

CORE UNITS

NSC1210	Skills for the Scientist	12
RBF1150	Global Environmental Issues	12
RBF1310	Biology 1	12
RBF1320	Biology 2	12
RCM1613	Applied Statistics 1	12
RCM1711	Mathematical Foundations 1	12
RCS1601	Chemistry 1A	12
RCS1602	Chemistry 1B	12

Majors

NMABIT	Biotechnology
NMACHE	Chemistry
NMAENV	Ecology and Environmental Management

Minors

NMIMBI	Molecular Biology
NMICBM	Cell Biology/Microbiology
NMIPCH	Pharmaceutical Chemistry
NMIMST	Mathematics/Statistics
NMIEAA	Ecology and Environmental Management
NMIACH	Analytical Chemistry
NMIESC	Environmental Science
NMIPHY	Physics

Graduate Diploma in Project Management

Course Code: NGPM
Campus: Footscray Park.

About this course: The Graduate Diploma in Project Management is one of a suite of Project Management courses that specifically meets the needs of current or potential project managers in industry. The course will equip graduates with specialised project management principles and techniques, enabling them to assume the role of project manager and/or become effective members of project management teams. Students can focus on specific project management sectors, including engineering, business, information technology and administration. The internationally recognised Project Management Body of Knowledge (PMBOK) underpins both core units and applications. This course has been accredited by the Australian Institute of Project Managers (AIPM) and Project Management Institute (PMI). USA.

Course Objectives: On successful completion of this course graduates will be able to:

- Explain key theoretical project management frameworks and apply them to a range of project management scenarios, taking into consideration social, cultural, environmental and economic factors.
- Differentiate research methods to investigate complex project management problems in order to generate solutions.
- Design, develop and implement comprehensive project management plans which meet stakeholder expectations.
- Evaluate the impact of organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation.
- Communicate effectively to specialist and non-specialist stakeholders utilising a variety of professional oral and written forms to demonstrate an understanding of theoretical concepts, methodologies, recommendations and professional decisions.

Careers: Completion of the course will prepare graduates for variety of project management careers in any sector of the industry such as engineering, construction, business, information technology, administration and others.

Course Duration: 1 year

Admission Requirements International: Entry into the program is open to applicants with a first degree in any discipline. The minimum English requirement for admission to the Master of Project Management is an IELTS of 6.5 or equivalent. Equivalence is to be assessed by VU. Applicants with a recognised degree in a cognate discipline (an area of management eg. Construction Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) may apply for credits against specific coursework units.

Admission Requirements Mature Age: Entry into the program is open to applicants with a first degree in any discipline. Applicants with a degree in a cognate discipline (an area of management eg. Construction Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) may apply for credits against specific coursework units. Applicants with vocational education qualification and at least 2 years work experience, in the project management area can enter the course upon the completion of the Graduate Certificate in Project Management.

COURSE STRUCTURE

The Graduate Diploma in Project Management degree is a 96 credit points (8 unit), 12 month full-time award which may be studied in part-time mode. The award consists of 4 core and 4 elective units. Four project management core units: Principles of Project Management, Project Planning and Control, Project Governance and Project Management and People. Four elective units (including up to one from outside the specified elective list). However, students without a degree in a cognate discipline will be required to complete EPM5500 Fundamentals of Project Management and EPM5530 Project Management Practice

Course structure consists of 4 core project management units and 4 elective units, including up to one other unit from outside the specified elective list.

Core Units

EPM5600	Principles of Project Management	12
EPM5610	Project Planning and Control	12
EPM5620	Project Governance	12
EPM5630	Project Management and People	12

Elective Units Select four units (48 credit points). Students without a degree in a cognate discipline must select EPM5500 and EPM5530.

Semester 1 units

EPM5500	Fundamentals of Project Management	12
EPM5510	Project Program and Portfolio Management	12
EPM5700	Project Management and Information Technology	12
EPM5740	Project Risk Management	12
EPM5760	Project Construction Management	12

Semester 2 units

EPM5520	Sustainable Project Management	12
EPM5530	Project Management Practice	12
EPM5710	Project Procurement Management	12
EPM5720	Facility Life Cycle Costing	12
EPM5730	Project Stakeholder Management	12
EPM5750	Project Investment Analysis	12

One unit at AQF8/9 level subject to course coordinator approval

Units are offered subject to availability

Bachelor of Engineering (Honours) (Architectural Engineering)

Course Code: NHEA
Campus: Footscray Park.

About this course: Architectural Engineers integrate essential building systems into architects' plans to meet project design, safety and environmental goals. The Bachelor of Engineering (Honours) (Architectural Engineering) covers the processes behind making safe buildings, with an emphasis on sustainable design concepts. Architectural Engineering encompasses elements of other engineering disciplines, including mechanical, electrical, fire protection, and others. The focus of the course is on design of structural systems while considering environmental systems such as air conditioning, water, power, lighting, fire and safety, as well as construction planning. You will learn selected 'creative' architecture skills in an engineering degree framework, so you can work closely with architects on the design of buildings. Areas of study include:

- architectural history and design of buildings
- air conditioning, lighting and electrical power distribution
- water supply and distribution
- fire and life safety systems
- sustainable building systems design
- building structures and building construction technology

Course Objectives: Upon completion of the course graduates will be able to:

- Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the architectural engineering discipline;
- Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline;
- Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices;

- Critically evaluate both sources and validity of information and use established processes for information management
- Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the engineering discipline;
- Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills);
- Present clear and coherent expositions of knowledge and ideas to a variety of audiences;
- Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts;
- Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

Careers: As an accredited Architectural Engineering graduate you will work in teams with other engineers and architects, who focus on designing structural systems, evaluating and planning heating and air conditioning, lighting, electrical, plumbing, and/or fire protection systems for buildings. Architectural Engineers may work on new building projects, or renovations of existing structures. With an increasing need for sustainable buildings, you will be in high demand, designing the systems that make modern buildings a safe and comfortable place to live and work. Job titles

- Design engineer
- Building services engineer
- Hydraulic engineer
- Estimator
- Structural engineer

Organisations employing architectural engineering graduates Graduates work closely with architects and can find employment within architecture, engineering and construction firms.

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (EAL) or 20 in any other English AND at least 20 in any Mathematics.

Admission Requirements International: Full-fee paying international students must have qualifications which are equivalent to those listed above. In addition, they must provide evidence of proficiency in the English language: IELTS - an overall band score of 6+ or equivalent, subject to individual profile.

Admission Requirements Mature Age: Applicants who have not completed Year 12 but who possess appropriate educational qualifications, work or life experiences which would enable them to successfully undertake the course, will be considered for admission.

Admission Requirements VET: Applicants with an Advanced Diploma of Engineering Technology (AQF 6) or equivalent may apply for advanced standing of up to 13 units (156 credit points) depending on the selection of units completed.

COURSE STRUCTURE

To complete the Bachelor of Engineering (Honours) (Architectural Engineering) students will be required to complete 384 credit points (equivalent to 32 units) in total consisting of:

- 156 credit points (equivalent to 13 units) of Common Engineering units
- 192 credit points (equivalent to 16 units) of Core Architectural Engineering units
- 36 credit points (equivalent to 3 units) of Elective studies

Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours student must achieve:

- A minimum weighted average of 60% over year levels 1 to 3
- A minimum weighted average of 80% in year level 4;
- A HD grade for the final year NEF4202 Capstone Project 2

Common Engineering Units (13 units, 156 credit points):

NEF1101	Engineering Mathematics 1	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12
NEF3101	Project Management	12
NEF3201	Engineering Management	12
NEF4105	Professional Engineering Practice	12
NEF4102	Capstone Project 1	12
NEF4202	Capstone Project 2	12

Core Architectural Engineering Units (16 units, 192 credit points):

NEA2101	Architectural History and Design	12
NEA2201	Building Development and Compliance	12
NEA3101	HVAC Systems 1	12
NEA3102	Building Electrical Systems	12
NEA3103	Hydraulic Services Systems	12
NEA3201	HVAC Systems 2	12

NEA3202	Environmentally Sustainable Design 1	12
NEA4101	Environmentally Sustainable Design 2	12
NEA4201	Building Systems Design & Costing	12
NEA4202	Building Fire Safety Systems	12
NEC2102	Solid Mechanics	12
NEC2103	Engineering Materials & Construction	12
NEC2201	Introduction to Structural Engineering Design	12
NEF2101	Fluid Mechanics 1	12
NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEM2201	Thermodynamics 1	12

Elective Units two (2) elective units selected from the list below:

NFM0112	Mathematics Foundations	12
NFP0102	Physics Foundations	12
NEC2104	Engineering Surveying	12
NEC2202	Geomechanics	12
NEC3101	Structural Analysis	12
NEC3202	Civil Engineering Design 1	12
NEE2103	Linear Analysis for Electrical Engineers	12
NEE2203	Experimental Data Analysis	12
NEE4207	Alternative Energy Systems and Power System Communication	12
NEM2102	Introduction to Engineering Materials	12
NEM2202	Dynamics	12
NBC3102	Building Development and Compliance 2	12

Plus ONE (1) elective unit (12 credit points) taken from any course offered by the University at AQF 7 level.

* Please note that students without prerequisites for NEF1101 ENGINEERING MATHEMATICS 1 and/or NEF1102 ENGINEERING PHYSICS 1 will be required to select NFM0112 Mathematics Foundations and/or NFP0102 Physics Foundation when enrolling in the course.

Bachelor of Engineering (Honours) (Civil Engineering)

Course Code: NHEC
Campus: Footscray Park.

About this course: Be part of a growing demand for Civil Engineers as communities and governments continue to expect well-engineered, effective and sustainable facilities. The Bachelor of Engineering (Honours) (Civil Engineering) covers the planning, design, construction and management of essential community infrastructure, including:

- commercial and industrial buildings
- water supply and wastewater systems
- irrigation, drainage and flood protection systems
- bridges, roads and transport systems
- port harbour and airport facilities

Civil engineering is one of the oldest technical professions providing the necessary infrastructure for societies. As a Civil Engineer, you can run your own practice or work for government authorities, private industry consulting firms or major construction companies on planning, investigation, design, construction and/or rehabilitation of:

- office, residential and industrial buildings, sporting and shopping complexes
- sustainable urban residential developments and municipal facilities
- transportation systems for passengers and freight including roads, bridges, railways and airports
- water infrastructure works including reservoirs, pump stations, pipelines, treatment plants, drainage and flood control
- irrigation and alternative water supply systems including wastewater recycling and stormwater harvesting
- pollution control facilities for solid, liquid and gaseous wastes
- mining developments and structural foundations (geological / soil investigations)
- energy extraction facilities and renewable energy sources such as hydro, solar, wind and geothermal
- ports, harbours, marinas, breakwaters, beach rehabilitation and other coastal

Course Objectives: Upon completion of the course graduates will be able to:

- Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the civil engineering discipline;
- Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline;
- Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices;
- Critically evaluate both sources and validity of information and use established processes for information management
- Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the engineering discipline;
- Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills);

- Present clear and coherent expositions of knowledge and ideas to a variety of audiences;
- Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts;
- Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

Careers: VU's civil engineering graduates are known in the industry as well-rounded accredited engineers. You'll graduate with highly-sought after technical and problem solving skills and join one of the oldest technical professions, providing the infrastructure necessary for societies to develop. Job titles

- Civil infrastructure engineer
- Civil design engineer
- Construction engineer
- Engineering technician
- Environmental engineer

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (EAL) or 20 in any other English AND at least 20 in any Mathematics.

Admission Requirements International: Full-fee paying international students must have qualifications which are equivalent to those listed above. In addition, they must provide evidence of proficiency in the English language: IELTS - an overall band score of 6+ or equivalent, subject to individual profile.

Admission Requirements Mature Age: Applicants who have not completed Year 12 but who possess appropriate educational qualifications, work or life experiences which would enable them to successfully undertake the course, will be considered for admission.

Admission Requirements VET: Applicants with an Advanced Diploma of Engineering Technology (AQF 6) or equivalent may apply for advanced standing of up to 13 units (156 credit points) depending on the selection of units completed.

COURSE STRUCTURE

To complete the Bachelor of Engineering (Honours) (Civil Engineering) students will be required to complete 384 credit points (equivalent to 32 units) in total consisting of:

- 156 credit points (equivalent to 13 units) of Common Engineering units
- 192 credit points (equivalent to 16 units) of Core Civil Engineering units

Plus:

- 36 credit points (equivalent to 3 units) of Elective studies

Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours student must achieve:

- A minimum weighted average of 60% over year levels 1 to 3;
- A minimum weighted average of 80% in year level 4;
- A HD grade for the final year NEF4202 Capstone Project 2.

Common Engineering Units (13 units, 156 credit points):

NEF1101	Engineering Mathematics 1	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12
NEF3101	Project Management	12
NEF3201	Engineering Management	12
NEF4105	Professional Engineering Practice	12
NEF4102	Capstone Project 1	12
NEF4202	Capstone Project 2	12

Core Civil Engineering Units (16 units, 192 credit points):

NEF2101	Fluid Mechanics 1	12
NEC2102	Solid Mechanics	12
NEC2103	Engineering Materials & Construction	12
NEC2104	Engineering Surveying	12
NEC2201	Introduction to Structural Engineering Design	12
NEC2202	Geomechanics	12
NEC2203	Hydraulics	12
NEC2204	Highway Engineering	12
NEC3101	Structural Analysis	12
NEC3102	Geotechnical Engineering	12
NEC3103	Hydrology and Water Resources	12
NEC3201	Hydraulic Engineering	12
NEC3202	Civil Engineering Design 1	12
NEC3203	Structural Engineering Design 1	12
NEC4101	Environmental Engineering 1	12

Plus select 12 credit points from either:

NEC4102	Structural Engineering Design 2	12
NEC4201	Civil Engineering Design 2	12

Select 24 credit points (equivalent to 2) Elective Units from the list below*:

NFM0112	Mathematics Foundations	12
NFP0102	Physics Foundations	12
NEC4102	Structural Engineering Design 2	12
NEC4082	Environmental Engineering 2	12
NEC4172	Urban Development and Transportation	12
NEC4201	Civil Engineering Design 2	12
NEA2101	Architectural History and Design	12
NEA2201	Building Development and Compliance	12
NEA3102	Building Electrical Systems	12
NEA3202	Environmentally Sustainable Design 1	12
NEA4201	Building Systems Design & Costing	12
NEA4202	Building Fire Safety Systems	12
NEE2103	Linear Analysis for Electrical Engineers	12
NEE2203	Experimental Data Analysis	12
NEE4207	Alternative Energy Systems and Power System Communication	12
NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEM2102	Introduction to Engineering Materials	12

And a 12 credit point elective (equivalent to one unit) taken from any course offered by the University at AQF 7 level.

* Please note that students without prerequisites for NEF1101 ENGINEERING MATHEMATICS 1 and/or NEF1102 ENGINEERING PHYSICS 1 will be required to select NFM0112 Mathematics Foundations and/or NFP0102 Physics Foundation when enrolling in the course.

Bachelor of Engineering (Honours) (Electrical and Electronic Engineering)

Course Code: NHEE
Campus: Footscray Park.

About this course: Position yourself at the exciting edge of electronic design, power generation and communications as you study one of the largest and oldest fields of engineering. Gain practical and problem-solving skills working on projects in the workplace that will help launch a career as an Electrical or Electronic Engineer. The Bachelor of Engineering degree combines electrical and electronic engineering, and you can specialise in telecommunications, power or embedded systems. Graduates of this course are equipped to:

- be responsible for electricity generation and distribution
- design and develop smart grids incorporating communication, control, and automation technologies in this modernisation
- design and develop renewable energy systems (such as photovoltaic, wind and biomass systems) as alternatives to fossil-fuel based generation
- work in the electricity supply industry with special skills on power systems analysis, protection, operations, reliability, maintenance, and management.
- design complex electronic equipment
- manage large industrial manufacturing plants and substations
- design and manage communications infrastructure (telephones, radio, TV and the Internet)
- design and program microprocessor based embedded systems for use within a wide range of applications and industries.

Course Objectives: Upon completion of the course graduates will be able to:

- Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the electrical and electronic engineering discipline;
- Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline;
- Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices;
- Critically evaluate both sources and validity of information and use established processes for information management
- Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the engineering discipline;
- Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills);
- Present clear and coherent expositions of knowledge and ideas to a variety of audiences;
- Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts;
- Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

Careers: VU's electronic and electrical engineering graduates are recognised in the industry as accredited engineers with the skills to develop creative and innovative solutions to engineering problems. Through laboratory experimentation and work placements, you'll gain the practical knowledge and ability to hit the ground running. Job titles

- Electrical engineer
- Electronic engineer

- Communications engineer
- Power engineer
- Telecommunications engineer
- Embedded software engineer

Organisations employing electronic and electrical engineering graduates Graduates can find employment in a diverse range of industries including robotics, renewable energy, transport, telecommunications, manufacturing and bioengineering.

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (EAL) or 20 in any other English AND a study score of 20 in any Mathematics.

Admission Requirements International: Full-fee paying international students must have qualifications which are equivalent to those listed above. In addition, they must provide evidence of proficiency in the English language: IELTS - an overall band score of 6+ or equivalent, subject to individual profile.

Admission Requirements Mature Age: Applicants who have not completed Year 12 but who possess appropriate educational qualifications, work or life experiences which would enable them to successfully undertake the course, will be considered for admission.

Admission Requirements VET: Applicants with Advanced Diploma of Engineering Technology - Electrical (AQF 6) or similar may apply for advanced standing of up to 12 units (144 credit points) depending on the selection of units completed.

COURSE STRUCTURE

To complete the Bachelor of Engineering (Honours) (Electrical & Electronic Engineering) students will be required to complete 384 credit points (equivalent to 32 units) in total consisting of:

- 156 credit points (equivalent to 13 units) of Common Engineering units
- 192 credit points (equivalent to 16 units) of Core Architectural Engineering units
- 36 credit points (equivalent to 3 units) of Elective units (from list below)

Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours student must achieve:

- A minimum weighted average of 60% over year levels 1 to 3;
- A minimum weighted average of 80% in year level 4;
- A HD grade for the final year NEF4202 Capstone Project 2.

Common Engineering Units:

NEF1101	Engineering Mathematics 1	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12
NEF3101	Project Management	12
NEF3201	Engineering Management	12
NEF4105	Professional Engineering Practice	12
NEF4102	Capstone Project 1	12
NEF4202	Capstone Project 2	12

Core Electrical and Electronic Engineering Units:

NEE2101	Electrical Circuits	12
NEE2102	Computer Systems	12
NEE2103	Linear Analysis for Electrical Engineers	12
NEE2110	Engineering Design and Practice 2A	12
NEE2201	Linear Systems with Matlab Applications	12
NEE2202	Electronic Systems	12
NEE2203	Experimental Data Analysis	12
NEE2210	Engineering Design and Practice 2B	12
NEE3101	Telecommunications	12
NEE3102	Electronic Systems 2	12
NEE3103	Electrical Machines	12
NEE3201	Introduction to Control Systems	12
NEE3202	Power System Supply Chain Management	12
NEE3203	Embedded Systems	12

Select 24 credit points (2) units from one of the following streams:

Power Systems Engineering:

NEE4110	Electrical Power Systems, Analysis and Operation	12
NEE4210	Electric Energy Systems Protection and Power Electronics	12

Communication and Systems Engineering:

NEE4120	Analog and Digital Transmission	12
NEE4220	Wireless and Broadband Communications	12

Embedded Systems Engineering:

NEE4130	Operating Systems and Network Programming	12
NEE4230	Real Time ASIC Based Systems	12

Electives Units: Select 24 credit points (2) elective units selected from the list below*):

NEA3102	Building Electrical Systems	12
NFM0112	Mathematics Foundations	12
NFP0102	Physics Foundations	12
NEE4102	Signal Processing	12
NEE4204	Computer and Fuzzy Logic Control Systems	12
NEE4207	Alternative Energy Systems and Power System Communication	12
NEM2201	Thermodynamics 1	12
NEM2202	Dynamics	12
VES3111	Mechatronics & Sensors 1	12

Plus 12 credit points (1) elective unit taken from any course offered by the University at AQF 7 level.

* Please note that students without prerequisites for NEF1101 ENGINEERING MATHEMATICS 1 and/or NEF1102 ENGINEERING PHYSICS 1 will be required to select NFM0112 Mathematics Foundations and/or NFP0102 Physics Foundation when enrolling in the course.

Bachelor of Engineering (Honours) (Mechanical Engineering)

Course Code: NHEM
Campus: Footscray Park.

About this course: Get set for a successful career in a wide range of areas such as computer-aided engineering design, modelling and simulation, transport systems, machine health monitoring, design of medical devices and prostheses, mining, defence and manufacturing. Mechanical Engineers use their in-depth knowledge of the Physical Sciences and Mathematics to invent new products, devices and processes as well as generate clever solutions to a broad range of problems. Intimately, Mechanical engineers work to improve the quality of life on Earth. Here are some examples of recent breakthroughs in which Mechanical Engineers played a critical role:

- Artificial kidney (wearable dialysis machine)
- 3D printing machines
- High-performance prostheses
- Hypersonic flight
- Unmanned vehicles

Mechanical Engineers combine inventiveness with their knowledge of mathematics and the physical sciences to develop ways to economically exploit the resources of nature for the benefit of humankind. Mechanical Engineering is concerned with bridging the gap between science and basic knowledge on the one hand, and the design and development of useful devices and processes on the other. The Bachelor of Engineering in Mechanical Engineering at VU focuses on modelling and simulation of components, machines, processes and systems. As a graduate of the course you will be able to:

- integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge
- develop expertise and professional judgement in engineering design practice
- adapt theoretical knowledge to propose creative, innovative and sustainable engineering practices
- critically evaluate both sources and validity of information
- plan and execute a research project, professional project or piece of scholarship
- work in and across disciplinary teams to communicate and solve problems
- apply professional ethics and accountabilities in your engineering practice
- develop and use computer modelling tools.

As part of this course, you will work on real problems and projects in the workplace and community. This ensures that you are career-ready when you graduate.

Course Objectives: Upon completion of the course graduates will be able to:

- Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the mechanical engineering discipline;
- Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the mechanical engineering discipline;
- Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices;
- Critically evaluate both sources and validity of information and use established processes for information management
- Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the mechanical engineering discipline;
- Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills);
- Present clear and coherent expositions of knowledge and ideas to a variety of audiences;
- Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts;
- Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

Careers: VU's mechanical engineering graduates are known in the industry as well-rounded, accredited engineers, with highly-sought after technical and problem solving skills. Upon graduation, you will be able to launch your engineering career by finding employment across a broad range of industries including:

- product and machine design
- modelling and simulation
- manufacturing and automation
- climatic and environmental control systems
- machine health and condition monitoring
- hydraulic and pneumatic systems
- project and resources management

Job titles:

- Mechanical engineer
- Design engineer
- Product engineer
- Product innovation engineer
- Development engineer
- Production engineer
- Sales engineer
- Systems engineer
- Production manager
- Engineering manager

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (EAL) or 20 in any other English AND at least 20 in any Mathematics.

Admission Requirements International: Full-fee paying international students must have qualifications which are equivalent to those listed above. In addition, they must provide evidence of proficiency in the English language: IELTS - an overall band score of 6+ or equivalent, subject to individual profile.

Admission Requirements Mature Age: Applicants who have not completed Year 12 but who possess appropriate educational qualifications, work or life experiences which would enable them to successfully undertake the course, will be considered for admission.

Admission Requirements VET: Applicants with an Advanced Diploma of Engineering Technology (AQF 6) or equivalent may apply for advanced standing of up to 13 units (156 credit points) depending on the selection of units completed.

COURSE STRUCTURE

To complete the Bachelor of Engineering (Honours) (Mechanical Engineering) students will be required to complete 384 credit points (equivalent to 32 units) in total consisting of:

- 156 credit points (equivalent to 13 units) of Common Engineering units
- 192 credit points (equivalent to 16 units) of Core Mechanical Engineering units

Plus:

- 36 credit points (equivalent to 3 units) of Elective studies

Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours student must achieve:

- A minimum weighted average of 60% over year levels 1 to 3;
- A minimum weighted average of 80% in year level 4;
- A HD grade for the final year NEF4202 Capstone Project 2.

Common Engineering Units (13 units, 156 credit points):

NEF1101	Engineering Mathematics 1	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12
NEF3101	Project Management	12
NEF3201	Engineering Management	12
NEF4102	Capstone Project 1	12
NEF4105	Professional Engineering Practice	12
NEF4202	Capstone Project 2	12

Core Mechanical Engineering Units (16 units, 192 credit points):

NEF2101	Fluid Mechanics 1	12
NEC2102	Solid Mechanics	12
NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEM2101	Mechanical Engineering Design	12
NEM2102	Introduction to Engineering Materials	12
NEM2201	Thermodynamics 1	12
NEM2202	Dynamics	12
NEM3101	Engineering Analysis and Modelling	12
NEM3102	Design of Mechanical Systems	12

NEM3103	Thermodynamics 2	12
NEM3201	Manufacturing Materials	12
NEM3202	Fluid Mechanics 2	12
NEM3203	Stress Analysis	12
NEM4101	Mechanical Vibrations	12
NEM4202	Advanced Engineering Analysis	12
NEM4420	Mechanical Design Project	12

Elective Units (two (2) elective units selected from the list below*):

NFM0112	Mathematics Foundations	12
NFP0102	Physics Foundations	12
NEA3101	HVAC Systems 1	12
NEA3102	Building Electrical Systems	12
NEA3202	Environmentally Sustainable Design 1	12
NEC2104	Engineering Surveying	12
NEC2202	Geomechanics	12
NEE2102	Computer Systems	12
NEE2103	Linear Analysis for Electrical Engineers	12
NEE2203	Experimental Data Analysis	12
NEE4207	Alternative Energy Systems and Power System Communication	12
RCM2911	Linear Optimisation Modelling	12
RCM3711	Computational Methods	12

Plus ONE (1) elective unit (12 credit points) taken from any course offered by the University at AQF 7 level.

* Please note that students without prerequisites for NEF1101 ENGINEERING MATHEMATICS 1 and/or NEF1102 ENGINEERING PHYSICS 1 will be required to select NFM0112 Mathematics Foundations and/or NFP0102 Physics Foundation when enrolling in the course.

Bachelor of Engineering (Honours) (Electrical and Sports Engineering)

Course Code: NHES
Campus: Footscray Park.

About this course: Prepare to contribute to the latest arenas where technological innovation is the key to winning! The Bachelor of Engineering (Electrical and Sport) degree answers the industry's latest demand for electrical engineers that understand human user requirements, can design next generation wearable technologies and can confidently analyse data to provide the winning edge. Graduates of this course are professional Electrical Engineers who may find careers in traditional electrical engineering areas such as (not limited to) the:

- design and manage communications infrastructure (telephones, radio, TV and the Internet)
- design and program microprocessor based embedded systems for use within a wide range of applications and industries.
- manage large industrial manufacturing plants and substations
- design solutions for power distribution, management and smart networks

Their passion for sports and healthcare and degree specialization would allow them to work in areas such as (not limited to) the:

- design electronic solutions required by sports applications;
- design wearable electronic systems for sports and health, and;
- analyse data generated by real time systems.

This degree program encourages students to strongly engage with our industry network of local and international academic institutions (US, UK, France, Germany and China), local sports associations (Australian Institute of Sports, Victorian Institute of Sports) and local sports businesses e.g. Racesafe Australia, Ventou Sports, and Autocoach Pty Ltd. Engagement will be in the form of projects embedded throughout the course, final year capstone projects and work experience/internships. International study tours are frequently undertaken for local students to go overseas and participate in a 2-3 week workshop focused on specific engineering problems.

Course Objectives: Graduates of the Bachelor of Engineering (Honours) (Electrical and Sports Engineering) will be able to:

- Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with core bodies of knowledge within the electrical and electronic engineering and sports engineering discipline;
- Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the electrical and electronic engineering and sports engineering discipline;
- Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices;
- Critically evaluate both sources and validity of information and use established processes for information management
- Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the engineering discipline;
- Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills);
- Present clear and coherent expositions of knowledge and ideas to a variety of audiences;
- Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts;
- Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

- Electrical and Electronics Engineer
- Sports Engineer
- Telecommunications Engineer
- Embedded Systems Engineer
- Power Engineer
- Control Engineer
- Mechatronics Engineer
- Data Analyst
- Software Programmer
- Biomechanics

Careers:

Course Duration: 4 years

Admission Requirements: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English AND a study score of 20 in any Mathematics.

Admission Requirements International: Successful completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Biology, Chemistry, Physics or Mathematics OR Successful completion of an Australian Diploma or Advanced Diploma (or equivalent) PLUS IELTS (or equivalent): Overall score of 6.0 with no band less than 6.0

Admission Requirements Mature Age: Applicants with relevant work, educational qualifications and/or life experience will be considered for admission to the course.

Admission Requirements VET: Successful completion of a cognate (similar discipline) Australian Diploma or Advanced Diploma (or equivalent, such as the Advanced Diploma of Engineering Technical - Electrical) will be granted advanced standing of a maximum of 96 credit points (Diploma) or 144 credit points (Advanced Diploma).

COURSE STRUCTURE

To complete the Bachelor of Engineering (Honours) (Electrical and Sports Engineering), students will be required to complete three hundred and eighty-four (384) credit points (equivalent to thirty-two (32) units in total), consisting of:

- One hundred and fifty-six (156) credit points (equivalent to thirteen (13) units) of Common Engineering units;
- One hundred and thirty-two (132) credit points (equivalent to eleven (11) units) of Core Electrical Engineering units;
- Ninety-six (96) credit points (equivalent to eight (8) units) from two (2) Minor studies.

At least one (1) Minor MUST be chosen from either (NMISPT) Sports Technology or (NMIBIA) Bioanalytics. The remaining Minor, (if required) can be selected from either (NMIASD) Software Development or (NMIBIM) Biomechanics.

Common Core Engineering Units:

Year 1:

Semester 1:

NEF1101	Engineering Mathematics 1	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12

Semester 2:

NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12

Year 2:

Semester 1:

NEE2101	Electrical Circuits	12
NEE2102	Computer Systems	12
NEE2103	Linear Analysis for Electrical Engineers	12

Plus one (1) unit from the selected Minor

Semester 2:

NEE2201	Linear Systems with Matlab Applications	12
NEE2202	Electronic Systems	12
NEE2203	Experimental Data Analysis	12

Plus one (1) unit from the selected Minor

Year 3:

Semester 1:

NEE3101	Telecommunications	12
NEE3102	Electronic Systems 2	12
NEF3101	Project Management	12

Plus one (1) unit from the selected Minor

Semester 2:

NEE3201	Introduction to Control Systems	12
NEE3203	Embedded Systems	12
NEF3201	Engineering Management	12

Plus one (1) unit from the selected Minor

Year 4:

Semester 1:

NEF4102	Capstone Project 1	12
NEF4105	Professional Engineering Practice	12

Plus two (2) units from the selected Minor

Semester 2:

NEE4210	Electric Energy Systems Protection and Power Electronics	12
NEF4202	Capstone Project 2	12

Plus two (2) units from the selected Minor

Minors

NMIASD	Software Development
NMISPT	Sports Technology
NMIBIA	Bioanalytics
NMIBIM	Biomechanics

Bachelor of Science (Honours)

Course Code: NHSC
Campus: Werribee, Footscray Park.

About this course: The Bachelor of Science (Honours) course allows students to undertake an independent research project in the areas of Biotechnology, Chemistry, Computer Science, Ecology or Physics and is available as a full-time (one year) or part-time (two year) option. Prospective students should contact the Honours Coordinator to obtain a copy of the project handbook which outlines the potential research projects available for the following year. The students should then contact the academic research leader of the projects in which they are interested in order to obtain further information regarding the work and skills involved in undertaking the research project. The research project is a two semester project which introduces students to the scientific research method and hones their laboratory, problem solving and communication skills. A series of workshops are conducted in which all the students undertaking the course, irrespective of their research discipline, are required to participate. Through these workshops students are expected to participate in discussion in advanced research design, statistics, referencing, oral and written presentation, research conduct, ethics and training.

Course Objectives: On successful completion of the Bachelor of Science (Honours), students will be able to:

- Exhibit advanced theoretical and technical knowledge in the discipline area by critically reviewing and evaluating relevant scientific literature;
- Design, implement, troubleshoot and manage a research project to successful completion;
- Analyse, evaluate and interpret data within the context of key literature;
- Communicate professionally with a range of people including direct supervisor, peers, researchers, and industry representatives;
- Produce a scholarly honours thesis based on their research project which complies with requisite academic conventions;
- Critically reflect on own learning and progress of professional goals.

Careers: Government research institutes, chemistry industry, biotechnology and ecology industry and ICT industry, research assistant, further studies to PhD and academia.

Course Duration: 1 year

Admission Requirements Mature Age: To qualify for entry to the Bachelor of Science (Honours) program, applicants must hold a degree with major studies in a relevant discipline and should normally have obtained a 'credit' average, or higher in their final year of undergraduate study. Applicants who do not meet the normal admission requirements may be admitted on the basis of exceptional experience, circumstances or achievements relevant to successfully undertaking the program.

COURSE STRUCTURE

For students to successfully complete the Bachelor of Science (Honours), students must complete a total of ninety-six (96) credit points consisting of either of the following:

- One (1) unit (equivalent to forty-eight (48) credit points), over two (2) semesters (fulltime option);

OR

- One (1) unit (equivalent to twenty-four (24) credit points), over four (4) semesters (part-time option)

FULL-TIME:

NHE5100	Honours Research Project	48

PART-TIME:

NHE5101	Honours Research Project	24

Master of Engineering

Course Code: NMEN
Campus: Footscray Park.

About this course: The Master of Engineering is comprised of coursework, project work and research, designed to enable students to acquire specialised skills and expertise in their chosen engineering discipline. The course will enable students to acquire advanced theoretical knowledge and critical analysis skills and apply these to research and complex technological problem solving scenarios. Additionally it provides pathways to higher research degrees. The Master of Engineering currently offers specialisations in two sub-disciplines: Telecommunications and Electrical Power, and in 2017 two new sub-disciplines will be offered to students - Process Engineering and Water Management. The course provides opportunities for students and also for suitably qualified persons to acquire the skills and expertise necessary to gain employment in the fast growing fields of Telecommunications, and Power industries. Emphasis is placed on topics which are required to support international trends in

mobile broadband, fibre optic communications, growing applications such as sensor networks and machine to machine communications, power generation and distribution. The material taught in the course units enables students to acquire expertise and enhance their communication skills to elucidate complex technical problems and solutions in given scenarios.

Course Objectives: The Course Learning Outcomes for the Master of Engineering comprise a set of generic statements that can apply to graduates in each of the specialisations within the course. On completion of the Masters of Engineering, students will be able to:

- Conceptually map the most recent theoretical developments in their Engineering specialisation and justify their application in various contemporary and emerging professional contexts.
- Contribute to the discourse and practice around 'engineering sustainability' and elaborate the links between Engineering and innovation
- Critically apply knowledge and skills relevant to both their chosen specialisation and the broader discipline of Engineering to new and uncertain professional practice scenarios, exhibiting a high level of personal autonomy and accountability.
- Design, implement and evaluate Engineering projects or research which address complex issues and transmit subsequent findings to specialist and non-specialist audiences.
- Formulate and strategise project management plans which accurately meet stakeholder needs and expectations.

Careers: The current specialisations within the Master of Engineering will enhance students' ability to gain employment in both the private and public sector in positions of managing, designing, or developing telecommunication network systems or electrical power. Graduates will have a wide range of careers in a variety of organisations including: telecommunications operators, telecommunications equipment manufacturers, information technology companies, specialised test and measurement companies, microelectronic and electronic equipment design companies, as well as installation and operations for private companies, defence and other government departments, power generation and distribution corporations, Process engineering entities and Water supply organisations.

Course Duration: 2 years

Admission Requirements: A relevant and recognised Bachelor degree in Engineering, Science, Information Technology, or the equivalent in qualifications and experience.

Admission Requirements International: International students are required to have qualifications equivalent to the above, and in addition, they must provide evidence of proficiency in English Language, as assessed by the International English Language Testing System (with an overall band score of 6.5 or equivalent, subject to individual band profile) or equivalent English language test result.

Admission Requirements Mature Age: A relevant and recognised Bachelor degree in Engineering, Science, Information Technology, or the equivalent in qualifications and experience.

COURSE STRUCTURE

To be eligible for the Master of Engineering, students will be required to complete one-hundred and ninety-two (192) credit points (equivalent to sixteen (16) units) in total consisting of:

- Forty-eight (48) credit points (equivalent to four (4) units) of Common Interdisciplinary components;
- Forty-eight (48) credit points (equivalent to two (2) twenty-four (24) credit point units or one forty-eight (48) credit point unit) of Research Component units. Research topics must be aligned with the chosen specialisation;
- Ninety-six (96) credit points (equivalent to eight (8) units) of Core Specialisation units for Telecommunications, Electrical Power, Process Engineering or Water Management.

Common Interdisciplinary Units:

Select forty-eight (48) credit points (four (4) units) from the following:

EPM5600	Principles of Project Management	12
EPM5610	Project Planning and Control	12
EPM5630	Project Management and People	12
BMO6506	Work and Organisation Systems	12
BMO6511	Strategic Management and Business Policy	12
BMO6050	Art and Practice of Leadership	12
NIT5110	Networking Systems	12
NIT5140	Information Security	12
NIT6140	Sensor Networks	12
NNG6001	HDL and High Level Synthesis	12
NNG6003	EDA Tools and Design Methodology	12
NNG6014	RF and Mixed Signal Design	12
NNG6551	Microwave Electronic Circuit Design	12
NNG6600	Global Engineering Communication	24

Research Units:

Select a total of forty-eight (48) credit points from the following:

NNR6001	Research Project A	24
NNR6002	Research Project B	24

OR

NNR6500	Research Project	48

Specialisations

NSPTEL	Telecommunication
NSPELE	Electrical Power
NSPPRE	Process Engineering
NSPWTR	Water Management

Master of Applied Information Technology

Course Code: NMIT
Campus: Footscray Park, VU Sydney.

About this course: Master of Applied Information Technology (NMIT) by coursework provides advanced training in Information Technology for students with an IT undergraduate qualification. NMIT prepares students for specialised work in the Information Technology industry at the highest levels. The course is practically-oriented and students will apply their knowledge and skills to real world problems and scenarios. Graduates may enter a range of careers upon completion of the course, such as software and application development/programming, databases, networking, software engineering, security, IT consultancy and ICT training. Graduates are also eligible to undertake further study and enter a Master by research and PhD degrees. The course complements the existing Bachelor of Information Technology course offered at Victoria University.

Course Objectives: On completion of their degree students will be able to:

- Conceptually map the most recent developments in IT theory and IT applications and justify their utility in various contexts.
- Critically apply information technology knowledge and skills to new and uncertain situations in professional practice exhibiting a high level of personal autonomy and accountability.
- Design, implement and evaluate applied IT research and transmit this knowledge to specialist and non-specialist audiences.
- Formulate and strategise IT project management plans which accurately meet stakeholder needs and expectations.

Careers: Completion of the course will prepare graduates for variety of computing careers such as: • software development/engineering • networking • networking administration • IT consultancy • data warehousing specialist • cutting-edge/leading-edge IT roles involving cloud computing, data mining, sensor networks or project management • IT training • IT project management • Business intelligence

Course Duration: 2 years

Admission Requirements International: Entry into the program is open to applicants with a postgraduate qualification (AQF8 or higher), a first degree (AQF7) in the following quantitative disciplines: Information Technology, Computer Science, Computing, Information Systems, Engineering, Business, Science, or equivalent. The minimum English requirement for admission to the Master of Applied Information Technology is an IELTS of 6.5 (with no band less than 6.0) or equivalent. Equivalence is to be assessed by VU. Applicants with any of the following qualifications may apply for up to 48 credits points against specific coursework units: (a) A degree in computer science or IT. (b) A four year Honours degree in computer science or IT. (c) A degree or a Graduate Certificate with IT or Project Management units. (d) A postgraduate qualification with IT or Project Management units. (e) A combination of qualifications and experience equivalent to (a), (b), (c) or (d) above.

Admission Requirements Mature Age: Entry into the program is open to applicants with a postgraduate qualification (AQF8 or higher), a first degree (AQF7) in the following quantitative disciplines: Information Technology, Computer Science, Computing, Information Systems, Engineering, Business, Science, or equivalent. Applicants with any of the following qualifications may apply for up to 48 credits points against specific coursework units. (a) A degree in computer science or IT. (b) A four year Honours degree in computer science or IT. (c) A degree or a Graduate Certificate with IT or Project Management units. (d) A postgraduate qualification with IT or Project Management units. (e) A combination of qualifications and experience equivalent to (a), (b), (c) or (d) above.

COURSE STRUCTURE

The Master of Applied Information Technology degree is a 192 credit points (16 units), two year full-time award which may be studied in part-time mode. The degree consists of IT units, project management units and research-based units. Students can choose between a 24 credit points thesis (Thesis 1 and 2), OR a 48 credit points thesis (Thesis 3 and 4).

Year 1, Semester 1

NIT5110	Networking Systems	12
NIT5130	Database Analysis and Design	12
EPM5600	Principles of Project Management	12
NIT5120	Software Engineering	12

Year 1, Semester 2

NIT5160	Cloud Computing	12
NIT5150	Advanced Object Oriented Programming	12
EPM5700	Project Management and Information Technology	12
NIT5140	Information Security	12

Year 2, Semester 1

NIT6110	Advanced Wireless Networking	12
NIT6120	Mobile Applications	12
NIT6130	Introduction to Research	12
NIT6041	Thesis 1	12

Year 2, Semester 2

NIT6140	Sensor Networks	12
NIT6150	Advanced Project	12
NIT6160	Data Warehousing and Mining	12

NIT6042	Thesis 2	12

Additional Electives:

NIT6043	Thesis 3	24
NIT6044	Thesis 4	24
EPM5730	Project Stakeholder Management	12
EPM5610	Project Planning and Control	12

Master of Project Management

Course Code: NMPM
Campus: Footscray Park.

About this course: The aim of NMPM Master of Project Management, is to offer a suite of units that specifically meets the needs of current or potential project managers in industry. The course will equip graduates with advanced project management principles and techniques, enabling them to assume the role of project manager and/or become effective members of project management teams. Students can specialise in specific project management sectors. These sectors include engineering, business, information technology, administration etc. The internationally recognised Project Management Body of Knowledge (PMBOK) underpins both core units and applications.

Course Objectives: On successful completion of this course graduates will be able to:

- Conceptually map key theoretical project management frameworks and apply them to a range of project management scenarios, taking into consideration social, cultural, environmental and economic factors.
- Select and defend research methods to investigate complex project management problems in order to generate solutions.
- Design, develop and implement comprehensive project management plans which meet or exceed stakeholder expectations.
- Critically analyse organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation.
- Communicate effectively to specialist and non-specialist stakeholders utilising a variety of professional oral and written forms in order to justify and interpret theories, methodologies, recommendations and professional decisions.
- Integrate professional standards into their practice and incorporate continuing professional development in accordance with Australian Institute of Project Management (AIPM) and Project Management Institute (PMI) USA protocols and standards.

Careers: Completion of the course will prepare graduates for variety of project management careers in any sector such as engineering, construction, business, information technology, administration and others.

Course Duration: 2 years

Admission Requirements International: Entry into the program is open to applicants with a first degree in any discipline. The minimum English requirement for admission to the Master of Project Management is an IELTS of 6.5 or equivalent. Equivalence is to be assessed by VU. Applicants with a recognised degree in a cognate discipline (an area of management eg. Construction Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) may apply for credits against specific coursework units.

Admission Requirements Mature Age: Entry into the program is open to applicants with a first degree in any discipline. Applicants with a degree in a cognate discipline (an area of management eg. Construction Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) may apply for credits against specific coursework units. Applicants with vocational education qualification and at least 2 years work experience, in the project management area can enter the course upon the completion of the Graduate Certificate in Project Management.

COURSE STRUCTURE

The Master of Project Management course is a 192 credit points (16 units), two year full-time award which may be studied in part-time mode. The degree consists of core units (84 credit points) and Project Management elective units (108 credit points). Up to 48 credit points can be taken from outside the specified elective list. Students from non-cognate discipline will be required to complete Fundamentals of Project Management, Project Management Practice, Project Program and Portfolio Management and Sustainable Project Management.

Core Units

EPM5600	Principles of Project Management	12
EPM5610	Project Planning and Control	12
EPM5620	Project Governance	12
EPM5630	Project Management and People	12
EPM5640	Research Methods	12

AND

EPM5660	Project Management Research Project	24

OR

EPM5651	Project Management Research Project A (Part-Time)	12
EPM5652	Project Management Research Project B (Part-Time)	12

Elective Units

EPM5500	Fundamentals of Project Management	12
EPM5510	Project Program and Portfolio Management	12
EPM5520	Sustainable Project Management	12
EPM5530	Project Management Practice	12
EPM5700	Project Management and Information Technology	12
EPM5740	Project Risk Management	12

EPM5760	Project Construction Management	12
EPM5710	Project Procurement Management	12
EPM5720	Facility Life Cycle Costing	12
EPM5750	Project Investment Analysis	12
EPM5730	Project Stakeholder Management	12
BMO6506	Work and Organisation Systems	12
BMO5003	Global Leadership	12
BMO6622	Managing Innovation and Entrepreneurship	12
BMO6624	Organisation Change Management	12

Up to 48 credit points (4) units at AQF8/9 level subject to course coordinator approval.

Graduate Certificate in Cyber Security

Course Code: NTCS
Campus: Footscray Park.

About this course: Cybersecurity is the protection of computers, networks, information systems and data from unauthorised access, change or destruction. With an increasing number of companies adopting cloud services and storage, valuable data and information systems are increasingly under threat from the hackers and industrial spies. They can even penetrate enterprise networks, encrypt the hard drive of computers and extort the organisation or computer owners to pay for unlocking the systems. Globally, cybersecurity is expected to have an annual growth of over 20% in the next five years. Experienced academic staff, with a strong track record in cyber security research, will provide students in the Certificate in Cyber Security with a modern, state of the art course. Guest lecturers with current experience in the cyber security industry will complement the academic staff and provide students with the latest developments in their field. The Graduate Certificate in Cyber Security opens new career possibilities in cyber security. The course will prepare students as security professionals who have attained specialised expertise in cyber security. The content covers the essential areas of cyber security, from proactive cyber threat detection, risk management to cyber law and regulations. Specifically the content includes:

- Cyber Security Fundamentals;
- Cyber Security Architecture;
- Cyber Security Technologies such as digital signature, public key infrastructure, virtual private networks, firewalls, intrusion detection, data encryption, and etc.
- Cloud Security;
- Enterprise Security;
- Cyber Security Regulation, Policies and Laws.

VU degrees are internationally recognised and provide an opportunity for our graduates to find jobs within and outside Australia.

Course Objectives: On successful completion of the Graduate Certificate in Cyber Security, graduates will be able to:

- Critically apply cyber security knowledge and skills to new and uncertain situations in professional practice, exhibiting a high level of personal autonomy and accountability;
- Evaluate cyber security architecture and state-of-the-art technologies including firewalls, virtual private networks, public key infrastructure, digital signature and anti-malwares;
- Apply commercial tools to secure computers and networks in enterprise and cloud systems to ensure privacy and prevent data loss;
- Develop organisational strategies relating to cyber security law, policies and regulations to solve legal challenges of the cyber world.

Careers: Completion of the course will prepare graduates for variety of Cyber Security careers, such as:

- Cyber Security Specialist;
- Cyber Security Consultant;
- Cloud Security Engineer, and;
- Network Security Engineer.

Course Duration: 0.5 years

Admission Requirements: Applicants with a Bachelor Degree (AQF7) in the following related disciplines: Information Technology, Computer Science, Computing, Information Systems, Engineering, (or equivalent) in a related discipline area, will be considered for admission to this course.

Admission Requirements Mature Age: Mature age applicants with significant professional experience, relevant work, education and/or community experience in a related discipline area, may qualify for admission into this course.

Admission Requirements VET: Successful completion of a cognate (similar discipline) Australian Diploma or Advanced Diploma (or equivalent) PLUS Four (4) years' experience in a related discipline area, will be considered for admission to this course.

COURSE STRUCTURE

To successfully attain the Graduate Certificate in Cyber Security, students will be required to complete forty-eight (48) credit points (equivalent to four (4) units).

NIT5081	Fundamentals of Cyber Security	12
NIT5082	Cloud Security	12
NIT5083	Enterprise Security Management	12
NIT5084	Cyber Security Law, Regulation and Policy	12

Graduate Certificate in Project Management

Course Code: NTPM
Campus: Footscray Park.

About this course: The Graduate Certificate of Project Management is one of a suite of courses in Project Management that specifically meets the needs of current or potential project managers in industry. The course will equip professionals with advanced project management principles and techniques, enabling graduates to assume the role of project manager and/or become effective members of project

management teams. Students can specialise in specific project management tasks across a number of sectors include engineering, business, information technology, and administration. The internationally recognised Project Management Body of Knowledge (PMBOK) underpins both core units and applications.

Course Objectives: On successful completion of this course graduates will be able to:

- Explain key theoretical project management frameworks and apply them to a range of project management scenarios, taking into consideration social, cultural, environmental and economic factors.
- Differentiate research methods to investigate complex project management problems in order to generate solutions.
- Design, develop and implement comprehensive project management plans which meet stakeholder expectations.
- Evaluate the impact of organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation.
- Communicate effectively to specialist and non-specialist stakeholders utilising a variety of professional oral and written forms to demonstrate an understanding of theoretical concepts, methodologies, recommendations and professional decisions.

Careers: Completion of the course will prepare graduates for variety of project management careers in any sector of the industry such as engineering, construction, business, information technology and administration.

Course Duration: 0.5 years

Admission Requirements: Entry into the program is open to applicants with a first degree in any discipline.

Admission Requirements Mature Age: Entry into the program is open to applicants with a first degree in any discipline or a vocational education qualification and at least 2 years work experience in the project management area.

COURSE STRUCTURE

The Graduate Certificate of Project Management degree is a 48 credit points (4 unit), six months full-time award which may be studied in part-time mode. The award consists of 2 core and 2 elective Project Management units. Two Project management core units: EPM5600 Principles of Project Management and EPM5610 Project Planning and Control. Two elective units (including up to one from outside the specified elective list). However, students without a degree in a cognate discipline (an area of management e.g. Consultation Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) will be required to complete EPM5500 Fundamentals of Project Management and EPM5530 Project Management Practice.

Course structure consists of two project management core units plus two elective units (including up to one from outside the elective list).

Core Units

EPM5600	Principles of Project Management	12
EPM5610	Project Planning and Control	12

Elective Units Select two units (24 credit points). Students without a degree in a cognate discipline must select EPM5500 and EPM5530.

Semester 1 Units:

EPM5500	Fundamentals of Project Management	12
EPM5700	Project Management and Information Technology	12
EPM5740	Project Risk Management	12
EPM5760	Project Construction Management	12

Semester 2 Units:

EPM5530	Project Management Practice	12
EPM5710	Project Procurement Management	12
EPM5720	Facility Life Cycle Costing	12
EPM5730	Project Stakeholder Management	12
EPM5750	Project Investment Analysis	12

Units are offered subject to availability.

Master of Science (Research)

Course Code: SRHC
Campus: Werribee, Footscray Park, St Albans.

About this course: Masters Degree (Research) in the field of Science The Masters Degree (Research) allows you to develop your knowledge and skills in planning and executing a substantial piece of original research in an area that is of interest to you and to the University, industry and the community, with the assistance of an experienced research supervisory team. This degree requires you to apply an advanced body of knowledge in a range of contexts for research and scholarship and potentially as a pathway to a PhD or Professional Doctorate. It involves supervised study and research, through completion of a major research thesis in an approved thesis format for examination, as well as research training and independent study. Feedback is provided face-to-face and online by the supervisory team, and co-curricular opportunities for receiving feedback are available through activities in which you are strongly encouraged to participate, such as involvement in support and adjunct programs offered by the university or externally; collaborative publication of academic articles with supervisors and peers; presentation at academic conferences including those organised within VU for graduate researchers and staff; and other presentations to a variety of audiences. This course is normally a 2 year (full time) and 4 year (part time) research-based degree.

Course Objectives: The course objectives are to produce graduates who have the following knowledge and skills:

- a body of knowledge that includes the understanding of recent developments in one or more discipline
- advanced knowledge of research principles and methods applicable to the field of work or learning
- cognitive skills to demonstrate mastery of theoretical knowledge and to reflect critically on theory and its application

- cognitive, technical and creative skills to investigate, analyse and synthesise complex information, problems, concepts and theories and to apply established theories to different bodies of knowledge or practice
- cognitive, technical and creative skills to generate and evaluate complex ideas and concepts at an abstract level
- cognitive and technical skills to design, use and evaluate research and research method
- communication and technical skills to present a coherent and sustained argument and to disseminate research results to specialist and non-specialist audience
- technical and communication skills to design, evaluate, implement, analyse, theorise and disseminate research that makes a contribution to knowledge

This knowledge and these skills will be demonstrated through the planning and execution of a substantial piece of research: with creativity and initiative

- with a high level of personal autonomy and accountability, demonstrating expert judgement, adaptability and responsibility as a learner

Careers: PhD or Professional Doctorate, research assistant, research technician.

Course Duration: 2 years

Admission Requirements Other: (a) Academic achievement and preparation to a level that is sufficient to undertake masters level research demonstrated in any one or more of the following: i. Qualified, at minimum, for a bachelors degree at a standard considered by the University to be sufficiently meritorious (normally Distinction average in the final year); or ii. Qualified for any other award judged by the University to be of a relevant and appropriate standard and have: •Produced evidence of professional experience; and •Fulfilled any other conditions relating to prerequisite studies which the University may impose. (b) Demonstrated competency in English sufficient to work at research masters level, through meeting one or more of the following criteria: i. Successful completion of one of the degrees stipulated under a) i) – ii) above with English as the language of instruction and assessment and undertaken in a predominantly English speaking context; or ii. Been taught for two of the past five years at a tertiary institution where English was the primary language of instruction; or iii. Achieved an overall band score of not less than 6.5 in an International English Language Testing Service (IELTS) test with no individual band score below 6.0; or iv. Achieved a score of not less than 92 and no section score less than 22 in the internet-based Teaching of English Foreign Language (TOEFL) test; or v. Documented evidence of English proficiency equivalent to the above.

COURSE STRUCTURE

The standard duration of a Masters Degree (Research) is two years of full-time study or part-time equivalent, although in certain circumstances the degree may be completed in eighteen months. In some cases the student may be required to complete approved coursework units such as laboratory skills or research design as part of the Masters Degree (Research).

College Health and Biomedicine

Biomedical Sciences Stream

Semester 1

RBM8001	Research Thesis 1 Full Time	48
RBM8011	Research Thesis 1 Part Time	24

Semester 2

RBM8002	Research Thesis 2 Full Time	48
RBM8012	Research Thesis 2 Part Time	24

Food Science Stream

Semester 1

RBF8001	Research Thesis 1 Full Time	48
RBF8011	Research Thesis 1 Part Time	24

Semester 2

RBF8002	Research Thesis 2 Full Time	48
RBF8012	Research Thesis 2 Part Time	24

College of Engineering and Science

Biotechnology Stream

Semester 1

RBT8001	Research Thesis 1 Full Time	48
RBT8011	Research Thesis 1 Part Time	24

Semester 2

RBT8002	Research Thesis - Sem 2 (Full-Time)	48
RBT8012	Research Thesis - Sem 2 (Part-Time)	24

Chemical Sciences Stream

Semester 1

RCS8001	Research Thesis 1 Full Time	48
RCS8011	Research Thesis 1 Part Time	24

Semester 2

RCS8002	Research Thesis 2 Full Time	48
RCS8012	Research Thesis 2 Part Time	24

Computer Science and Mathematics Stream

Semester 1

RCM8001	Research Thesis 1 Full Time	48
RCM8011	Research Thesis 1 Part Time	24

Semester 2

RCM8002	Research Thesis 2 Full Time	48
RCM8012	Research Thesis 2 Part Time	24

Master of Science (Research)

Course Code: SRLC
Campus: Footscray Park, St Albans, ..

About this course: Masters Degree (Research) in the field of Science The Masters Degree (Research) allows you to develop your knowledge and skills in planning and executing a substantial piece of original research in an area that is of interest to you and to the University, industry and the community, with the assistance of an experienced research supervisory team. This degree requires you to apply an advanced body of knowledge in a range of contexts for research and scholarship and potentially as a pathway to a PhD or Professional Doctorate. It involves supervised study and research, through completion of a major research thesis in an approved thesis format for examination, as well as research training and independent study. Feedback is provided face-to-face and online by the supervisory team, and co-curricular opportunities for receiving feedback are available through activities in which you are strongly encouraged to participate, such as involvement in support and adjunct programs offered by the university or externally; collaborative publication of academic articles with supervisors and peers; presentation at academic conferences including those organised within VU for graduate researchers and staff; and other presentations to a variety of audiences. This course is normally a 2 year (full time) and 4 year (part time) research-based degree.

Course Objectives: The course objectives are to produce graduates who have the following knowledge and skills:

- a body of knowledge that includes the understanding of recent developments in one or more discipline
- advanced knowledge of research principles and methods applicable to the field of work or learning
- cognitive skills to demonstrate mastery of theoretical knowledge and to reflect critically on theory and its application
- cognitive, technical and creative skills to investigate, analyse and synthesise complex information, problems, concepts and theories and to apply established theories to different bodies of knowledge or practice
- cognitive, technical and creative skills to generate and evaluate complex ideas and concepts at an abstract level
- cognitive and technical skills to design, use and evaluate research and research method
- communication and technical skills to present a coherent and sustained argument and to disseminate research results to specialist and non-specialist audience
- technical and communication skills to design, evaluate, implement, analyse, theorise and disseminate research that makes a contribution to knowledge

This knowledge and these skills will be demonstrated through the planning and execution of a substantial piece of research:

- with creativity and initiative
- with a high level of personal autonomy and accountability, demonstrating expert judgement, adaptability and responsibility as a learner

Careers: PhD, research assistant, research technician

Course Duration: 2 years

Admission Requirements Other: (a) Academic achievement and preparation to a level that is sufficient to undertake masters level research demonstrated in any one or more of the following: i. Qualified, at minimum, for a bachelors degree at a standard considered by the University to be sufficiently meritorious (normally Distinction average in the final year); or ii. Qualified for any other award judged by the University to be of a relevant and appropriate standard and have: •Produced evidence of professional experience; and •Fulfilled any other conditions relating to prerequisite studies which the University may impose. (b) Demonstrated competency in English sufficient to work at research masters level, through meeting one or more of the following criteria: i. Successful completion of one of the degrees stipulated under a) i) – ii) above with English as the language of instruction and assessment and undertaken in a predominantly English speaking context; or ii. Been taught for two of the past five years at a tertiary institution where English was the primary language of instruction; or iii. Achieved an overall band score of not less than 6.5 in an International English Language Testing Service (IELTS) test with no individual band score below 6.0; or iv. Achieved a score of not less than 92 and no section score less than 22 in the internet-based Teaching of English Foreign Language (TOEFL) test; or v. Documented evidence of English proficiency equivalent to the above.

COURSE STRUCTURE

The standard duration of a Masters Degree (Research) is two years of full-time study or part-time equivalent, although in certain circumstances the degree may be completed in eighteen months. In some cases the student may be required to complete approved coursework units such as laboratory skills or research design as part of the Masters Degree (Research).

College of Health and Biomedicine

Biomedical Sciences Stream

Semester 1

RBM8001	Research Thesis 1 Full Time	48
RBM8011	Research Thesis 1 Part Time	24

Semester 2

RBM8002	Research Thesis 2 Full Time	48
RBM8012	Research Thesis 2 Part Time	24

Food Science Stream

Semester 1		
RBF8001	Research Thesis 1 Full Time	48
RBF8011	Research Thesis 1 Part Time	24
Semester 2		
RBF8002	Research Thesis 2 Full Time	48
RBF8012	Research Thesis 2 Part Time	24
College of Engineering and Science		
Biotechnology Stream		
Semester 1		
RBT8001	Research Thesis 1 Full Time	48
RBT8011	Research Thesis 1 Part Time	24
Semester 2		
RBT8002	Research Thesis - Sem 2 (Full-Time)	48
RBT8012	Research Thesis - Sem 2 (Part-Time)	24
Chemical Sciences Stream		
Semester 1		
RCS8001	Research Thesis 1 Full Time	48
RCS8011	Research Thesis 1 Part Time	24
Semester 2		
RCS8002	Research Thesis 2 Full Time	48
RCS8012	Research Thesis 2 Part Time	24
Computer Science and Mathematics Stream		
Semester 1		
RCM8001	Research Thesis 1 Full Time	48
RCM8011	Research Thesis 1 Part Time	24
Semester 2		
RCM8002	Research Thesis 2 Full Time	48
RCM8012	Research Thesis 2 Part Time	24

Master of Science (Research)

Course Code: SRMS
Campus: Werribee, Footscray Park, St Albans.

About this course: Masters Degree (Research) in the field of Science The Masters Degree (Research) allows you to develop your knowledge and skills in planning and executing a substantial piece of original research in an area that is of interest to you and to the University, industry and the community, with the assistance of an experienced research supervisory team. This degree requires you to apply an advanced body of knowledge in a range of contexts for research and scholarship and potentially as a pathway to a PhD or Professional Doctorate. It involves supervised study and research, through completion of a major research thesis in an approved thesis format for examination, as well as research training and independent study. Feedback is provided face-to-face and online by the supervisory team, and co-curricular opportunities for receiving feedback are available through activities in which you are strongly encouraged to participate, such as involvement in support and adjunct programs offered by the university or externally; collaborative publication of academic articles with supervisors and peers; presentation at academic conferences including those organised within VU for graduate researchers and staff; and other presentations to a variety of audiences. This course is normally a 2 year (full time) and 4 year (part time) research-based degree.

Course Objectives: The course objectives are to produce graduates who have the following knowledge and skills:

- a body of knowledge that includes the understanding of recent developments in one or more discipline
- advanced knowledge of research principles and methods applicable to the field of work or learning
- cognitive skills to demonstrate mastery of theoretical knowledge and to reflect critically on theory and its application
- cognitive, technical and creative skills to investigate, analyse and synthesise complex information, problems, concepts and theories and to apply established theories to different bodies of knowledge or practice
- cognitive, technical and creative skills to generate and evaluate complex ideas and concepts at an abstract level
- cognitive and technical skills to design, use and evaluate research and research method
- communication and technical skills to present a coherent and sustained argument and to disseminate research results to specialist and non-specialist audience
- technical and communication skills to design, evaluate, implement, analyse, theorise and disseminate research that makes a contribution to knowledge

This knowledge and these skills will be demonstrated through the planning and execution of a substantial piece of research:

- with creativity and initiative
- with a high level of personal autonomy and accountability, demonstrating expert judgement, adaptability and responsibility as a learner

Careers: PhD or Professional Doctorate, research assistant, research technician.

Course Duration: 2 years

Admission Requirements International: In addition to meeting the University requirements (See: Admission Requirements - Other) international applicants who will be studying in Australia must satisfy the English language qualifying requirement for gaining an entry visa to Australia for applicants from their country.

Admission Requirements Other: (a) Academic achievement and preparation to a level that is sufficient to undertake masters level research demonstrated in any one or more of the following: i. Qualified, at minimum, for a bachelors degree at a standard considered by the University to be sufficiently meritorious (normally Distinction average in the final year); or ii. Qualified for any other award judged by the University to be of a relevant and appropriate standard and have: •Produced evidence of professional experience; and •Fulfilled any other conditions relating to prerequisite studies which the University may impose. (b) Demonstrated competency in English sufficient to work at research masters level, through meeting one or more of the following criteria: i. Successful completion of one of the degrees stipulated under a) i) – ii) above with English as the language of instruction and assessment and undertaken in a predominantly English speaking context; or ii. Been taught for two of the past five years at a tertiary institution where English was the primary language of instruction; or iii. Achieved an overall band score of not less than 6.5 in an International English Language Testing Service (IELTS) test with no individual band score below 6.0; or iv. Achieved a score of not less than 92 and no section score less than 22 in the internet-based Teaching of English Foreign Language (TOEFL) test; or v. Documented evidence of English proficiency equivalent to the above.

COURSE STRUCTURE

The standard duration of a Masters Degree (Research) is two years of full-time study or part-time equivalent, although in certain circumstances the degree may be completed in eighteen months. In some cases the student may be required to complete approved coursework units such as laboratory skills or research design as part of the Masters Degree (Research).

College of Biomedical and Health Sciences

Biomedical Sciences Stream

Semester 1

RBM8001	Research Thesis 1 Full Time	48
RBM8011	Research Thesis 1 Part Time	24

Semester 2

RBM8002	Research Thesis 2 Full Time	48
RBM8012	Research Thesis 2 Part Time	24

Food Science Stream

Semester 1

RBF8001	Research Thesis 1 Full Time	48
RBF8011	Research Thesis 1 Part Time	24

Semester 2

RBF8002	Research Thesis 2 Full Time	48
RBF8012	Research Thesis 2 Part Time	24

College of Engineering and Science

Biotechnology Stream

Semester 1

RBT8001	Research Thesis 1 Full Time	48
RBT8011	Research Thesis 1 Part Time	24

Semester 2

RBT8002	Research Thesis - Sem 2 (Full-Time)	48
RBT8012	Research Thesis - Sem 2 (Part-Time)	24

Chemical Sciences Stream

Semester 1

RCS8001	Research Thesis 1 Full Time	48
RCS8011	Research Thesis 1 Part Time	24

Semester 2

RCS8002	Research Thesis 2 Full Time	48
RCS8012	Research Thesis 2 Part Time	24

Computer Science and Mathematics Stream

Semester 1

RCM8001	Research Thesis 1 Full Time	48
RCM8011	Research Thesis 1 Part Time	24

Semester 2

RCM8002	Research Thesis 2 Full Time	48
RCM8012	Research Thesis 2 Part Time	24

SPECIALISATIONS

NMABIT Biotechnology

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this specific group of units allows you to pursue a Major in Biotechnology. This biotechnology major has a strong research and application focus and will produce graduates that are 'work ready' by combining an extensive laboratory program with training on state-of-the-art instrumentation and techniques along with a final year research project. The course combines studies in modern cell-, molecular-, immuno- and micro-biology to develop a broad range of knowledge and investigative skills that are applicable to a broad range of research fields, industries and employers. The laboratory program includes hands-on training on modern analytical equipment including applications, theory of operation, optimisation and data analysis. The major includes two Capstone units: NSC3010 Biotechnology Applications which provides an overview of the broad range of research fields and industries that utilise biotechnological advances in real world settings. This unit also provides research training in industrial techniques as well as field trips to biotechnology companies. This unit also considers the broader context of biotechnological advances in modern society. NSC3020 Biotechnology Project which enables students to complete either a research project in a field of biotechnology or a work placement in the biotechnology industry. This provides graduates with significant practical experience in a research or industry setting and provides training in the administrative requirements of lab-based research.

NSC3010	Biotechnology Applications	12
NSC3020	Biotechnology Project	12
NSC3030	Molecular & Systems Biology	12
RBF2300	Microbiology 1	12
RBF2330	Cell Biology	12
RBF2390	Molecular Genetics	12
RBF2520	Biochemistry 1	12
RMS3113	Comparative Immunobiology	12

NMACHE Chemistry

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this specific group of units allows you to pursue a Major in Chemistry. This chemistry major has a strong industry focus and will produce graduates that are 'work ready' by combining an extensive laboratory program with training on state-of-the-art equipment along with an industry project. The course combines studies in analytical, pharmaceutical, forensic and organic chemistry to develop measurement and investigative skills that are highly sought after by industry. The laboratory program includes hands-on training on modern analytical equipment including applications, theory of operation, optimisation, and maintenance and troubleshooting. The major includes two Capstone units: NPU3101 Pharmaceutical Regulatory Processes which provides training in Laboratory management and presents an overview of current laboratory practices. As part of the Unit students complete an extensive written report on their laboratory work based upon current industry standards. RSS300 Industry Project which enables students to complete either a research project in the Chemical Sciences area or a work placement in the Chemical industry. This provides graduates with significant practical experience in a research or industry setting.

NPU2101	Analytical Methods 1	12
NPU2102	Analytical Methods 2	12
NPU2103	Organic Synthesis	12
NPU3101	Pharmaceutical Regulatory Processes	12
NPU3103	Techniques in Pharmaceutical Synthesis	12
NPU3104	Drug Testing and Analysis	12
RCS2503	Forensic Chemistry 2	12
RSS3000	Industry Project	12

NMAENV Ecology and Environmental Management

Locations: Werribee, Footscray Park

This Ecology and Environmental Management major has a strong research and application focus and will produce graduates that are 'work ready' by combining an extensive laboratory and field-based program with training centred on state-of-the-art techniques and information along with final year research projects embedded in the capstone units. The course combines studies in ecology, zoology, ecology, geography, genetics and applied ecological management to develop a broad range of knowledge and investigative skills that are applicable to a wide range of research fields, industries and employers. The laboratory and field programs, includes hands-on training on modern analytical equipment including applications, theory of operation, optimisation and data analysis. The major includes two Capstone units: RBF3210 Environmental Rehabilitation builds on previously taken units and introduces a range of tools that will assist in the rehabilitation of Victoria's terrestrial environments and communities. Topics include the ecological parameters and adaptations of organisms in diverse environments and the key ecological relationships amongst organisms. Rehabilitation projects based on approaches using ecological theory will be reviewed using contemporary case studies. Practicals will include hands-on experience in the use of the Native Vegetation Management Framework, the Habitat Hectare approach, development of land management plans, and specific threatened species rehabilitation programs. RBF3620 Conservation and Sustainability ties together, in both theoretical and practical ways, concepts and practices for maintaining biological diversity, and how these concepts and practices can be integrated with social and economic needs. More specifically, this unit brings together concepts such as the development of conservation theory and practice in Australia; extinction and its significance, including pathways to extinction; the meanings, levels and interpretation of concepts of biodiversity; ecological and adaptive management approaches to conservation and recovery, including design of reserves, setting priorities, off-reserve conservation and ex-situ (captive breeding, reintroduction and translocation). Practical field studies and site visits will investigate the contributions of zoo's, national and state parks, friends groups, councils and shires, other government agencies and private landholders to the conservation and recovery of plant and animal species, from insects to mammals, and from mushrooms to trees. The subject will also include practical appraisals of techniques used to determine integrity of ecosystems, landscapes and overall environment, the

contributions made by biodiversity to ecosystem services and integrated methods for recovery and sustainable management of species and ecosystems.

NPU2110	Australian Landscapes and Biota	12
NPU3106	Conservation Genetics	12
RBF2610	Fundamentals of Ecology	12
RBF2620	Australian Plants	12
RBF2640	Australian Animals	12
RBF3110	Marine & Freshwater Ecology	12
RBF3210	Environmental Rehabilitation	12
RBF3620	Conservation and Sustainability	12

NMANSC Network and System Computing

Locations: Footscray Park

This major provides students with advanced knowledge and skills in network and system computing through an integrated set of units in networking and network management. It builds on the Bachelor of IT foundations including computer networks, programming, database systems and operating systems. Students will study server management, enterprise network management, routing and switching, IPv6, mobile and wireless networks, network design, Internet of Things, network security and virtualisation. It will prepare students for Microsoft and Cisco certificates like Microsoft Server Administration, Microsoft Active Directory, Microsoft HyperV, CCNA, CCNA Wireless and CCNA Security. Furthermore, they will apply practical and contemporary technologies to develop solutions to real world problems in their capstone final year projects. The final year project is included in the Graduation Core. According to Growth Opportunity Assessment conducted in December 2014, this is a key area of ICT management which has the second largest number of employment opportunities, among all professional areas in engineering, science and information technologies.

NIT2122	Server Administration and Management	12
NIT2124	Network Management	12
NIT2222	Networking Technologies	12
NIT2223	Mobile & Wireless Networks	12
NIT3104	Computer Architecture	12
NIT3122	Enterprise Network Management	12
NIT3123	Advanced Networking Technologies	12
NIT3222	Virtualization in Computing	12

NMAWMD Web and Mobile Application Development

Locations: Footscray Park

This major provides students with advanced knowledge and skills in web and mobile application development through an integrated set of units in web and mobile application development. It builds on the Bachelor of IT foundations including computer networks, programming, database systems and operating systems. Students will study object oriented programming, software engineering, web programming, mobile app programming, cloud app programming and database systems. Furthermore, they will apply practical and contemporary technologies to develop solutions to real world problems in their capstone final year projects. The final year project is included in the Graduation Core. According to Growth Opportunity Assessment conducted in December 2014, this is the area with the largest number of employment opportunities, among all professional areas in engineering, science and information technologies.

NIT2112	Object Oriented Programming	12
NIT2113	Cloud Application Development	12
NIT2212	Database 2	12
NIT2213	Software Engineering	12
NIT3112	Advance Web Application Development	12
NIT3113	Advanced Programming	12
NIT3114	Online Business System Development	12
NIT3213	Mobile Application Development	12

NMIACH Analytical Chemistry

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this specific group of units allows you to pursue a breadth minor in Analytical Chemistry. Analytical chemistry is a cornerstone of the chemical industry and has many applications including food, forensic, pharmaceutical, medical and environmental analyses. This chemistry minor includes hands-on training on modern analytical equipment including applications, theory of operation, optimisation, maintenance and troubleshooting to produce work ready graduates. This minor is appropriate for student undertaking major studies in a range of science discipline areas who wish to complement their studies with some training in chemical instrumentation operation and interpretation.

NPU2101	Analytical Methods 1	12
NPU2102	Analytical Methods 2	12
NPU3101	Pharmaceutical Regulatory Processes	12
NPU3104	Drug Testing and Analysis	12

NMIANM Network Management

Locations: Footscray Park

The network management minor provides students with broad understanding of the operation, administration and maintenance of network systems. The students will study specialised and in depth technologies in network management, including routing algorithms and protocols, Network Address Translation (NAT), IPv6 networks, Microsoft server management, Microsoft enterprise network management and Microsoft HyperV virtualisation.

NIT2122	Server Administration and Management	12

NIT2222	Networking Technologies	12
NIT3122	Enterprise Network Management	12
NIT3222	Virtualization in Computing	12

NMIASD Software Development

Locations: Footscray Park

The minor prepares students for careers in software engineering. Students will be provided with broad and coherent knowledge in contemporary software modelling techniques and specialised software development technologies. Modules include object-oriented programming, web programming and mobile application development. Students will also have opportunity to work on a productive software development team by applying the core principles consistent in software design, construction and maintenance.

NIT2112	Object Oriented Programming	12
NIT2213	Software Engineering	12
NIT3112	Advance Web Application Development	12
NIT3213	Mobile Application Development	12

NMIBIA Bioanalytics

Locations: Footscray Park

This minor will equip students with the fundamental understanding of bio analytics where data analytics, big data, data modelling, and the tools required to perform data analysis are applied to human related data. The focus will be on sports and health applications, but the topics covered are equally applicable to other important areas of electrical engineering e.g., telecommunications, power, electronics, aerospace and even in sales engineering, and areas where data analysts are in high demand e.g., finance, management, business.

NEE2105	Introduction to Data Analytics	12
NEE3205	Signal Processing Techniques	12
NEE4101	Sports Data Analytics 1	12
NEE4202	Sports Data Analytics 2	12

NMIBIM Biomechanics

Locations: Footscray Park

The biomechanics minor begins with the study of the human musculoskeletal system which is responsible for the physical form, support, stability and locomotion of the human body. This is then followed by biomechanics study in sports application and in depth study of human movement quantification. The final unit focuses on how the brain deals with the sensorimotor control requirements for safe movement, and the disorders that arise if brain dysfunction should occur.

AHE1101	Structural Kinesiology	12
AHE2102	Sports Biomechanics	12
AHE3101	Advanced Biomechanics	12
AHE3126	Motor Control	12

NMIBIO Biology

Locations: Werribee

The minor in biology will introduce you to a range of biology topics and allow you to develop an understanding of the interrelationships between the various facets of life. A strong mix of theoretical and practical based studies of how science is discussed, the basic scientific knowledge it contains and the experimental process from where the information has been collected, will teach you how to analyse both data and the literature and apply critical thinking skills to defend the ideas you have developed. Topics include the investigation the molecules of life, ecology and evolution, how the world works at the cellular level, how the body defends itself from foreign invaders and how biology is used in commercial applications.

RBF1310	Biology 1	12
RBF1320	Biology 2	12
RBF2300	Microbiology 1	12
RBF2330	Cell Biology	12

NMICBM Cell Biology / Microbiology

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year this group of units allows you to pursue a breadth minor in Cell Biology and Microbiology. This biotechnology minor is focussed upon the cellular processes fundamental to life and spans both single celled organisms through to complex multi-cellular life. In addition to the investigation of the intracellular processes underpinning life, the interaction between cells is also explored. This includes an understanding of multicellular cooperation, the basis of adaptive immunity and the breakdown of these regulated processes in disease (ie. cancer, auto-immunity... etc). It also explores the interaction between cells and the environment and the critical roles of microorganisms in the biosphere. This minor includes extensive practical training in methods for studying cellular processes including cell culture techniques, microbial culture/identification and immunological-based techniques. This minor is appropriate for students undertaking major studies in a range of science discipline areas who wish to complement their studies with an understanding of the cellular basis of life and how that knowledge can be utilised in a broad range of settings, including medical, environmental, pharmaceutical and agricultural industries.

NSC3010	Biotechnology Applications	12
RBF2300	Microbiology 1	12
RBF2330	Cell Biology	12
RMS3113	Comparative Immunobiology	12

NMICHE Chemistry

Locations: Footscray Park

This minor in Chemistry will introduce you to the principles and practices of modern chemistry. Building upon the fundamental principles of chemistry which are introduced in the first year units, Analytical Methods 1 and Organic Synthesis introduce students to instrumental analytical chemistry and the theoretical and practical aspects of synthetic organic chemistry. These units provides basic training in the preparation, purification and characterisation of organic compounds and their complimentary modern spectroscopic, chromatographic and spectrometric methods of analysis. For students interested in teaching chemistry, taking the four (4) units in

this minor adequately prepares students to deliver units 1, 2, 3 and 4 of the VCE chemistry curriculum.

NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12
RCS1601	Chemistry 1A	12
RCS1602	Chemistry 1B	12

NMIEAA Ecology and Environmental Management

Locations: Werribee, Footscray Park

The units within this group comprise of the Ecology and Environmental Management Minor within the new Bachelor of Science degree (NBSC). These units have been selected to provide students with a thorough grounding in the latest advances in ecology and environmental restoration and management. The units selected provide a focus on the theoretical and practical foundations of biological and environmental research. The practical application of ecologically sound techniques across a broad spectrum of settings related to conservation and general environmental restoration and management, are covered in depth throughout these units. There is a clear focus on the applications, procedures and regulations used in ecological management and related industries to produce work-ready graduates.

NPU2110	Australian Landscapes and Biota	12
RBF2610	Fundamentals of Ecology	12
RBF3210	Environmental Rehabilitation	12
RBF3620	Conservation and Sustainability	12

NMIENV Environmental Science

Locations: Werribee

The world around us is changing at an ever increasing pace, and Environmental Science offers the key to better understanding and managing these changes. By investigating the relationships between the physical, chemical and biological components of the natural world the human race can actively develop solutions to varied environmental problems. Studies will cover topics including management of natural resources, sustainability, the impact of pollution, climate change, deforestation and habitat destruction among other issues will affect us in the coming decades. A minor in Environmental Science incorporates ideas from a broad range of disciplines - from the natural sciences, to geography, economics and politics, in addition to the philosophies and ethics that underpin activity in these areas.

RBF1310	Biology 1	12
RBF1320	Biology 2	12
RBF2620	Australian Plants	12
RBF2640	Australian Animals	12

NMIESC Environmental Science

Locations: Werribee, Footscray Park

The units within this group comprise of the Environmental Science Minor within the new Bachelor of Science degree (NBSC). These units have been selected to provide students with a thorough grounding in the latest advances in botany, zoology, geography and ecology. The units selected provide a focus on the theoretical and practical foundations of biological and environmental research. The foundations of ecological knowledge and the key components of natural ecosystems are covered in depth throughout these units. There is a clear focus on the key elements needed to understand ecological applications, procedures and regulations used in ecological management and related industries. These key understanding will produce work-ready graduates that have a good grounding in environmental science.

NPU2110	Australian Landscapes and Biota	12
RBF2610	Fundamentals of Ecology	12
RBF2620	Australian Plants	12
RBF2640	Australian Animals	12

NMIICT ICT Management

Locations: Footscray Park

The ICT management minor provides students the opportunity to explore the depth and breadth in planning, risk management and change control in small IT business. It is designed to equip students with the analytic, communication and project management skills to tame the IT-business interface. Furthermore, students will develop ICT service agreements to manage a collaborative relationship between an IT department and others. They will exhibit professional capacity to promote sustainable procurement practice, ensure the desired organizational outcomes and reduce administrative overheads.

NIT2171	Introduction to ICT Management	12
NIT2271	ICT Change Management	12
NIT3171	ICT Business Analytics and Data Visualisation	12
NIT3274	Small IT Business	12

NMIITC Graduating Core

Locations: Footscray Park

This minor provides students the opportunity to articulate the role of the IT profession within the local and global communities by bringing together the knowledge and skills acquired in earlier units and apply them to solve the real-world problems in Capstone IT projects. Students will also study core knowledge and skills such as security, ethics and other areas important for IT professionals.

NIT2101	Computer and Internet Security	12
NIT2201	IT Profession and Ethics	12
NIT3101	IT Project 1	12
NIT3201	IT Project 2	12

NMIMBI Molecular Biology

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year this group of units allows you to pursue a breadth minor in Molecular Biology. This biotechnology minor concentrates on the chemical basis of life with a particular focus on the relationship between genes, the proteins they encode and the impact these have on organisms. This minor provides knowledge of biochemistry

and genetics that can be utilised across a broad range of industries, from DNA-based technologies in forensic science and conservation biology, to the diagnosis of disease using biochemical and genetic analyses, to the genetic engineering of cells and organisms. This minor includes practical training in the techniques used in biochemical analysis, investigation of gene and protein function and genetic engineering. This minor also investigates the ethical implications of these technologies and their broader impact on society. This minor is appropriate for students undertaking major studies in a range of science discipline areas who wish to complement their studies with an understanding of the molecular basis of life and how that knowledge can be utilised in a broad range of settings, including medical, forensic, conservation, pharmaceutical and agricultural industries.

NSC3010	Biotechnology Applications	12
NSC3030	Molecular & Systems Biology	12
RBF2390	Molecular Genetics	12
RBF2520	Biochemistry 1	12

NMIMST Mathematics/Statistics

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this specific group of units allows you to pursue a breadth minor in mathematics and statistics. These disciplines are at the heart of all modern science: from modelling of scientific problems to analyzing data. This minor includes the fundamental mathematics and statistics as used in modern applications, and will also provide you with the grounding to be an active and independent learner. This minor places great emphasis on applications, and also on the use of technology: from hand-held calculators to modern "industry strength" computer systems. As a science graduate with a solid grounding in mathematics and statistics you will be well placed to enter the workforce. Much modern science requires the creation of a good mathematical model as an underpinning; this minor will provide the necessary tools to be able to create such models, analyze them, and use them for testing, evaluation, and prediction. As well, data produced from laboratory or field studies needs to be rigorously analysed, and this minor introduces the technical skills necessary for such analysis. This minor is appropriate for student undertaking major studies in a range of science discipline areas who wish to complement their studies with some training in applied mathematics and statistics, and in the use of technology to support those fields.

RCM1614	Applied Statistics 2	12
RCM1712	Mathematical Foundations 2	12
RCM2611	Linear Statistical Models	12
RCM2713	Modelling for Decision Making	12

NMIPCH Pharmaceutical Chemistry

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this group of units allows you to pursue a breadth minor in Pharmaceutical Chemistry. This chemistry minor is focussed upon the processes involved in the development and preparation of new pharmaceutical products. The development of a new pharmaceutical product can be a long and involved process. The units in this minor cover the discovery process looking at historical and modern methods of drug discovery and design from drug mining to the latest computer aided design. Complimenting this area of study are units looking at synthetic organic chemical techniques which highlight the methodology involved in preparing the final pharmaceutical product. This minor is appropriate for student undertaking major studies in a range of science discipline areas who wish to complement their studies with an understanding of the discovery, design and preparation of pharmaceutical products.

NPU2103	Organic Synthesis	12
NPU2104	Drug Discovery and Development	12
NPU3102	Drug Design	12
NPU3103	Techniques in Pharmaceutical Synthesis	12

NMIPHY Physics

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this specific group of units allows you to pursue a breadth minor in Physics. This minor is appropriate for students undertaking major studies in a range of science discipline areas who wish to complement their studies with some training in Physics. Completion of these units will provide students with hand-on laboratory experiences in electrical circuits and optics, and complementary theoretical knowledge in topics such as radiation and lasers (and an appreciation of the relevance of these skills to chemistry and biotechnology). The units in this minor cover the topics in VCE physics Units 1-4 and are ideal for students wishing to pursue a career in physics teaching.

NEF1102	Engineering Physics 1	12
NEF1202	Engineering Physics 2	12
NSC2101	Physics 2A	12
NSC2102	Physics 2B	12

NMISPT Sports Technology

Locations: Footscray Park

The emerging sports technology industry is focused on personal electronics. This includes wearable electronics, sensors, and actuators applied to the areas of performance monitoring, injury risk minimization and rehabilitation monitoring. This minor will equip students with the basic understanding of engineering design processes, engineering knowledge in sensors, actuators, materials and software required to deliver the next generation personal electronic technologies, be it in the field of wearable electronics or biomechatronics (prostheses and exoskeletons).

NEE2104	Sports Technology Design	12
NEE3204	Sensors and Actuators in Sports	12
NEE4100	Wearable Technology Design	12
NEE4200	Biomechatronics	12

NMNBIO Biology

Locations: Werribee, Footscray Park, St Albans

After developing a solid grounding in science and mathematics from the core units in

first year this unit set allows you to pursue a specialisation in Biology. By completing all units in this specialisation, you will have fulfilled VIT requirements for a Teaching major in Biology.

RBF2390	Molecular Genetics	12
RBF2520	Biochemistry 1	12
RMS3020	Genomics, Proteomics and Bioinformatics	12
RMS3030	Genetic Engineering	12

NMNCHE Chemistry

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year this unit set allows you to pursue a specialisation in Chemistry. By completing all units in this specialisation, you will have fulfilled VIT requirements for a Teaching major in Chemistry.

RCS2100	Organic Chemistry 2A	12
RCS2601	Analytical Chemistry 2A	12
RCS3601	Analytical Chemistry 3A	12
RCS3602	Analytical Chemistry 3B	12

NMNENV Environment

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year. This unit set allows you to pursue a specialisation in Environmental Science. By completing all units in this specialisation, you will have fulfilled VIT requirements for a Teaching major in Environmental Science.

RBF2620	Australian Plants	12
RBF2640	Australian Animals	12
RBF3110	Marine & Freshwater Ecology	12
RBF3210	Environmental Rehabilitation	12

NSPELE Electrical Power

Locations: Footscray Park

The Master of Engineering specialisation in Electrical Power comprises coursework, design exercises and research projects designed to enable students to acquire specialised skills and expertise in the field of Power Systems, specifically catering for the contemporary Smart electricity system. Making the electricity grid Smart compliant is a global priority. Upgrading electricity grids to 21st century standards requires incorporating power engineering with the latest digital communications systems and information technology areas (including sensors, electronics, controls and wireless devices). The course will enhance students' academic experience through work-related learning. Active learning, strong contextualisation and industry relevance characterise the design, development and delivery of resources and course materials.

Core Units:

NNM7001	Power Generation	12
NNM7002	Transient Analysis, Stability and Surge Protection	12
NNM7003	Overhead Design and Construction	12
NNM7004	Underground Design and Construction	12
NNM7005	Power Quality and Harmonics	12
NNM7006	Insulation Co-Ordination and Sub-Station Design Principles	12
NNM7007	National Electricity Market and Regulation Principles	12
NNM7008	Environmental Issues and Sustainability	12

NSPPRE Process Engineering

Locations: Footscray Park

The Master of Engineering specialisation in Process Engineering comprises coursework, designed exercises and research projects constructed to enable students to acquire specialised skills and expertise in the field of Process Engineering, specifically catering for the future direction of sustainable water and foods industries. Understanding and developing more sustainable approaches to manufacturing foods and treating water is a global priority. Enhancing food and water security requires application of fundamental knowledge within innovative industry approaches. These approaches will pave the way to new means to produce safe water and food while also value-adding solid or liquid wastes. This is to be done at the same time as reducing energy, health and safety risks, waste by-products and environmental impact at prices communities worldwide can afford. The course will enhance students' academic experience through development of fundamental knowledge and work-related learning, as well as communicating their work in a professional manner to their peers. Active learning, strong contextualisation and industry relevance characterise the design, development and delivery of resources and course materials.

Core Units:

NNE7001	Environmental Management	12
NNE7002	Advanced Water and Waste Water Treatment	12
NNP7001	Fundamentals in Process Engineering 1	12
NNP7002	Fundamentals in Process Engineering 2	12
NNP7003	Process Chemistry	12
NNP7004	Safety and Quality Assurance	12
NNP7005	Units of Operation in Process Engineering	12
NNP7006	Industrial Biotechnology	12

NSPTEL Telecommunication

Locations: Footscray Park

The Master of Engineering Telecommunications specialisation is supported by coursework, design exercises and research projects designed to enable the development of specialised skills and expertise in the telecommunications field, specifically wireless and network engineering. Graduates will meet employment demand in the telecommunications industry within Australia and overseas. Particular

emphasis on wireless and networking within the course will provide job opportunities in the areas of mobile broadband and fibre to the premises - the current growth drivers of the global telecommunications industry. Students in this specialisation will benefit from the College's strong research capabilities and facilities in wireless systems and optical technology which were major contributors to the 2010 (Excellence in Research Australia) ERA=4 ranking in electrical engineering.

Core Units:

NNT6510	Communication Theory	12
NNT6531	Radio Frequency Engineering	12
NNM6513	Fibre Network Design	12
NNT6501	Advanced Communication System Design 1	12
NNT6502	Advanced Communication System Design 2	12
NNT6532	Satellite Network Design	12
NNT6542	Mobile Network Design	12
NNT6562	Digital Signal Processing	12

NSPWTR Water Management

Locations: Footscray Park

The Master of Engineering specialisation in Water Management comprises coursework, design exercises and research projects designed to enable students to acquire specialised skills and expertise in the field of Water Management, specifically designed to develop future water smart cities. The aspects of surface water, groundwater, alternative water resources, water quality & quantity, hydrology, hydraulics, water treatment and associated environmental management, economics and community are covered in units. The specialisation will enhance students' academic experience through work-related learning. Active learning, strong contextualisation and industry relevance characterise the design, development and delivery of resources and materials.

Core Units:

NNE7001	Environmental Management	12
NNE7002	Advanced Water and Waste Water Treatment	12
NNW7001	Surface Water Planning	12
NNW7002	Water, Society and Economics	12
NNW7003	Ground Water	12
NNW7004	Integrated Urban Water Management	12
NNW7005	Flood Hydrology and Hydraulics	12
NNW7006	Water quantity and quality modelling using SOURCE	12

UNITS

ECB1111 Introduction to Computer Systems

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit of study explores the design of a computer system at the architectural level. Topics covered computer hardware, computer software, data and communications, which makes up the architecture of a computer system. In addition to concepts of computer systems, the unit will discuss modern computer systems' applications such as Google applications, Cloud computing and Mobile applications. Although computer technology is developed very quickly, the basic architecture of computer systems has changed surprisingly little. This understanding is at the foundation of being a competent and successful system analyst, system architect, system administrator or programmer.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Rationalise key processor components; 2. Review and analyse computer organisation; 3. Use simulator programs to model computer system components; and 4. Design and construct application specific solutions in the field of computer architecture.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation. Randal E. Bryant and David R. O'Hallaron/2015 3rd Edition Computer Systems: A Programmer's Perspective Pearson John L. Hennessy/2011 5th Ed. Computer Architecture: A Quantitative Approach Morgan Kaufmann
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Computer simulation, 25%. Examination, Final Written Examination (3 hours), 50%.

ECB1121 Programming Principles

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides in-depth understanding of a modern object oriented language. The unit develops skills in software development, through an algorithmic approach and the application of principles of objected oriented programming. Content includes: introduction to programming; basic constructs of a programming language; sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries; one dimensional arrays; graphical user Interface.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss and apply fundamental aspects of computer program development; 2. Describe and conduct software development activities; 3. Develop algorithms using basic programming constructs; 4. Manipulate primitive data types and structured data types; and 5. Apply object-oriented software principles in problem solving.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Lewis J., DePasquale P., & Chase J. (2014) 3 Java Foundations: Introduction to program design and data structures, Pearson International Edition.
Assessment: Test, Test (60 min), 25%. Assignment, Assignment (programming tasks), 25%. Examination, Final 3 hours Written Examination, 50%.

ECB1131 Computer Network Concepts

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides an introduction to data communication fundamentals, network transmission technologies and network protocols. It introduces students to basic design and communicational issues related to local area networks, wide area networks and the Internet. Content includes: History and fundamentals of data communications and networks; standards; communication media types; data communications principles and protocols; network architectures and protocols, standard interfaces and transmission techniques; data integrity and security; Local Area Networks (LAN); data link control; IP Addressing and Subnetworking; Routing protocols like RIP; Switching technologies and Virtual LANs; Design and implementation of enterprise networks using industry standard equipment like CISCO routers and switches.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of modern business and personal applications of data communication systems; 2. Apply various technologies to solving data communication and networking problems; 3. Design IP networks with proper sub-networks; 4. Design switching networks; and 5. Implement moderately complex networks with industry standard technologies like CISCO routers and switches.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Kurose, J. F. , Ross, K. W. (2010) 5th Ed. Computer Networking Boston: Pearson Addison-Wesley Bennett, S. (2009) 2nd Ed. 31 Days Before Your CCNA Exam: A Day-by-Day Quick Reference Study Guide Indianapolis: Cisco Press
Assessment: Test, Test 1, 25%. Test, Test 2, 30%. Assignment, Final Assignment, 45%.

ECB1151 Communication and Information Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit aims to develop a set of skills associated with oral, written, technical and online communication. Students locate and assembling reliable sources of information for collation and presentation. Information is stored and managed electronically for effective storage and communication. Content includes an overview of the Internet, characteristics and functions of browsers, resources on the Internet, using search engines effectively, and application of IT technology to information gathering, storage and reporting. The unit also addresses formal and academic written communication.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct basic research and locate relevant Web-based and other resources; 2. Assess and evaluate resources and make judgements and decisions on their reliability and validity; 3. Access, collate and synthesise information from a variety of sources; 4. Plan and apply a variety of approaches to design and present researched information to given problem; and 5. Collaborate with others using effective interpersonal skills to design and develop online material, with responsibility for own output.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs
Required Reading: Material provided (referred to) in unit.
Assessment: Test, Test 1, 25%. Test, Test 2, 25%. Assignment, Final Assignment: Apply information or communication concepts, 50%.

ECB1213 Computer Operating Systems

Locations: Footscray Park.
Prerequisites: Nil.

Description: This unit introduces students to modern computer operating systems, their major components and roles. Students will be exposed to at least two popular operating systems including a mobile OS. Content includes: Operating System (OS) concepts, OS architectures; threads and processes; concurrency, daemons and services; memory management, devices and device drivers; file systems, security; basic scripting.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of the basic OS architectures, functions and roles; 2. Cite the history and identify social impacts of different operating systems, including mobile OS; 3. Describe OS components for processes, devices, files and memory management; 4. Research and report information on operating system types; and 5. Understand the basis of Unix shell scripting.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: McIver-McHoes A. & Flynn, I. (2008) 6th Ed. Understanding Operating Systems Cengage Learning
Assessment: Assignment, Assignment (1000-1500 words), 30%. Test, Test (90 min), 30%. Examination, Final Written Examination (2 hours), 40%.

ECB1222 Web Design and Programming

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides an introduction to coding web sites and the use of Content Management Systems (CMS) in the provision of web sites. Coding of sites involves Extensible Hyper Text Markup Language (XHTML) and Cascading Style Sheets (CSS). CMS involves design, creation and management of web sites using specialist CMS tools. The unit is delivered using Problem-based Learning (PBL). Lectures and laboratories will support the PBL approach with the use of scaffolding. Contents include: XHTML and CSS for coding web sites; use of a CMS to design, set up, deploy and maintain web sites.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop Web sites using XHTML and CSS; 2. Apply a CMS in the design, development and deployment of a web site; and 3. Apply Web design principles in the effective design of Web sites.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Gosselin, D. (2011) 1st Ed. Principles of HTML, XHTML, and DHTML Course Technology
Assessment: Test, Test 1 (20 minutes), 10%. Laboratory Work, Assessable Lab 1 (1.5 hours), 30%. Laboratory Work, Assessable Lab 2 (1.5 hours), 30%. Test, Test 2 (1.5 hours), 30%.

ECB1223 Introduction to Systems Analysis and Databases

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces fundamental concepts and principles of database and explains its role and purpose in information system design and analysis. Students gain mastery of standard techniques to identify system requirements and design a simple database system. Content includes: systems concepts; role of the analyst; Systems Development Life Cycle (SDLC), process modelling, Entity-Relationship (ER) modelling; relational database design using ER and Extended ER modelling, SQL (Structured Query Language), normalisation; and database management systems (DBMS).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the benefits and functions of databases and their applications; 2. Design a database using key relational database model concepts; 3. Develop and apply ER and EER diagrams; 4. Implement a relational database with multiple tables using a relational DBMS; 5. Apply query languages and manage a database using SQL; and 6. Normalise relations in a relational database system.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Connolly, T.M., and Begg, C.E. (2010) 5th Ed. Database Systems: A Practical Approach to Design, Implementation and Management Pearson International
Assessment: Assignment, Assignment, 30%. Test, Test, 20%. Examination, Final Written Examination (2 hours), 50%.

ECB1252 Introduction to the Computing Profession

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit articulates the role and importance of the computing profession within the local and global communities. Content includes: the role of a computing professional; understanding how computers impact on society; ethical issues including: privacy and ownership, issues in storing and retrieving information, responsibilities to install, maintain and upgrade software; dealing with clients and problem solving; career options in IT; job application and interviews skills.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key roles of computing in the local and global communities; 2. Identify ethical issues in computing; 3. Communicate effectively by writing on a range of computer-related topics using appropriate language; 4. Communicate effectively using oral and visual presentations on range of computer-related topics; 5. Work individually and with others in teams; 6. Prepare Curriculum Vitae and demonstrate general job seeking skills; and 7. Initiate an educational plan for learning and career goals.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.
Assessment: Assignment, Assignment-1 (500-1000 words), 10%. Assignment, Assignment-2 (1000-1500 words), 20%. Presentation, Oral presentation-1 based on Assignment-1, 10%. Presentation, Oral presentation-2 based on Assignment-2, 20%. Portfolio, Initiate the creation of Web-based portfolio, 40%.

ECB2112 Security, Privacy and Ethics

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit articulates the role of the IT profession within the local and global communities. The unit examines a wide range of ethical and privacy issues and concepts in the ICT field. The unit develops student critical thinking skills by introducing topical and controversial issues related to computing ethics and privacy problems. Content includes: the role of a computing professional; understanding how computers impact on society; information privacy concepts as applied to the management of information systems; different industry policies; mechanisms for implementing these policies; Australian Computer Society (ACS) code of ethics; social issues of privacy, intellectual property, and the digital divide.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key roles of computing in the local and global communities; 2.

Demonstrate an understanding of the different principles underlying ethical decision making; 3. Critically discuss social and ethical issues in Information and Communication Technology (ICT) domains; 4. Identify and relate appropriate privacy measures and their management for computing environments; 5. Identify specific ethical and privacy issues in networked computing environments; and 6. Communicate effectively on a range of IT-related topics using appropriate language.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Quinn, M.J. /2012 5th Ed. Ethics for the Information Age Pearson International
Assessment: Assignment, Assignment-1 (1000-1500 words), 25%. Assignment, Assignment-2 (1000-1500 words), 25%. Examination, Final 3 hours written examination, 50%.

ECB2123 Programming for Networks

Locations: Footscray Park.
Prerequisites: NIT2112 - Object Oriented Programming NIT2213 - Software Engineering ECB1121 - Programming Principles NIT2112 or NIT2213 or ECB1121
Description: This unit explores the methodologies and approaches used in programming for computer networks through using appropriate features and the application programming interface of a modern programming language. Content includes: In-depth study of classes and objects, polymorphism; advanced graphical user interfaces (GUI), programming for Transmission Control Protocol (TCP) and Universal Datagram Protocol (UDP); file input and output; object streams and exception handling.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate general network programming ability; 2. Demonstrate an understanding of networking with URLs (Uniform Resource Locators), sockets and datagrams; 3. Establish a simple server using TCP/IP protocol; 4. Implement a network client; 5. Program basic client-server communications; and 6. Compose advanced object-oriented solutions for problem solving using Model-View-Controller framework.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Deitel & Deitel (2015) 10th Ed. Java How to Program Pearson Education
Assessment: Test, Test (60 min), 25%. Assignment, Assignment (programming tasks), 25%. Examination, Final 3 hours written examination, 50%.

ECB2124 Web-Based Systems Development

Locations: Footscray Park.
Prerequisites: NIT1101 - Web Development and CMS NIT2112 - Object Oriented Programming NIT2213 - Software Engineering ECB1222 - Web Design and Programming NIT1101 or NIT2112 or NIT2213 or ECB1222
Description: This unit provides students with knowledge and practice of designing and developing large complex web applications, e.g., large enterprise software systems in web-based environment. Students will learn of advanced software frameworks for web development and apply them in practice. A number of techniques will be introduced which include Web Service and Services, MVC (Model-View-Controller) framework, etc.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse requirements of large and complex web applications for a real-world business case; 2. Apply advance web application frameworks in designing large and complex web application; and 3. Develop and prototype large web applications with current popular technologies, e.g., Web services.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Imar Spaanjaars (2013) 1st Beginning ASP.NET 4.5 in C# and VB USA/John Wiley & Sons, Inc.
Assessment: Assignment, Large web system design, 25%. Project, Large web system prototyping and development, 25%. Examination, Final Written Examination (3 hours), 50%.

ECB2132 Internetworking Technologies

Locations: Footscray Park.
Prerequisites: ECB1131 - Computer Network Concepts
Description: This unit enhances and deepens the knowledge on internetworking technologies and protocols. Content includes: Routing algorithms and protocols including EIGRP and OSPF, Network Address Translation (NAT), IP V6, Wide Area Networks (WANs), Transmission Control Protocol, and network design and implementation with industry standard equipment like Cisco routers and switches.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the mechanisms and algorithms of major switching and routing technologies; 2. Design networks with appropriate network structures, addresses and routing protocols; and 3. Design and implement networks with industry standard technologies for LANs, WANs and the Internet (e.g. with Cisco Routers and WAN Switches).
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Kurose, J. F. , Ross, K. W. (2010) 5th Ed. Computer Networking Pearson Addison-Wesley
Assessment: Test, Assignment 1, 20%. Assignment, Assignment 2, 30%. Examination, Final Written Examination (3 hours), 50%. Assignment is LiWC assessment in a simulated environment. .

ECB2225 Multi-User Database Systems

Locations: Footscray Park.
Prerequisites: NIT1201 - Introduction to Database Systems ECB1223 - Introduction to Systems Analysis and Databases NIT1201 or ECB1223
Description: This unit provides students with an in-depth understanding of the design and implementation of modern multi-user database systems. Content includes: design and implementation of robust and scalable database applications; issues pertaining to multi-user database environments, such as transaction management and performance; in-depth study of Structured Query Language (SQL); database application development tools; database performance optimisation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain design principles underlying multi-user database management systems; 2. Apply database theories to real-life database applications; 3. Demonstrate knowledge of the technologies that underpin multi-user database systems; 4. Analyse a real-life problem, and design and implement a system using a commercial database management system; and 5. Evaluate the robustness and scalability of database systems.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Connolly, T.M., and Begg, C.E. (2010) 5th Ed. Database Systems: A Practical Approach to Design, Implementation and Management Pearson International
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final written examination (3 hours), 50%.

ECB2234 Network Security

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer NetworksECB1131 - Computer Network ConceptsECB1213 - Computer Operating SystemsNIT1104 or ECB1131 or ECB1213
Description: This unit investigates processes of security at local and network levels, including security policies and practices, software, hardware and human issues. Content includes: physical and system security; cryptosystems; authentication and authorization; Access Control List (ACL); firewalls and port security; secure and insecure web protocols (e.g. telnet, ssh); secure email protocols (e.g. PGP and S/MIME); intrusion detection and system hardening; security in Virtual Private Networks (VPN), cloud computing, and databases.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Audit a system for security vulnerabilities; 2. Manage and use system security and logging tools; 3. Identify strengths and weaknesses in security products; 4. Apply security tools to strengthen a networked system; 5. Analyse a system for deploying the most appropriate security solution; and 6. Design and implement a security solution given a set of constraints.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Ross J. Anderson (2008) 2nd Ed. Security Engineering: A Guide to Building Dependable Distributed Systems Wiley
Assessment: Laboratory Work, Practical Knowledge Test, 20%. Assignment, Project report (2500 - 3000 words), 30%. Examination, Final Written Examination (3 hours), 50%.

ECB2241 Wireless Networks

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer NetworksECB1131 - Computer Network ConceptsNIT1104 or ECB1131
Description: This unit provides students with an in-depth awareness of the fundamentals of Cisco WLAN and an overview of current technologies, together with an understanding of some scientific aspects of wireless communications and the necessary techniques to implement a WLAN. Content includes: wireless regulatory bodies; Wireless Local Area Networks (WLAN) fundamentals, such as Bluetooth, WiMAX, ZigBee; cordless phone technologies; wireless standards such as 802.11; authentication and encryption methods; wireless systems architectures, such as Cisco Unified Wireless Network Architecture.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of WLAN fundamentals; 2. Install and configure WLAN and clients; 3. Implement and design WLAN; and 4. Conduct WLAN troubleshooting and maintenance.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Henry Chou and Michael Kang, 2010 CCNA Cisco Certified Network Associate Wireless study guide McGraw Hill
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Assignment (Wireless LAN Deployment Project), 25%. Examination, Final 3 hours Written Examination, 50%.

ECB2253 IT Project Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit investigates aspects of professional practice and specific tasks that need to be undertaken in order to initiate and implement an IT project. Content includes many aspects of project management, definition of a project; characteristics of IT projects; project life cycle; project team; project management aspects; scope, time, cost, quality, human resource; communications, risk, procurement, and integration management; project planning and scheduling; Critical Path Method (CPM); project execution and monitoring; project closure; project management software.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Define a project, and identify the special characteristics of IT projects; 2. Describe the key elements of a project plan, including cost and time schedules; 3. Undertake project planning and documentation, considering all project requirements, constraints and risks; 4. Manage project execution activities, monitor and control project scope changes, risks, issues and the delivery of project team work activities; and 5. Coordinate project closure, consider IT support plans and obtain final project sign-off.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Schwalbe, K. (2013) 7th Ed. Information Technology Project Management Thomson Course Technology
Assessment: Test, Two tests (10% each), 20%. Project, Group Project Implementation, 30%. Examination, Final Exam, 50%.

ECB3135 Server Administration and Maintenance

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer NetworksNIT1202 - Operating SystemsECB1213 - Computer Operating Systems(NIT1104 and NIT1202) or ECB1213
Description: This unit provides students with the knowledge of server administration, including database and operating system administration. Content includes: database (DB) administration; operating system (OS) administration; system administration: network connection, data backup, software administration; TCP/IP (Transmission Control Protocol/Internet Protocol) configuration; creating DNS (Domain Name Servers), wireless communication systems administration; firewalls, IPSec protocols.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain fundamentals of database, operating systems, and server administration; 2. Develop server administration and maintenance skills; and 3. Configure real-life network infrastructures, including wireless systems.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Burgess, Mark (2007) 2nd. ed. Principles of Network and System Administration Melbourne: John Wiley & Sons
Assessment: Laboratory Work, Practical Knowledge Test, 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%. Two (2) Technical reports based on real industry problems and seminars given by industry professionals are the LiWC components, with a weighting of 25% of assessment. .

ECB3142 Active Directory Design and Management

Locations: Footscray Park.
Prerequisites: NIT2122 - Server Administration and ManagementNIT2222 - Networking TechnologiesECB1131 - Computer Network ConceptsECB1213 - Computer Operating SystemsNIT2122 or NIT2222 or ECB1131 or ECB1213
Description: The Enterprise Network Management unit aims to provide students with an understanding of issues relevant to enterprise networks and related technologies, as well practical skill and techniques to manage the enterprise network. Topics studied include Enterprise Network Infrastructure, Domain Name Systems, Network

Group Policy Design and Implementation, Security Planning and Administration, System Maintenance and Trouble Shooting and their related technologies.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop solutions for enterprise network architecture; 2. Build and configure small-scale enterprise network; 3. Analyse and identify potential issues in managing enterprise network; and 4. Manage and maintain enterprise network infrastructure.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Shannon McFarland/2011 1 IPv6 for Enterprise Networks (Networking Technology) Cisco Press
Assessment: Laboratory Work, Practical Tasks (4 to 6 labs), 20%. Assignment, Enterprise network Design and Implementation, 30%. Examination, Final Written Examination (3 hours), 50%.

ECB3143 Network Management

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer Networks ECB1131 - Computer Network Concepts NIT1104 or ECB1131
Description: This unit explores the fundamentals and practice of network management methodologies. This includes the study of standard network management models such as the FCAPS model that includes fault management, configuration management, accounting management, performance management, and security management. Management models like FCAPS will be used to justify and assess the applicability of various network management tools like the Simple Network Management Protocol. Content includes: FCAPS (Fault, Configuration, Accounting, Performance, and Security) model, Simple Network Management Protocol (SNMP); network management tools and systems, such as CiscoWorks LAN Management Solution (LMS).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principles of network management; 2. Develop the skills required to manage networks; 3. Understand the applicability of the available tools; 4. Perform network management tasks.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Alexander Clemm (2006) 1st ed. Network Management Fundamentals Cisco Press
Assessment: Assignment, Two (2) Reports (4-5 technical questions), 25%. Test, Two (2) Practical Knowledge Tests, 25%. Examination, Final Written Examination (2 hours), 50%.

ECB3154 Computing Project Analysis and Design

Locations: Footscray Park.
Prerequisites: NIT2112 - Object Oriented Programming NIT2122 - Server Administration and Management NIT2213 - Software Engineering NIT2222 - Networking Technologies ECB2123 - Programming for Networks ECB2124 - Web-Based Systems Development ECB2253 - IT Project Management (NIT2112 AND NIT2213) OR (NIT2122 AND NIT2222) OR (ECB2123 AND ECB2124 AND ECB2253)
Description: This unit centres on an industry sponsored group project. In a team students develop an IT solution to solve a real-world problem for their client. Student activities include: business case analysis, requirements modelling, data and process modelling, and project management. This unit brings together the knowledge and skills acquired by students in earlier units and apply them to a real-world system development project.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Gain knowledge for working on a real-world software development project; 2. Apply software engineering and database design methodologies; 3. Demonstrate IT project management skills, such as liaising with clients, working in a team; and 4. Create and produce project documentation;
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.
Assessment: Presentation, Oral presentation-1 on project progress (5-10 minutes), 15%. Presentation, Oral presentation-2 on project update (5-10 minutes), 15%. Other, Peer and client assessments, 20%. Project, Group project documentation (4000-5000 Words), 50%. Oral presentations - 25% LiWC (presentations of the progress of projects with clients' feedback and requirements); Project documents - 75% LiWC (working with client to create and produce analysis and design project documents).

ECB3214 Virtualisation in Computing

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer Networks NIT2122 - Server Administration and Management ECB1131 - Computer Network Concepts NIT2122 or NIT1104 or ECB1131
Description: This unit provides students with knowledge and skills of virtualisation in computing including design, implement and management of virtualisation. Content: fundamentals of virtualisation in computing, server virtualisation, storage virtualisation, desktop virtualisation, application virtualisation, design and develop virtualised environments, manage and administration of virtualised systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply core knowledge of virtualisation; 2. Manage a virtualisation environment with industry products; 3. Design and develop virtual machines with main-stream industry technologies; 4. Design, develop and manage desktop virtualisation; and 5. Design, develop and manage application virtualisation.
Class Contact: Lecture 3.0 hrs PC Lab 2.0 hrs
Required Reading: Jason Kappel, Anthony Velte, and Toby Velte (2009) Microsoft Virtualization with Hyper-V McGraw Hill
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Design and implement virtualised environment (individual or group design project), 25%. Examination, Final 2 hours written examination, 50%. Assignment is assessed in simulated environment (LiWC).

ECB3244 Advanced Network Technologies

Locations: Footscray Park.
Prerequisites: NIT2122 - Server Administration and Management NIT2222 - Networking Technologies ECB2234 - Network Security ECB2241 - Wireless Networks NIT2122 or NIT2222 or ECB2234 or ECB2241
Description: This unit will introduce students to the latest networking technologies and their ability to handle advanced communications applications. Students will work with an industry or community organisation to design an advanced network for their current and/or future networking and data communication needs. Content includes: advanced networking technologies, such as Ad-hoc Networks, ubiquitous networks, and sensor networks; an industry standard framework for network design and evaluation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe important features of advanced networking technologies; 2. Assess the networking needs of an industry or community organisation; 3. Apply network design principles to develop a model of the required network; 4. Evaluate a number of network technologies to meet the design requirements; 5. Design a network to meet the organisation needs; 6. Apply good design and project management principles.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Anthony Bruno and Steve Jordan (2011) Cisco Network Design Associate CISCO Press

Assessment: Test, Practical Knowledge Test, 25%. Project, Group project design, documentation and presentation (2000-3000 words), 25%. Examination, Final Written Examination (2 hours), 50%.

ECB3255 Small IT Business Development

Locations: Footscray Park.

Prerequisites: NIT2171 - Introduction to ICT Management NIT2271 - ICT Change Management ECB1252 - Introduction to the Computing Profession NIT2171 or NIT2271 or ECB1252

Description: The unit will prepare students for starting and running a small IT business. It will enable students to research and develop a new IT business proposal. The students will role-play four forms of business ownership: sole proprietorship, partnership, corporation and trusts. The unit provides the opportunity for them to have a broad and coherent body of knowledge, including the types of IT-related businesses; business plan development; business functions: marketing, location, operations, staffing, accounting; government assistance; e-business; home-based business; taxation; borrowing; franchising; social, environmental and ethical considerations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Distinguish the various forms of ownership of small businesses, including IT businesses; 2. Evaluate various IT business opportunities; 3. Prepare a proposal for starting and running a business; and 4. Appraise sources of finance for starting and running the business.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Hatten, T. S (2012) 5th Edition Small Business Management: Entrepreneurship and Beyond Sydney: Cengage Learning

Assessment: Test, Test, 10%. Project, Team Project: Business Website Development, 40%. Examination, Final Examination, 50%.

ECB3256 Computing Project Development and Implementation

Locations: Footscray Park.

Prerequisites: NIT2112 - Object Oriented Programming NIT2122 - Server Administration and Management NIT2213 - Software Engineering NIT2222 - Networking Technologies ECB2123 - Programming for Networks ECB2124 - Web-Based Systems Development ECB2253 - IT Project Management (NIT2112 AND NIT2213) OR (NIT2122 AND NIT2222) OR (ECB2123 AND ECB2124 AND ECB2253)

Description: This unit centres on an industry sponsored group project. In a team students develop an IT solution to solve a real-world problem for their client. Student activities include: design and implementation of the project based on business case analysis, business processes and requirement models; delivery, deployment and maintenance of the project in production environment. This unit brings together the knowledge and skills acquired by students in earlier units and apply them to a real-world system development project.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Gain knowledge for working on a real-world software development project; 2. Apply software engineering and database design methodologies in real-world project implementation and deloyment; 3. Demonstrate IT project management skills, such as liaising with clients, working in a team; and 4. Create and produce project documentation.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.

Assessment: Presentation, Oral presentation-1 on project continuity (5-10 minutes), 15%. Presentation, Oral presentation-2 on project completion (5-10 minutes), 15%. Test, User Acceptance Test, 20%. Project, Group project documentation (4000-5000 Words), 50%.

ECS4100 Analog and Digital Transmission

Locations: Footscray Park.

Prerequisites: ENE3101 - Systems Engineering Complete Second Year.

Description: The unit is designed to provide the theoretical basis for the understanding of the engineering aspects of the design, construction, and operation of the existing and emerging telecommunication systems. It also provides the support for students requiring basic knowledge of telecommunication engineering in order to handle concurrently studied Engineering Design projects that involve various aspects of telecommunication engineering. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain signals and their characteristics as depicted in time and frequency domains; 2. Discuss the information bearing nature of signals and the bandwidth considerations; 3. Explain the principles behind frequency translation and its depiction as various types of modulation; 4. Explain the signal transition in linear and non-linear systems, and the recognition of such systems in terms of filters and other components; 5. Describe the types of noise present in telecommunication systems and the characterisation of thermal noise; 6. Perform the statistical analysis of random signals and the characterisation of such signals in terms of correlation and power spectral density functions; 7. Explain the concept of signal to noise ratio and its influence in faithful reception of analog and digital signals; 8. Outline the assessment of performance in digital communication systems in terms of bit error probability; 9. Describe the bandpass transmission techniques and application of line coding; 10. Discuss the baseband recovery of bandpass communication systems, including matched-filters, and the impact of the type of modulation in such systems. Understand the applications of probability theory in the analysis of engineering systems; 11. Describe the space and material media that are capable of carrying signals used in Telecommunication systems; 12. Describe the physical composition of such media, their characteristics and modes of operation; 13. Discuss the limitations of such media with regard to frequency, bandwidth, and power; 14. Explain the phenomena of propagation of electromagnetic waves in space and material media including coaxial cables and waveguides; 15. Discuss the theoretical basis for electromagnetic wave propagation including Maxwell's

equations; 16. Explain line impedance, transmission, reflection, matching and there application to the design of high frequency circuits and systems. If time permits, introduce the Smith Chart; 17. Explain free space propagation and practical propagation models. Explain the principles of digital communication systems and components.

Class Contact: Sixty (60) hours or equivalent for one semester comprising of a mix of small group work, lectures, and workshops.

Required Reading: Lathi, B. P. (2001) 3rd ed. Modern digital and analog communication systems Oxford University Press Proakis, J. G., & Salehi, M. (2002) Contemporary communication systems using MATLAB Belmont, CA: Thomson Brooks/Cole Cheng, D. K. (1999) 2nd ed. Field and wave electromagnetics Addison Wesley

Assessment: Laboratory Work, Continuous assessment in laboratory work, 20%. Test, Mid-semester written test, 20%. Examination, End-of-semester examination, 60%.

ECS4200 Signal Processing and Digital Modulation

Locations: Footscray Park.

Prerequisites: ENE3101 - Systems EngineeringComplete Second Year.

Description: Introduction Continuous-time and discrete-time signals. The sampling theorem. Impulse sampling and the zero-order hold. The z-transform. Analysis of discrete-time systems Unit-pulse response. Causal linear shift-invariant systems. Ordinary convolution. Bounded-input bounded output stability. Difference equation and transfer pulse transfer function. Unit-delay operator and realization structures of causal linear shift-invariant systems. A stability test. The frequency response function The discrete-time Fourier transform (DTFT) pairs. Mapping between the s-plane and the z-plane. Infinite duration Impulse Response filters Butterworth and Chebyshev filters. Frequency scaling and transformations. Transformation of analog filters into IIR filters. Matched z-transform, impulse-invariance, and bilinear transformations. Finite duration Impulse Response filters Linear phase response. Filter design with window functions. Frequency sampling filters. The Discrete Fourier transform (DFT). Relationship between DFT and DTFT. The Fast Fourier transform (FFT). Computation of frequency spectra, zero padding. Cyclic convolutions and its application in filter realization. Application of digital signal processing to the modulation and demodulation of digital signals. Nyquist filtering, Binary Phase-Shift Keying, Quadrature Phase-Shift Keying and Quadrature Amplitude Modulation. Spectral efficiency of various modulation schemes. Channel coding and decoding; linear block code, cyclic code and convolution code. Coded modulation systems. Information theory and Source coding.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform time and frequency domain analysis of discrete-time linear signal processing systems; 2. Design simple FIR and IIR filters; 3. Perform spectral analysis on sampled signals with DFT via FFT digital signals; 4. Explain the principles of digital communication systems and components; 5. Describe the optimum signal detection using matched filter receiver in additive white Gaussian noise; 6. Explain the baseband transmission techniques; 7. Discuss the effects of bandwidth limitation, intersymbol interference, Nyquist signalling and channel equalisation; 8. Describe the bandpass transmission techniques; 9. Describe the BPSK, QPSK, and QAM modulation systems and coherent detection of those systems; 10. Explain the carrier and clock synchronisation techniques; 11. Explain the channel coding including linear block codes, convolutional codes, and the Viterbi algorithm; 12. Explain information theory, source coding, and data compression; and 13. Explain coded modulation systems, trellis coding, and decoding.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and laboratories.

Required Reading: E.C. Ifeachor and B.W. Jervis, 2002 Digital Signal Processing - A Practical Approach Prentice Hall Kurzweil, J., 2000 An introduction to digital communications John Wiley Proakis, J. G., & Salehi, M., 2002 Contemporary communication systems using MATLAB Belmont, CA: Thomson Brooks/Cole

Assessment: Laboratory Work, Continuous assessment in laboratory work, 20%. Test, Mid-semester test, 20%. Examination, End-of-semester examination, 60%.

EMS4100 IC Design and EDA Tools

Locations: Footscray Park.

Prerequisites: Nil.

Description: The design of basic CMOS integrated circuits is covered, including overview of MOS technology, complex complementary CMOS design, combinational design techniques including dynamic and domino logic. Students will develop hands-on experience in design, simulation, verification and implementation using industry standard EDA tools for custom and semi-custom nanoelectronic design. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students are expected to be able to: 1. Have gained knowledge of basic custom and semi-custom integrated circuits design; 2. Have gained knowledge of custom and semi-custom integrated circuit design flow and circuit design; 3. Carried out significant tasks designed to improve desired generic skills and attributes; 4. Have gained knowledge of industry standard electronic design automation tools; 5. Have gained knowledge of electronic design automation tools for custom and semi-custom IC designs.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials, laboratory work and project work.

Required Reading: Rabaey, J. M., 2002 2nd Edition Digital Integrated Circuits Prentice Hall

Assessment: Laboratory Work, Laboratory based excercises, 30%. Project, Industry based project, 30%. Examination, End-of-semester examination, 40%.

EMS4200 Analog and Mixed Signal Design

Locations: Footscray Park.

Prerequisites: EMS4100 - IC Design and EDA Tools

Description: The design of CMOS analog and mixed-signal integrated circuits is covered. Design concepts of high speed low power amplifiers, filters, sample and hold circuits, comparators, digital to analog and analog to digital converters are fully analysed. Students will develop hands-on experience in design, simulation, verification and implementation using industry standard EDA tools.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students are expected to be able to: 1. Describe most common integrated circuit design, and D/A and D/A converters; 2. Use industry standard Software design tools.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials, laboratory work and project work.

Required Reading: Behzad Razavi, 2001 Design of analog CMOS integrated circuits McGraw Hill International Edition

Assessment: Laboratory Work, Laboratory based excercises, 20%. Project, Industry based project, 20%. Examination, End-of-semester examination, 60%.

ENE2100 Engineering Design and Practice 2A

Locations: Footscray Park.

Prerequisites: Nil.

Description: This is a practical, PBL mode subject in which students work in teams to solve a number of problems specifically designed to integrate with the learning and content from ENE2101 and ENE2102. Teams of students will have an Electrical Engineering staff member as a 'coach or mentor' whilst working on these problems. 'Specialist' staff from the ENE2101 and ENE2102 subjects will be available to assist students with technical aspects of the problems. Staff members from the College of Arts will be available on a weekly basis to assist with the development of communications skills. Staff members from other Colleges will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Demonstrate technical competence in at least one engineering discipline; 4. Undertake problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Describe the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Define the principles of sustainable design and development; 9. Define professional and ethical responsibilities and display a commitment to them; 10. Display the capacity to undertake lifelong learning; and 11. Locate, evaluate, manage and use information effectively.

Class Contact: One hundred and twenty (120) hours for one semester comprising lectures and tutorials.

Required Reading: Nil

Assessment: Other, Attendance and participation, 10%. Project, Project demonstrations, 10%. Presentation, Oral presentations, 10%. Assignment, Written technical paper, 10%. Report, Written project report, 10%. Portfolio, Demonstrate the attainment of learning outcomes, 50%. In the portfolio students are required to demonstrate the attainment of learning outcomes using: peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports.

ENE2101 Fundamentals of Electrical & Electronic Circuits

Locations: Footscray Park.

Prerequisites: ENF1202 - Engineering Physics 2

Description: Independent sources, real voltage sources. Nodal Voltage Method. Supernodes. Dependent sources. Introduction to Operational Amplifiers, Inverting Amplifier, Non-inverting amplifiers, Comparator, Buffer and Summing Amplifier circuits. Real Resistors. Nominal values, tolerance, power rating and temperature coefficient. Volt-ampere characteristics. Equivalence. Thevenin's Theorem & Equivalent Circuit. Norton's theorem & Equivalent Circuit. Diode VI characteristics, Rectifier diodes and their application. Zener diodes. Capacitance. Parallel plate capacitor. Stray capacitance. Permittivity. Step response of RC circuit. Capacitor discharge. Time constant of RC circuit. Time delay and voltage ramp circuits. Electrostatic fields and energy storage in a capacitor. Ideal transformer. TRU circuits. Capacitors in power supplies. Real capacitors, electrolytic & non-electrolytic. Voltage regulators. Principle of Superposition. Non-ideal DC characteristics of real operational amplifiers. Introduction to AC circuits. Sinusoids. AC voltage applied to ideal resistor, and to ideal capacitor. Reactance. Phasors. AC voltage applied to RC series circuit. AC power in a resistor. RMS value. Crest and form factors. True RMS meters. Introductory description of mains electricity. Electric shock and safety. Introduction to magnetism. Induced voltage. Faraday's Law. Coils and self-inductance. Lenz's Law. Energy stored in a magnetic Field. Inductors in DC circuits. Switching induction circuits. LR series circuits and transient behvaiour. AC voltage applied to ideal self-inductor. Inductive reactance. RL series AC circuit. J operator. Revision of complex numbers. Use of complex numbers in AC circuit analysis. Complex impedance. Series RLC circuits. ESR and ESL of real capacitors. Resonance in series RLC circuits. Voltage multiplication. Parallel AC circuits. Parallel to seies and Series to parallel conversions. Admittance and susceptance. Input impedance of an amplifier. Resonance in parallel circuits.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse simple DC and AC circuits using the methods outlined above; 2. Incorporate the presented material into subsequent design exercises; and 3. Successfully study subsequent downstream Units of Study.

Class Contact: Sixty (60) hours or equivalent for one semester comprising of lectures and tutorials.

Required Reading: Provided Lecture Notes.

Assessment: Test, Mid-semester test, 20%. Examination, End-of-semester examination, 80%.

ENE2102 Digital & Computer Systems

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to electronics circuits and engineering computer programming using a high level language (C/C++). An overview of a typical computer system. The program creation process (for an embedded microcontroller); editing, compiling and debugging. Data types, correct choice of type and their range. The use of variable, assignment, arithmetic and logical operations. Flow control using loops; if, while and switch statements. An Introduction to arrays. System library and user defined functions, function calls and parameters passing. An introduction to data structures and uses. Use of microcontroller PORTS for simple sensor/actuator interfacing. Logic gates, truth tables and Boolean algebra. Equation formation in Sum of Products and Product of Sums forms. Graphical methods of equation minimization including Venn diagrams and the Karnaugh map. Circuit implementation using universal gate sets. Combinational equation implementation using simple Programmable Logic Devices (PLDs). Latches and flip-flops, types, triggering, synchronous and asynchronous signals. Asynchronous counter design using flip-flop chains and manufacturer's devices. Simple multi-mode synchronous counter and state machine design. Electrical characteristics of logic devices.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Construct truth tables, formulate logic expressions, minimize logic expressions using Boolean Algebra and Karnaugh maps; 2. Design and construct simple combinational logic circuits in Sum of Products (SOP) and Product of Sums (POS) forms using simple gates and through VHDL and PLDs; 3. Design and construct sequential logic digital circuits using D and J-K flip-flops and logic gates; 4. Design simple sequential circuits through the use of state diagrams and implement on PLDs using VHDL; 5. Convert numbers between bases (decimal, binary and hexadecimal forms), perform binary and hexadecimal arithmetic and determine the permissible range of a number (signed and unsigned) given a word length; 6. Write programs in the C language to solve simple problems that may include use of selection and repetition structures, create arrays, store and manipulate data, employ

library and user created function calls, pointers and simple data structures,etc; and 7. Embed C programs onto a microcontroller and make appropriate use of input/output ports, interrupts, timers and external interface devices including simple sensors and displays.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and group laboratory practical activities.

Required Reading: Tocci, R., Widmer, N. and Moss, G., 2007 Digital Sytems: Principles and Applications Pearson/Prentice-Hall

Assessment: Test, Mid-semester test, 20%. Assignment, Semester assignment, 20%. Examination, End-of-semester examination, 60%.

ENE2200 Engineering Design and Practice 2B

Locations: Footscray Park.

Prerequisites: ENE2100 - Engineering Design and Practice 2A

Description: This is a practical, PBL mode subject in which students work in teams to solve a number of problems specifically designed to integrate with the learning and content from ENE2201 and ENE2202. Teams of students will have an Electrical Engineering staff member as a 'coach or mentor' whilst working on these problems. 'Specialist' staff from the ENE2201 and ENE2202 subjects will be available to assist students with technical aspects of the problems. Staff members from the College of Arts will be available on a weekly basis to assist with the development of communications skills. Staff members from other Colleges will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Apply In-depth technical competence in at least one engineering discipline; 4. Undertake problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Define the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Define the professional and ethical responsibilities and display a commitment to them; 10. Display the capacity to undertake lifelong learning; and 11. Ability to locate, evaluate, manage and use information effectively.

Class Contact: One hundred and twenty (120) hours for one semester comprising lectures and tutorials.

Required Reading: Nil.

Assessment: Other, Attendance and participation, 10%. Project, Project demonstrations, 10%. Presentation, Oral presentations, 10%. Assignment, Written technical paper, 10%. Report, Written report, 10%. Portfolio, Demonstrate the attainment of learning outcomes, 50%. In the portfolio students are required to demonstrate the attainment of learning outcomes using:- peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports.

ENE2201 Linear Systems with Matlab Applications

Locations: Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENE2101 - Fundamentals of Electrical & Electronic Circuits

Description: Analysis of linear time-invariant systems in time-domain. Lumped models of linear time-invariant system elements. Formulation of system equations and initial conditions for systems described by first-order and second-order linear constant-coefficients ordinary differential equations. Zero-input response and zero-state response. Unit-impulse function. Sifting property. Unit-step function. Laplace transformation and solution of ordinary linear differential equations with constant coefficients. Obtaining zero-input response and zero-state response for first-order and second-order systems by using Laplace transforms. Relationship between impulse response and transfer function. Poles and zeros and their significance. Transient response and steady-state response decomposition. Elementary eigenvalue-eigenvector problems and solution of a set of ordinary linear first-order differential equations with constant coefficients. Analysis of linear time-invariant systems in frequency-domain. Introduction to Fourier series and Fourier transforms. Frequency response and Bode diagrams.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform time-domain analysis of linear time-invariant systems using Laplace transforms; 2. Perform frequency-domain analysis of linear time-invariant systems using Fourier series and Fourier transforms; 3. Apply linear algebra to find trajectories of linear systems modelled as a system of first-order linear ordinary differential equations with constant coefficients; and 4. Employ simple MatLab commands and Simulink to analyse linear time-invariant systems.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Alexander, C.K. and M.N.O. Sadiku, 2004 Fundamental of Electric Circuits McGraw-Hill Strum, R.D. and D.E. Kirk, 2000 Contemporary Linear Systems using MatLab Brooks/Cole Kreyszig, E., 2006 Advanced Engineering Mathematics John Wiley

Assessment: Test, Semester tests, 20%. Report, Laboratory report, 20%. Examination, End-of-semester examination, 60%.

ENE2202 Electronic Systems

Locations: Footscray Park.

Prerequisites: ENE2101 - Fundamentals of Electrical & Electronic CircuitsENE2102 - Digital & Computer Systems

Description: Internal architecture of a small embedded microcontroller. An overview of instruction set and Assembler Language. Use of microcontroller on-chip peripherals and features including:- timer/counters, interrupts, Analog to Digital converters. Interfacing to LCDs and digital displays. Logic data path element description (counters, registers, multiplexers, encoders, decoders, comparators etc) using VHDL and implementation on PLDs. PLD architectures. Applications of datapath elements. PN diodes, electrical characteristics, applications. Zener diodes. Bipolar transistors, characteristics, small signal model analysis and design. MOSFET devices, characteristics, configurations and use in amplifier design. Voltage regulators, series and shunt types.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe applications of common digtal datapath elements; 2. Describe the structure, benefits and limitations of simple and complex PLDs; 3. Design interconnected logic circuits comprising several datapath elements all described in VHDL and implemented on PLDs; 4. Describe the internal architecture of a simple embedded microcontroller and create and analyse simple Assembler Language programs; 5. Write C programs that respond to external and internal interrupts and maintain a simple "real-time" flow and interface to common display devices including 7-sement displays and LCDs; 6. Describe the characteristics of

semiconductor devices (Diodes, Bipolar and Metal Oxide Transistors); and 7. Analyse and design of simple rectifier based power supplies and small signal amplifiers.

Class Contact: Sixty (60) hours equivalent for one semester comprising lectures, tutorials and group laboratory practical activities.

Required Reading: Roth, C.H., 2004 5th edition Fundamentals of Logic Design Thomson Learning Sedra, A. and Smith, K, 2004 5th edition Microelectronic Circuits Oxford University Press

Assessment: Test, Mid-semester tests, 20%. Assignment, Semester assignments, 20%. Examination, End-of-semester examination, 60%.

ENE2203 Industrial Control and Automation

Locations: Footscray Park.

Prerequisites: ENE2102 - Digital & Computer Systems

Description: Programmable Logic Controllers: Introduction to PLCs, programming and application. Introduction to Digital Control: Control loops, Process responses, PID algorithm. Loop tuning. Sensors and Actuators: Resistive, inductive, capacitive, photo-electric, Stepping Motors, Solenoids and applications. Analog to Digital Conversion, Digital to Analog Conversion and Signal Conditioning Circuits. SCADA : Concepts, Human Interface, Remote Terminal Unit, Master Station, Communication Infrastructure, Controller Area Network, Machine to machine communication, Security. System Design and Implementation. Electronics Manufacturing: PCB Design, Routing, Components Placement, Signal Integrity, Electromagnetic Compatibility, Design for Manufacturing, Schematic and Netlist, Library, Components and Data Sheets.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Program PLC; 2. Apply PID algorithm to effectively control a system; 3. Use appropriate sensors and actuators in an engineering setting; 4. Use A-to-D and D-to-A for interfacing; 5. Explain SCADA systems and its components as well as being able to design a SCADA system for a simple manufacturing plant; 6. Explain the whole electronics manufacturing process in general and PCB design and production in particular; and 7. Design a PCB for a given electronic circuit that could be produced in volume by outsourcing to other companies.

Class Contact: Sixty (60) hours for one semester comprising lectures/tutorials and laboratory sessions.

Required Reading: Ng, Y., 2008 Class notes (Rev. ed.) Footscray, Australia: Victoria University, School of Electrical Engineering

Assessment: Assignment, Laboratory assignments, 30%. Test, Tests throughout semester, 10%. Examination, End-of-semester examination, 60%.

ENE3100 Engineering Design and Practice 3A

Locations: Footscray Park.

Prerequisites: ENE2200 - Engineering Design and Practice 2B

Description: This unit is designed to create the opportunity for students to integrate generic skills with the learning and content from the concurrent third year subjects. The PBL approach to this unit of study requires students to form a holistic consideration of problems which are not only technical in nature but also exercise the students generic skills. Students are required to demonstrate critical thinking, problem solving skills, systems thinking and professional engineering practice. The unit is delivered in PBL mode and will encourage students to become independent learners and self reflective about professional communication processes and practices.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Apply in-depth technical competence in at least one engineering discipline; 4. Undertake problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Define the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Define the professional and ethical responsibilities and display a commitment to them; 10. Display a capacity to undertake lifelong learning; and 11. Locate, evaluate, manage and use information effectively.

Class Contact: One hundred and twenty (120) hours for one semester comprising lectures, tutorials and group work.

Required Reading: Given the diverse nature of the Unit there is no set textbook for this module. However, study material will be handed out during the course of the Unit and this will be considered as essential reading.

Assessment: Other, Workshop attendance and participation, 10%. Presentation, Oral presentation, 10%. Presentation, Semester and final team product demonstration, 30%. Report, Written technical report, 30%. Portfolio, Reflective Journal Portfolio, 20%. In the portfolio students are required to demonstrate the attainment of learning outcomes using: peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports. .

ENE3101 Systems Engineering

Locations: Footscray Park.

Prerequisites: ENE2201 - Linear Systems with Matlab Applications

Description: Probability theory. Continuous random variables and probability density functions. Normal distribution. Expected value, mean and variance. Joint and marginal distributions. Baye's theorem, conditional distribution. Functions of random variables. Conditional expectation and maximum likelihood estimation. Confidence intervals and hypothesis testing. Introduction to random processes, Gaussian processes. Correlation, covariance, and power spectrum. Examples of communication systems, cellular telephony systems and Internet. Communication signal analysis using Fourier series and Fourier transforms. Convolution. Spectral standards and bandwidth calculations. Waveform distortion. Nyquist sampling theorem. Implication of Shannon's theorem. Pulse Code Modulation (PCM) as an analog to digital converter. Line codes in baseband communication systems. Thermal noise and their effects in communication systems. Feedback problems and their solutions. Low sensitivity design. Dynamic characteristics and closed-loop stability, algebraic stability tests. Introduction to PID controllers.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the applications of probability theory in the analysis of engineering systems; 2. Explain the principles of digital communication systems and the implication of Shannon's theorem in information theory; 3. Perform spectral calculations for line codes employed in baseband communication systems; 4. Compute signal to quantisation noise ratio in PCM systems; 5. Perform stability analysis on control systems; 6. State and differentiate the purposes and requirements of communication systems and control systems; 7. Perform elementary time-domain and frequency-domain analyses of simple communication

systems and control systems; and 8. Employ simple MatLab commands and Simulink to analyse simple communication systems and control systems.
Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and laboratory work.
Required Reading: Lathi, B.P., 1998 Modern Digital and Analog Communication Systems Oxford University Press Proakis, J. G., & Salehi, M., 2002 Contemporary communication systems using MATLAB Belmont, CA: Thomson Brooks/Cole Nise, N.S., 2003 Control Systems Engineering John Wiley
Assessment: Laboratory Work, Continuous assessment in laboratory work, 20%. Test, Mid-semester written test, 20%. Examination, End-of-semester examination, 60%.

ENE3102 Systems & Applications

Locations: Footscray Park.
Prerequisites: ENE2202 - Electronic Systems
Description: Synchronous system design; Moore and Mealy models. Description in VHDL. An introduction to Algorithmic State Machine Design through VHDL description and PLD implementation. Controller and data-processor partitioning. Mechanical and Electromagnetic Fundamentals: Magnetic field, Faraday's Law and Lenz's Law. DC shunt motors Frequency response of amplifiers; an introduction to wide-band and high frequency amplifier design. Differential amplifiers, models of operation, gain, CMMR; design for performance characteristic. Feedback: Classification and the effect on driving point impedance and transfer functions. Series and Shunt feedback, Stability and gain and phase margins and compensation. Introduction to Switch mode power supply.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Implement optimal state machines for a range of electronic engineering applications; 2. Apply a system level approach to digital design using the algorithmic state-machine design paradigm; 3. Synthesize ASM controllers using: the traditional method, ROM based method and one-hot method; 4. Describe the fundamental principles of mechanical and electromagnetic energy conversion; 5. Analyse simple power systems containing DC machines and transformers; 6. Analyse a range of analogue circuit types and assess the circuit performance; 7. Apply the negative feedback on electronic circuits to achieve specific performance and stability; and 8. Design analogue circuits to meet performance criteria and select suitable components for circuit realisation.
Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and group laboratory practical activities.
Required Reading: Roth, C.H., 2004 5th edition Fundamentals of Logic Design Thomson Learning Sedra, A. and Smith, K., 2004 5th edition Microelectronic Circuits Oxford University Press Chapman, S. J., 2002 Electric Machinery and Power System Fundamentals McGraw Hill
Assessment: Test, Mid-semester tests, 20%. Assignment, Semester assignments, 20%. Examination, End-of-semester examination, 60%.

ENE3200 Engineering Design and Practice 3B

Locations: Footscray Park.
Prerequisites: ENE3100 - Engineering Design and Practice 3A
Description: This unit is designed to create the opportunity for students to integrate generic skills with the learning and content from the concurrent third year subjects. The PBL approach to this unit of study requires students to form a holistic consideration of problems which are not only technical in nature but also exercise the students generic skills. Students are required to demonstrate critical thinking, problem solving skills, systems thinking and professional engineering practice. The unit is delivered in PBL mode and will encourage students to become independent learners and self reflective about professional communication processes and practices.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Apply in-depth technical competence in at least one engineering discipline; 4. Undertake problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Describe the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Define the principles of sustainable design and development; 9. Describe the professional and ethical responsibilities and display a commitment to them; 10. Display a capacity to undertake lifelong learning; and 11. Locate, evaluate, manage and use information effectively.
Class Contact: One hundred and twenty (120) hours for one semester comprising lectures, tutorials and group work.
Required Reading: Given the diverse nature of the Unit there is no set textbook for this module. However, study material will be handed out during the course of the Unit and this will be considered as essential reading.
Assessment: Other, Workshop attendance and participation, 10%. Presentation, Oral presentation, 10%. Presentation, Semester and final team product demonstration, 30%. Report, Written technical report, 30%. Portfolio, Reflective Journal Portfolio, 20%. In the portfolio students are required to demonstrate the attainment of learning outcomes using: peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports. .

ENE3201 Electrical Machines and Control

Locations: Footscray Park.
Prerequisites: ENE2101 - Fundamentals of Electrical & Electronic CircuitsENE3101 - Systems Engineering
Description: Electrical Machines: Balanced 3-phase systems; transformers, equivalent circuits and performance analysis; induction machines, equivalent circuits, performance analysis, starting methods; synchronous machines, generator characteristics and analysis, infinite bus, synchronous condenser and power factor calculations, motor operation of synchronous machines. Control Systems: Transfer functions. Root Locus. Introduction to P, PI, PID, lead, lag and lag-lead controllers. Time and frequency domain design of lead, lag and lag-lead controllers. Introduction to state-space models. State-Space and transfer function models conversion. Introduction to discrete-time control systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students are expected to be able: Appreciate fundamentals of mechanical and electromagnetic energy conversion; Analyse simple power systems containing transformers; Analyse and solve 3 phase AC power systems; Develop an understanding of the structure of A.C. electrical machines and the purpose of the various components; Develop equivalent circuit models for the machines; Calculate the operating characteristics of machines using the equivalent models (power, torque, efficiency, power factor etc.); Develop an understanding of starting dynamics of motors; Develop an understanding of appropriate applications of A.C. machines in industries; Display a basic understanding

of the use of transfer functions, signal flow graphs and block diagrams in the description and analysis of control systems; Calculate an overall transfer function by use of both Mason s Gain Formula and Block Diagram Reduction; Appreciate the difference between real systems and the models of these systems; Show awareness of the limitations of simulation software; Write a quantitative specification of system performance; Use Root Locus Techniques to analyse the performance of LTI SISO systems; Perform analysis and design of continuous-time control systems with the use of Bode diagrams; Design P, PI, PID, lead, lag and lag-lead controllers to improve the behaviour of a LTI SISO systems; Display an introductory knowledge of state-space models; Use Matlab/Simulink to analyse the behaviour of LTI SISO systems (including use of LTI viewer and rltool); Display an introductory knowledge of discrete-time control systems. The Learning outcomes of this unit of study will depend upon the lectures presented, as required to support concurrent Engineering Design exercises.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Bhag S. Guru, Huseyin R. Hiziroglu, 2001 3rd edition Electric Machinery and Transformers Oxford University Press Ives, R., 2008 Introduction to Control Systems 3B Lecture Notes Victoria University

Assessment: Laboratory Work, Laboratory assessment, 20%. Test, Mid-semester test, 20%. Examination, End-of-semester examination, 60%.

ENE3202 Embedded and Networked Systems

Locations: Footscray Park.

Prerequisites: ENE2202 - Electronic Systems

Description: This unit extends the study of Embedded Computing from year 2 of the program and introduces the principles of operation of networked computer systems. The unit includes the learning of basic concepts of computer communication. Data and signals, Frequency Spectrum and bandwidth, Data encoding, Framing and synchronisation. Modulation of data, Modems. Physical layer interfaces. Transmission of data, Transmission media, Multiplexing. Error detection and correction. Data link control, Data link protocols. Local area networks. The Embedded Systems area includes system design involving real-time constraints, Pulse Width Modulation for actuator control, sensor interfacing using direct digital sensors and analogue to digital conversion , inter-device communication using industry standard methods:- USART, SPI, I2C and CAN.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe basic principles and techniques used in computer data communication; 2. Analyse a situation that requires a computer networking system and make recommendations on the system specification and formulate an implementation plan; 3. Analyse an industrial control system application and derive an embedded system specification for the application; and 4. Implement a real-time, embedded industrial control system using an embedded microcontroller with associated interface and communication devices.

Class Contact: Sixty (60) hoursor equivalent for one semester comprising lectures, tutorials and group practical activities.

Required Reading: Mazidi, McKinlay and Causey, 2008 PIC Microcontroller and Embedded Systems using Assembly Language and C for PIC18 Pearson/Prentice-Hall Forouzan. B., Fagan. S. C., 2006 Data Communication and Networking McGraw Hill

Assessment: Test, Mid-semester test, 20%. Assignment, Semester assignment, 10%. Examination, End-of-semester examination, 70%.

ENE3203 Power Electronics and Machines

Locations: Footscray Park.

Prerequisites: ENE2101 - Fundamentals of Electrical & Electronic Circuits

Description: This unit of study is intended to provide a sound knowledge of induction and synchronous machines including equivalent circuits, performance analysis based on the equivalent circuits, and operating characteristics under varying operating conditions. Power electronics theory and applications: AC-DC conversion, DC-DC switching, and motor speed controls The syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented. Unit Content Introduction to induction motor and rotating field. Equivalent circuit of an induction motor. Power, torque, efficiency, power factor calculations. Induction motor starting. Speed control of induction motor. Introduction to synchronous machines. Synchronous motors and their characteristics. Synchronous generators. Loci of synchronous motor. Synchronous motor starting. Introduction to the theory, design and analysis of conversion of electric power by means of power electronics, including AC to DC and DC to DC power converters. The fundamental knowledge of electronic speed control techniques for DC motor drives for different applications. AC-DC single-phase and three-phase power converters: Diode and SCR bridge rectifiers. DC-DC Switching Mode Power Converters, buck converters and boost converters, Buck-boost converters. Unipolar and bipolar voltage switching method. Fly-back converters, push pull converters. First quadrant, two quadrant and four quadrant drive. Different electronic speed control techniques for DC motor drives.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop equivalent circuit models for the machines; 2. Calculate the operating characteristics of machines using the equivalent models (power, torque, efficiency, power factor etc.); 3. Show an understand the starting dynamics of motors; 4. Display and understanding of appropriate applications of A.C. machines in industries; 5. Display an understanding of the basics and operations of power semiconductor switches; 6. Define the building blocks of power electronics conversion; 7. Analyse AC/DC and DC/DC power converters; 8. Analyse and design different types of switching power supplies in different modes of operation; 9. Demonstrate the knowledge of electronic speed control techniques for DC motor drives for different applications; and 10. Demonstrate the knowledge of electronic speed control techniques for DC motor drives for different applications.

Class Contact: Sixty (60) hours for one semester comprising Lectures, Tutorials and Laboratory work.

Required Reading: Theodore Wildi, 2002, fifth Edition, Electrical Machines, Drives and Power Systems, Prentice Hall. N. Mohan, T. M. Undeland & W. P. Robbins, 2003, Power Electronics - Converters, Applications, and Design, John Wiley & Sons.

Assessment: Test, Test, 20%. Laboratory Work, Laboratory, 15%. Examination, Written, 65%.

ENE4100 Engineering Design and Practice 4A

Locations: Footscray Park.

Prerequisites: Completion of all 3rd year units.

Description: Students will commence a major engineering project resulting in a complete and working outcome which meets the agreed specifications and demonstrates an understanding of relevant professional engineering standards. The project will continue in the follow-on second semester unit ENE4200.The student will define the problem, develop functional specifications (in collaboration with the

project supervisors), and write a concise project contract and comprehensive project plan. A feasibility study is the next stage. Possible alternative engineering solutions are conceptualised and evaluated using objective criteria functions. Cost, reliability, sustainability and environmental impacts should also be considered in choosing the best approach, which the student should be able to defend in an objective way. All progress work on the design should be documented in notebooks. Written progress reports, oral presentation and interim product demonstrations will be required during the course of the problem. This unit includes a mandatory series of lectures on professional conduct and ethics.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Undertake problem identification, formulation and solution; 2. Demonstrate an understanding of environmental and sustainability issues in problem solution; 3. Utilise a systems approach to complex design problems; 4. Demonstrate the ability to synthesise solutions, and use analysis to verify designs, using computing tools where appropriate; 5. Demonstrate skills in prototyping and testing engineering projects; 6. Display capabilities in managing a project, designing to specification, and meeting the sponsor's outcomes and reporting timelines; 7. Demonstrate the ability to manage information and documentation; 8. Interface with and communicate with other designers who may be working on related project tasks; 9. Display the capacity to write a competent feasibility study, and progress report; 10. Display fluency in delivering oral progress presentations to external sponsors; and 11. Demonstrate proper and ethical professional conduct.

Class Contact: One hundred and twenty (120) hours or equivalent for one semester comprising of Individual project work generally outside of formal classes. However, students are expected to maintain regular weekly contact with their academic and industrial Supervisors. There will be lectures provided in Project and Business Management and technical lectures and workshops will be organised as required by the project. The project Sponsor will usually be someone other than the project Supervisor, and some will be external to the University. Where this occurs, the student is should establish a communications protocol (i.e. decide on the mode and frequency of the communication) with the Sponsor early on in the project. This will ensure that communication with the Sponsor is appropriate and effective.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: Report, Feasability Study, 20%. Project, Project Contract, 10%. Project, Project Plan, 20%. Presentation, 1st Progress Presentation, Interim Demonstration and Progress Report, 50%.

ENE4200 Engineering Design and Practice 4B

Locations: Footscray Park.

Prerequisites: ENE4100 - Engineering Design and Practice 4A

Description: In this unit, students will continue and complete a major engineering project begun in ENE4100. Written progress reports, oral presentation, and a final product demonstrations and presentation will be required during the course of the project. The final report should document the complete design process, the synthesis and analysis of the design, prototyping, experimental testing, refinement of the design, the final product and full performance testing and comparison with the specifications.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Undertake problem identification, formulation and solution; 2. Utilise a systems approach to complex design problems; 3. Display skills in prototyping, realising and testing engineering projects to meet agreed specifications; 4. Display capabilities in managing a project, designing to specification, and meeting the sponsor's outcomes and reporting timelines; 5. Manage information and documentation; 6. Interface with and communicate with other designers who may be working on related project tasks; 7. Display the capacity to write a comprehensive final report; and 8. Show fluency in delivering oral progress presentations to external sponsors.

Class Contact: One hundred and twenty (120) hours or equivalent for one semester comprising of individual project work generally outside of formal classes. However, students are expected to maintain regular weekly contact with their academic and industrial Supervisors. Technical lectures and workshops will be organised as required by the project. The project Sponsor will usually be someone other than the project Supervisor, and some will be external to the University. Where this occurs, the student is should establish a communications protocol (i.e. decide on the mode and frequency of the communication) with the Sponsor early on in the project. This will ensure that communication with the Sponsor is appropriate and effective.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: Presentation, Interim Progress Presentation and Report, 20%. Presentation, Final Product Demonstration, 30%. Presentation, Final Oral Presentation, 10%. Report, Final Report, 40%.

ENE4201 Measurement Systems Engineering

Locations: Footscray Park.

Prerequisites: Completion of 2nd year in an appropriate B.Eng., B.Eng.Sc., B.Sc., B.App.Sc. or B.Ed. course.

Description: The importance of measurement; the measurement process. Measurement System Architecture: Classification of transducers, sensors, actuators and modifiers, energy matrices, developing a measurement system block diagram. Measurement System Performance: Static performance, environmental effects, modelling static performance, modelling dynamic performance. Error and Uncertainty: Units, standards, traceability, calibration, accreditation, specifying uncertainty, calculation of uncertainty. Sensors: The sensor interface, sensors for common measurands, signal conditioning Signals and Information in Measurement Systems: data acquisition systems, signal behaviour within systems, noise and noise reduction. Creating and Testing Measurement Systems: Specification, selection and decision-making, quality and reliability aspects of measurement systems, evaluation, installation and commissioning. Case Studies: Design case studies of commercial measurement systems. Current Issues and Trends in Measurement Systems: Intelligent systems, distributed measurement systems Modelling the Measurement System: Introduction to LabVIEW.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand and utilise the key theoretical and practical issues relevant to the design and realisation of measurement systems; and 2. Model, realise and evaluate the solution to a practical measurement problem.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Bishop, R. H., 2004 Learning with LabView 7 Express Pearson Prentice Hall, Upper Saddle River, NJ

Assessment: Project, Projects and reports throughout semester, 60%. Examination, End-of-semester examination, 40%.

ENE4202 Wireless and Broadband Communications

Locations: Footscray Park.

Prerequisites: ENE3101 - Systems EngineeringCompletion of the Second Year of degree.

Description: Overview of digital modulations with emphasis on wireless applications: QPSK, MSK, GMSK, QAM. Vector space representation of digital signals, Correlation receiver, Matched filter receiver, Signal-space representation of noise, Maximum likelihood sequence estimation (MLSE) detector, Performance in AWGN channels. CDMA. OFDM and its application to wireless LAN and ADSL, Cellular System Engineering, GSM, WCDMA. Layered structure of computer communication protocols. ISO OSI 7 layer model and TCP/IP protocol suit. LANs. Ethernet. WANs. PPP. X..25. Frame relay. ATM. Network connecting devices. Repeaters, hubs, bridges, routers, and gateways. IP and IP addressing. Sub-netting and super-netting. Routing protocols. ARP and RARP. ICMP and IGMP. Transport layer protocols. UDP and TCP. Flow control, error control, and congestion control in TCP. Routing protocols. RIP, OSPF, and BGP. Multicast routing. Application layer. Concurrent clients and servers. BOOTP and DHCP. Domain name system. Socket interface. FTP and TFTP. SMTP. SNMP. HTTP. WWW

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain digital communications and modulation as used in weird and wireless transmission; 2. Explain receiver techniques for digital modulation links; 3. Introduce key wireless systems. GSM, WCDMA and WLAN; 4. Discuss the basic principles involved in data communication systems; 5. Explain the data network architecture, operation, and performance analysis; 6. Evaluate the protocols employed in data networks; 7. Explain the particular aspects of local area and wide area networks; 8. Discuss wireless networks, their operation, and interfacing with network backbone; 9. Explain the analytical techniques employed in data network performance estimation; 10. Explain the basic queuing theory and its application to data networks; 11. Describe data network switching and switching systems; 12. Discuss the principles involved in data network design and the heuristic algorithms employed; and 13. Explain cost effective designs of local and wide area networks. Explain information theory, source coding, and data compression.

Class Contact: Sixty (60) hours or equivalent for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Forouzan, B.A., 2003 'TCP/IP Protocol Suite' McGraw Hill Haykin, S. 2001 4th Edition Communication Systems John Wiley & Sons.

Assessment: Laboratory Work, Continuous assessment in laboratory work., 20%. Test, Mid-semester, 20%. Examination, Final, 60%.

ENE4205 Digital System Design

Locations: Footscray Park.

Prerequisites: ENE3102 - Systems & Applications

Description: This unit extends the study of digital electronics for year 2 into a systems level design approach based on the use of top-down design methods and implementation on very large scale programmable logic devices including simple and Complex Programmable Logic Devices (PLDs) and Field Programmable Gate Arrays (FPGAs). The design approach employs the partitioning of the task into a controller and associated data-processing sections. Synchronous and asynchronous approaches are examined along with optimization methods for operational speed and logic circuit gate count. The unit also includes the use of modern Computer Aided Engineering (CAE) tools and the study of the automated logic synthesis method.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design simple and complex digital systems using the ASM and RTL design methods; 2. Implement designs on small and complex PLDs and FPGAs; 3. Use modern Computer Aided Engineering (CAE) tools to predict design performance in terms of power consumption, propagation delay etc. and optimize according to application requirements; 4. Describe the principle of operation of automated logic synthesis software and be able to "guide" the synthesis process through the structure of a VHDL hardware description; and 5. Prepare manufacturing information for the transfer of a design from an FPGA onto a mass produced "hard copy" version.

Class Contact: Sixty (60) hours or equivalent for one semester comprising of lectures, tutorials and group practical activities.

Required Reading: Dueck, R.K. 2005 2nd edition, Digital Design with CPLD Applications and VHDL, Thomson Learning Hamblen, J.O. 2001 2nd edition, Rapid Prototyping of Digital Systems: A Tutorial Approach, Kluwer Academic Pub

Assessment: Assignment, Assignment, 20%. Test, Mid-semester, 20%. Examination, Final, 60%.

ENF1101 Engineering Mathematics 1

Locations: Footscray Park.

Prerequisites: Year 12 Mathematics or its equivalent.

Description: Basic algebra, including index, log laws, indicial and log equations, absolute value, inequalities, algebraic expansions; functions, straight line, parabola, ellipse, hyperbola etc., domain, range, inverse functions; trigonometric identities, functions and their graphs, period amplitude, frequency, inverse trigonometric functions. Limits, continuity, derivatives of polynomials, trigonometric, logarithms and exponentials functions, differentiation rules, higher derivatives, concavity of graph, implicit differentiation. Statistics, frequency distribution, histograms, mean, mode, median, range, variance, standard deviation, Normal distribution; probability, expectation of events from an experiment, mutually exclusive and independent events, permutations and combinations, binomial and Poisson probability distributions, normal curve, confidence limits. Parametric differentiation; tangents and normal lines, derivatives of logs and exponentials; Newton-Raphson method, rates of change, maximum and minimum problems, small change. Introduction to integration, definite integral, fundamental theorem of integral calculus; Integration methods, substitution technique, integration by parts, partial fractions; areas, mean value of a function; methods of integration, partial fractions, simple integration by parts.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Solve and graph functions; 2. Perform basic differentiation and integration; 3. Apply calculus to engineering-related problems; and 4. Perform statistical analysis on real data and make valid inference from samples.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorials.

Required Reading: James, G., 2007 4th edn Modern Engineering Mathematics Pearson Prentice Hall

Assessment: Test, Weekly in-class tests, 15%. Test, Mid-semester test, 35%. Examination, End-of-semester examination, 50%.

ENF1102 Engineering Physics 1

Locations: Footscray Park.

Prerequisites: Nil

Description: Units and measurements: Physical units and dimensions, unit conversions, significant figures, uncertainty calculations. Mechanics: Scalars and vectors, resolving of vectors, unit vectors, vector algebra; displacement, velocity and acceleration, one-dimensional motion, two-dimensional motion; Newton's laws and forces, equilibrium of forces, friction, work, energy; conservation of energy, impulse

and momentum; Waves and Sound: Simple harmonic motion (SHM), damped harmonic motion, forced oscillations and resonance, oscillatory motion, mechanical and acoustic waves, superposition and standing waves, Doppler effect.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use Newton's laws to calculate displacement, velocity and acceleration; 2. Apply the rules of conservation of energy and momentum to engineering-related problems; 3. Apply the principles of SHM and waves to engineering-related problems; and 4. Perform calculations on sound intensity levels and the Doppler effect in engineering-related problems.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Giancoli, D.C., 2008 4th Edition Physics for Scientists and Engineers with Modern Physics Prentice Hall

Assessment: Report, Laboratory report/ assignment, 20%. Test, Weekly in-class tutorial tests, 30%. Examination, End-of-semester examination, 50%.

ENF1103 Engineering and the Community

Locations: Footscray Park.

Prerequisites: Nil

Description: In this unit, students will explore the role and importance of engineering in society, at both the national and international level. This will include identifying issues facing engineers such as sustainability; existing trends and practices; and innovations to meet future challenges. Students will examine the development of Engineering as a profession and look at the varying disciplines within the profession. This will enable students to establish their own learning and career goals and develop strategies to achieve those goals. Students will also examine the activities that constitute the engineering method, a problem-solving process, and apply the method to an identified problem. Case studies will be presented to students introducing them to descriptions of real situations that provide a context for engineers to explore decision-making in the face of socio-technical issues, such as environmental, political, and ethical issues. Students will work on a number of deliverables that will require them to work both individually and collaboratively, and communicate their work and findings in oral and written forms.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key roles of engineering in the local and global communities, and understand the key features of the different disciplines of engineering practice; 2. Develop their own learning and career goals, and use self-management skills to plan and manage their work; 3. Recognise the professional responsibilities of engineers as well as ethical and sustainability issues in engineering practice; 4. Understand strategies for practising sustainable engineering and how to evaluate a solution in terms of environmental, social and economic costs and benefits; 5. Describe the engineering method as well as the activities that constitute this problem-solving process and apply the method to an identified problem; 6. Communicate effectively with others orally and in writing on a range of engineering-related topics using appropriate language; and 7. Work individually and with others, as both a team member and leader in both formal and informal teams, to complete tasks.

Class Contact: Sixty (60) hours for one semester comprising of lectures, tutorials and field trips.

Required Reading: Dowling, D, Carew, A, Hadgraft, R, 2013. 2nd edn. Engineering Your Future: an Australasian Guide. John Wiley and Sons Australia, Milton, Queensland. VU, College of Arts, 2013. 10th edn. Handbook of Communication Skills for First Year Students in the College of Engineering and Science. Victoria University.

Assessment: Essay, Individual Reflection Essay - 1000 Words, 25%. Case Study, 1 Individual Case Study Report - 1500 Words, 25%. Presentation, 1 Team Oral Presentation - 15 Minutes, 10%. Project, A Team Project Report - 5000 Words, 40%. Students must obtain a minimum of a pass in both the Reflection Exercise and Team Project in order to gain an overall pass in this unit. Failure to comply with the hurdle assessment requirements will result in a fail of the overall unit, however, students will be offered one additional submission for the failed assessment. For any team assessment, a percentage of student's mark is based on observations of their contribution to the overall task, as such; attendance is mandatory in the workshops, field trips and presentations. Exercise Assesses: Learning Outcomes 1,2,6,7 and Graduate Capabilities 2,3,4,6 Case Study Assesses: Learning Outcomes 1,3,4,6,7 and Graduate Capabilities 2,3,4,5 Presentation Assesses: Learning Outcomes 3,6,7 and Graduate Capabilities 2,3,4,5 Project Assesses: Learning Outcomes 3,4,5,6,7 and Graduate Capabilities 1,2,3,4,5.

ENF1104 Problem Solving for Engineers

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is based on a series of problems designed to both introduce students to systematic problem solving methods and to apply knowledge introduced in other first year semester 1 units. The problems will focus on a range of issues related to engineering practice and sustainability. Students will be required to undertake data analysis and manipulation using various computing tools, including spreadsheet software and fundamental programming techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental knowledge of mathematics and science to solving engineering problems; 2. Apply systematic approaches to solving engineering problems; 3. Undertake data analysis and manipulation using various computing tools, including spreadsheet software and fundamental programming techniques; 4. Identify and respond to broad sustainability issues in finding solutions to engineering problems; 5. Work individually and collaboratively, as both a team member and leader, to complete tasks and evaluate own and others' performance; 6. Demonstrate reflection of learning by keeping a personal journal; and 7. Demonstrate safe laboratory practices and an ability to identify potential safety hazards.

Class Contact: Sixty (60) hours for one semester comprising of team workshops, supporting lectures and labs.

Required Reading: VU 2009, School of Engineering and Science, 2nd edn., PBL in Engineering Manual, Victoria University, Melbourne, Australia. VU 2013, College of Arts, 10th edn., Handbook of Communication Skills for First Year Students in the College of Engineering and Science, Victoria University, Melbourne, Australia.

Assessment: Portfolio, Individual Portfolio, 20%. Report, 4 Team Project Reports (1000 words each), 40%. Test, 4 Class Tests, 40%.

ENF1201 Engineering Mathematics 2

Locations: Footscray Park.

Prerequisites: ENF1101 - Engineering Mathematics 1

Description: Matrices, determinants, Cramer's rule matrix algebra, special matrices, matrix inversion, solution of simultaneous equations by matrix inversion. First order linear differential equations (DE's) with constant coefficients, separable DE's, integrating factor, homogenous method, initial value problems; first order DE's in engineering applications. Second-order linear DE's with constant coefficients, second order homogenous linear DE's, simple double and complex roots of auxiliary

equation; second order linear DE's in engineering applications. Algebra with complex numbers, Argand diagram, complex conjugate, modulus and argument, polar form, exponential form. Introduction to series and some convergence tests, radius of convergence; Taylor series, Maclaurin series, convergence of power series. Partial differentiation, higher order derivatives, chain rule, engineering applications of partial derivatives—maxi/min, approximate value.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use matrices to solve simultaneous linear equations; 2. Apply first order and second order differential equations to engineering-related problems; 3. Perform simple complex number calculations; 4. Test series for convergence and use Maclaurin method to generate power series; and 5. Apply partial differentiation to engineering problems.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorials.

Required Reading: James, G., 2007 4th edn Modern Engineering Mathematics Pearson Prentice Hall

Assessment: Test, Weekly in-class tests, 15%. Test, Mid-semester test, 35%. Examination, End-of-semester examination, 50%.

ENF1202 Engineering Physics 2

Locations: Footscray Park.

Prerequisites: ENF1102 - Engineering Physics 1

Description: Electricity and magnetism: Electric charges, forces and fields, electric flux and potential, magnetic forces and fields, electromagnetic induction. Electric circuits: Ohm's law, resistors in series and parallel, equivalent resistive circuits, AC and DC sources, RMS values in AC/DC circuits, Kirchhoff's laws, single loop circuits, multi-loop circuits, voltage dividers. Thermodynamics: Temperature, thermal expansion, heat capacity, specific and latent heat, ideal gases, work and heat in the thermal process, first law of thermodynamics, heat engines and the second law of thermodynamics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply principles of electric and magnetic fields to engineering-related problems; 2. Calculate the forces acting on charged particles in electric and magnetic fields; 3. Apply Ohm's law and Kirchhoff's laws in single-loop and multi-loop circuits; and 4. Apply principles of heat and temperature to engineering-related problems.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Giancoli, D.C., 2000 3rd Edition Physics for Scientists and Engineers with Modern Physics Prentice Hall

Assessment: Report, Laboratory reports/ assignments, 20%. Test, Weekly in-class tutorial tests, 30%. Examination, End-of-semester examination, 50%.

ENF1204 Introduction to Engineering Design

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit is based on a series of problems designed to both introduce students to the design process and to apply knowledge introduced in other Year 1 units of study. The problems will therefore emphasise creative thinking in design, generating and evaluating alternatives against a range of technical, environmental, social and economic criteria, and making the final design decisions. The unit also incorporates a module on professional drawing practice including projections and views, dimensioning, different drawing types and using computer-aided design (CAD) software.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply a systematic approach to engineering design; 2. Find, organise and evaluate information on a range of topics related to problems in engineering design; 3. Identify and evaluate technical, environmental, social and economic factors impacting on the solution of engineering design problems; 4. Use computer-aided design (CAD) software to develop and present design solutions; 5. Communicate effectively with others orally, in writing and by means of engineering drawings; 6. Demonstrate an ability to learn individually and collaboratively in a team environment; 7. Use a personal reflective journal and demonstrate improvements in their effectiveness as learners; and 8. Respond to diverse learning situations in a socially and culturally responsible manner.

Class Contact: Sixty (60) hours for one semester comprising of team workshops, including supporting lectures and labs.

Required Reading: Vallero, D.A, and Brasier, C, (2008) Sustainable Design: The Science of Sustainability and Green Engineering Richmond: Wiley VU, School of Engineering and Science, (2009) 2nd edn PBL in Engineering Manual Melbourne: Victoria University VU, Faculty of Arts, (2009) 9th edn Communication Skills Handbook for First Year Students in the Faculty of Health, Engineering and Science Melbourne: Victoria University

Assessment: Report, Teamwork including technical reports (4000-5000 words as a cumulative total for a team of 4 students per semester), 45%. Portfolio, Individual portfolio (additional 1000 words which excludes the copies of the reports which are part of the portfolio), 25%. Test, 2 Short individual tests on design in class, 10%. Presentation, Team Oral Presentation (5 minutes per student), 5%. Test, CAD Skill, 15%. Report: Learning Outcomes 1,2,3,5,6,&8 and Graduate Capabilities 1, 2, 3, 4, 5 and 6 Portfolio: Learning Outcomes 5,6,&7 and Graduate Capabilities 3 and 4 Short Test: Learning Outcome 6 and Graduate Capabilities 2, 4 and 6 Presentation: Learning Outcome 5 and Graduate Capabilities 3, 4, 5,and 6 Cad Skill Test: Learning Outcome 4,5 & 6 and Graduate Capabilities 2, 3, 4 and 6 .

ENF1205 Engineering Fundamentals

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide a basic understanding in the two broad areas of statics and electrical fundamentals. The following topics are covered in two parts: Part A - Statics: Part A introduces the concept of force, resultants and components, levers and moments. Free body diagrams, 2D and 3D statical equilibrium concepts are covered. Part A further explores the analysis of pin jointed trusses, statically determinate beams/shafts including loads, reactions and internal forces. Bending moment and shear force diagrams are also studied and applied. Part B - Electrical Fundamentals: Part B begins with an introduction on Ohm's and Kirchhoff's laws. Series and parallel resistor circuits are analysed and their equivalent resistive circuits are developed. DC sources are studied. Part B examines the analysis of single and multiple loop circuits as well as voltage dividers. The Nodal Voltage method, the Principle of Superposition, Thevenin's Theorem, Norton's Theorem, and equivalent circuits will be emphasised. Part B concludes with a discussion on diodes and voltage amplification in electrical networks.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate states of statical equilibrium for objects subjected to forces/couples in two/three dimensions, including external 'freebody' force/couple diagrams; 2. Assess internal forces in simple pin-jointed trusses, beams and frames including axial force, bending moment and shearing force diagrams; 3. Apply Ohm's law and

Kirchhoff's laws in single and multiple loop circuits; 4. Analyse DC circuits by Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, and Norton's theorem; 5. Calculate voltage amplification in electrical circuits; and 6. Collaborate with team members to solve problems, undertake basic Engineering analysis and design, and write technical lab reports.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorial/practice classes. Includes a mix of individual and small group work.

Required Reading: Hibbeler, 2010 12th edn in SI units Engineering mechanics: statics Singapore, Pearson/ Prentice Hall

Assessment: Laboratory Work, Laboratory Reports, 20%. Test, In Semester Tests, 20%. Examination, End of Semester Examination (3 hours), 60%.

EPM5500 Fundamentals of Project Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: This course comprises three modules. In Module 1, participants will identify the roles of players and stakeholders engaged in specific projects and the interaction between them. Project management processes will be considered at both theoretical and applied levels (using authentic industry-based scenarios drawing on students' existing knowledge and experience). In Module 2, project initiation, development of a project charter, scoping and network analysis, time management, cost management and quality management are addressed. In Module 3 participants work collaboratively within a simulated project environment and investigate the impact of human behaviour and group dynamics in project management. A key feature of the unit is the critique of the PMBOK© (Project Management Body of Knowledge) framework.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Define and differentiate the notions of portfolios, programs and projects; 2. Critically apply knowledge, skills tools and techniques to project activities through project management processes; 3. Conceptually map and elaborate the 10 Knowledge Areas of Project Management (PMBOK©); 4. Formulate a Project Charter which addresses scoping and network analysis for initiating a project in various contexts; 5. Communicate complex project information relevant to all stakeholders and at all levels of the organisation; and 6. Elaborate strategies for risk assessment and safety in accordance with OHS legislation and regulations.

Class Contact: Lecture 3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. (PMBOK© GUIDE) (2013), 5 A Guide to the Project Management Body of Knowledge Project Management Institute Larson E W, Gray G E (2011) 5 Project Management: the managerial process McGraw Hill - Irwin Series Lock Dennis (2013) 1 Project Management Ashgate Publishing Ltd.

Assessment: One assessment record is needed to satisfy mandatory requirements of system, please check with your College for internal procedures. Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral Presentation (3000 words), 30%. Examination, Final Examination, 50%.

EPM5510 Project Program and Portfolio Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: Project, Program and Portfolio Management (PPPM) will introduce students to senior management decision-making models. Portfolio management involves prioritisation, risk assessment and deployment of resources across an entire organisation to achieve benefits to the whole-of-business. In contrast, program management identifies benefits and realises outcomes across programs and projects. PPPM concentrates on the development of a realistic picture of an organisation's business and future strategy and how to best use company resources to achieve beneficial results. These resources include adopting standards across an enterprise, developing staff competency through education and training, and implementing reporting regimes to provide senior management with information for sound decision making. Program Management feeds into portfolio decision making by providing accurate and real-time data, quality assurance across programs and projects and ensuring consistent processes are maintained.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate the concepts of project, program and portfolio management and articulate the key features of each; 2. Deconstruct the role and responsibilities of a Program Management Office and extrapolate these to a known or unknown organisational context; 3. Critically analyse the role and responsibilities of a Portfolio Services Organisation and exemplify how it relates to the strategic direction of organisations; 4. Conceptually map reporting chains and systems within an organisation and relate them to theoretical models of decision-making; and 5. Systematically evaluate the return on investment in program and portfolio project management in various contexts.

Class Contact: Lecture 3.0 hrs

Required Reading: Formal class notes will be provided to students for each module within this unit of study. These notes are reviewed and updated regularly. Project Management Institute (PMI) (2013) 3rd ed. The Standard for Program and Portfolio Management Project Management Institute (PMI)

Assessment: Case Study, Project 1 (2000 - 2500 words), 25%. Case Study, Group Project 2 (2000 - 2500 words per group), 25%. Examination, Final Examination - 3 Hours., 50%.

EPM5520 Sustainable Project Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: Participants will complete the PRiSM (Projects integrating Sustainable Methods) program, whereby they can gain benefits from integrating sustainable based project delivery processes and practices into their existing work and obtain access to a globally recognised certification program - "Sustainable Project Manager". Theoretical models are proposed which integrate sustainable methods into the fabric of projects and align project outcomes with organisational strategic goals. Potential impacts on the five (5) bottom lines that define the health of an organisation (planet, people, profit, process, and product) are investigated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Deconstruct and apply as appropriate the PRiSM Model for guiding sustainably based processes and practices in various contemporary and emerging organisational settings; 2. Critically review and apply Sustainable Project Management frameworks in accordance with government and industry standards; 3. Propose sustainability processes and practices which align with organisational goals; 4. Formulate performance indicators which measure social, economic, & environmental sustainability as bottom line activities; and 5. Develop an advanced risk mitigation strategy in regard to elements of the Sustainability Management Plan.

Class Contact: Lecture 3.0 hrs

Required Reading: Students will provide their own laptop or similar, with all course reference material supplied in downloadable electronic book format. Additional

resource material would be available as handouts where necessary.Carboni J., Gonzalez M., Hodgkinsons J., (2013) PRiSM - Projects Integrating Sustainable Methods: The GPM Reference Guide to Sustainability in Project Management Green Project Management GPM Global (2014) The GPM Global P5 Standard for Sustainable Project Management: Planet, People, Profit, Process and Products Green Project Management PMI (2013) 5th ed. The Guide to the Project Management Body of Knowledge Project Management Institute

Assessment: Assessment will be a combination of two case study projects plus a two class tests. Case Study, Group Case Study Project 1 - Approx. 1,000 words per group member, 30%. Case Study, Group Case Study Project 2 - Approx. 1,000 words per group member, 30%. Test, 2 class tests, 40%.

EPM5530 Project Management Practice

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to provide an understanding of the principles of project management practice and the roles and responsibilities of stakeholders and others in a project team. Utilising the PMBOK© (Project Management Body of Knowledge) Guide as a reference, the unit explores 10 Knowledge Areas in project management and instigates the process of applying these to contemporary and emerging project environments. The unit delivers a comprehensive understanding of how due diligence manifests in a project life cycle. It addresses what is to be delivered in a project (scope), how it is to be delivered (plan), the delivery and implementation (execution) and finally reporting and review. As projects are situated within organisations, relevant concepts of organisational management and human resource management are also analysed.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply knowledge, skills, tools and techniques to project activities through the lens of an established project management process (PMBOK©); 2. Define, differentiate and critique the 10 Knowledge Areas of project management; 3. Exhibit the use of Project Communications tools and techniques in the areas of planning, assessing, quantifying, qualifying, control, monitoring and disposition of project information relevant to all stakeholders and at all levels of the organisation; 4. Appraise the dynamics of working collaboratively within a project environment and developing distributed leadership skills; and 5. Predict the impact of risk in various project management scenarios.

Class Contact: Lecture 3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.(PMBOK© GUIDE) (2013), 5th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Larson E. W., Gray G. E., (2011) 5th ed. Project Management: the managerial process McGraw Hill - Irwin Series Lock Dennis (2013) 1st ed. Project Management Ashgate Publishing Ltd. Hartly, Stephen (2008) 2nd ed. Project Management: Principles, processes and practice Pearson Education Australia.

Assessment: Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral Presentation, 30%. Examination, Final Examination, 50%.

EPM5600 Principles of Project Management

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: The unit of study will introduce and define project management as it applies to the conceptualisation, design, development, documentation, procurement and maintenance of any project or facilities (including buildings and infrastructure). Various models of project management and related principles and methodologies will be appraised. Frameworks for working in a project team environment will also be proposed and evaluated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interrogate and apply project management and lifecycle principles to assess project scope and complexity and strategise accordingly; 2. Critically evaluate the relevance of selected project management theoretical frameworks to a variety of project scenarios; 3. Determine and interpret contemporary and future trends and modelling in project management to ensure quality outcomes, including evidence of due diligence; 4. Elucidate and critique the potential roles and responsibilities of Project Manager and Project Team Member to inform professional practice; 5. Deconstruct and apply theories of stakeholder management as appropriate to projects in emerging and dynamic contexts; and 6. Participate effectively as a member of a multi-disciplinary project team.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Workshop 1.0 hr

Required Reading: Pinto, Jeffrey K, (2012) 3 Project Management: Achieving Competitive Advantage Pearson Education Limited, Essex, UK Bender, Michael B, (2010), 1 A Manager's Guide to Project Management - Learn How to Apply Best Practices Pearson Education Inc, New Jersey

Assessment: Assignment, Individual assignment, 20%. Project, Group project, 40%. Examination, Final Examination (2 hours), 40%. Total word equivalence of the above assessment tasks is 8,000 words.

EPM5610 Project Planning and Control

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Project Planning and Control unit will review the development process of a project from its inception through to feasibility and commencement. Design documentation, procurement commissioning and life cycle planning will all be addressed. Theoretical frameworks for planning and managing the project management process will be critiqued. Project control and cost planning, financial control, time management and other scheduling techniques will be applied to practical scenarios.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elaborate and apply advanced project management principles and techniques to enable them to plan, organise, execute, control and complete a project; 2. Develop a project management plan for the successful delivery of a complex project in various contexts; 3. Critically apply resource scheduling and allocation techniques to facilitate effective project control; 4. Investigate and appraise key project evaluation monitoring and control techniques and justify their importance in bringing projects to successful completion; 5. Review various contemporary and IT based project management tools and hypothesise their application in diverse, dynamic and emerging contexts; and 6. Evaluate different quality systems and make recommendations regarding their role in minimising waste and providing value to the client.

Class Contact: Lecture 3.0 hrs

Required Reading: Formal class notes will be provided to students for each unit of study. These notes are reviewed and updated regularly.PMBOK© Guide (2013), 5 A Guide to the Project Management Body of Knowledge Project Management Institute Larson E W, Gray G E. (2011) 5 Project Management: the managerial process

McGraw Hill-Irwin Series
Assessment: Project, Group project, 60%. Examination, Final Examination (2 hours), 40%. Total word equivalence of the above assessment tasks is 8,000 words.

EPM5620 Project Governance

Locations: Footscray Park.
Prerequisites: Nil.
Description: Project management applies those technical and human skills that lead to project success. Project governance is the system and framework that ensures project decisions are made in alignment with the organisational governance policies and procedures. This unit of study will allow students to identify and develop processes through which a project governance framework can be set up and applied to projects in any organisation. This will involve a practical application of the principles on a project where the project governance framework is analysed for its ability to prevent project failure.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the role of corporate governance in project design, development and execution; 2. Interrogate causes and symptoms of ineffective or poor governance to develop a governance framework; 3. Develop, implement and evaluate the governance of a specified project and report on its success or failings; 4. Devise and validate an integrated project governance framework which demonstrates its suitability across projects.
Class Contact: Lecture 3.0 hrs
Required Reading: Formal class notes will be provided to students for each module within this unit of study. These notes are reviewed and updated regularly. Rezaee, Z. (2009). 2nd ed. Corporate Governance and Ethics John Wiley & Sons. Renz, P. S. (2007). Project Governance Springer E-books.
Assessment: One assessment record is needed to satisfy mandatory requirements of system, please check with your College for internal procedures. Assignment, Individual assignment (approx 2000 words), 25%. Assignment, Individual assignment (approx 2000 words), 25%. Examination, Final Examination (3 hours), 50%.

EPM5630 Project Management and People

Locations: Footscray Park.
Prerequisites: Nil.
Description: Successful projects comprise several key features. One is the 'people' factor. Good project outcomes rely on both strong leadership and management skills which include the explicit specification and understanding of requisite roles, responsibilities, skills and effort of project participants. Project Management and People identifies and critically assesses the qualities of people working on projects and extrapolates how they can contribute to project success in a diversity of known and uncertain contexts. The subject also explores how human behaviour in project-focused organisations differs from that in more traditional organisational forms. The evidence base of theoretical and translational approaches to people management is reviewed and critiqued.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate between audiences internal and external to a project and their impact on project management; 2. Conceptually map how project teams can be established and roles allocated; 3. Critically evaluate different structures that can be created to ensure both intra and inter-team communication; 4. Devise tools and techniques for motivating staff and ensuring high levels of morale in project teams; and 5. Manage grievances and conflict in a team setting, provide space for team members with special skills and abilities, and introduce incentives and rewards to ensure ongoing efficiency.
Class Contact: Lecture 3.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. McShane, S, Olekalns, M. & Travaglione, T (2014) 4th ed. Organisational Behaviour: Emerging Knowledge, Global Insights. McGraw Hill Brown, D & Harvey, D (2006) 7th ed. An experiential approach to organisational development Pearson Education
Assessment: Assignment, Individual Research Project, 20%. Project, Group Research Project, 40%. Examination, Final Examination (2 hours), 40%.

EPM5640 Research Methods

Locations: Footscray Park.
Prerequisites: EPM5600 - Principles of Project ManagementEPM5610 - Project Planning and Control
Description: Effective management of successful projects is founded on a broad evidence-base. While evidence can be extracted from the disciplinary literature, existing databases or previous project experience, original research may also be undertaken to meet the requirements of a specific project. Research is a process of enquiry and investigation, and takes a systematic and methodical approach to the creation of knowledge-as-evidence. Ineffective decision making can occur when a lack of knowledge leads to project delay and failure. Research Methods guides participants through the logical steps required for the establishment of a research proposal for a professional project or further scholarship. Starting with an overview of the purpose of research, it develops a set of principles designed to build a research proposal based on conceptual issues and different approaches to research design. The collection and review of primary and secondary data, the application of qualitative and/or quantitative methodologies, the collection and interrogation of data, reporting of results and conclusion are all considered.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate sequentially and elaborate the principles involved in planning and executing a research project; 2. Theorise a conceptual framework for a research problem and assess it in the context of project management principles; 3. Operationalise concepts to formulate a research question(s) or a hypothesis; 4. Select and develop the appropriate methodology and measurement instruments for data collection; 5. Critique relevant sources of information and justify the selection and application of methods for data collection and analysis; and
Class Contact: Lecture 3.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Veal A.J., (2005) 2nd ed. Business Research Methods: A Managerial Approach Pearson NSW Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London
Assessment: Project, Individual Research Project: selection and literature review (2000 words), 20%. Report, Research Proposal: submission in report format (4000 words), 40%. Presentation, Research Proposal project presentations and discussions (ongoing), 20%. Presentation, Final Formal Research Proposal Presentation (30 minutes), 20%.

EPM5651 Project Management Research Project A (Part-Time)

Locations: Footscray Park.
Prerequisites: EPM5640 - Research Methods

Description: Effective project management is based on evidence. Such evidence can be extracted from the existing literature and/or previous project experience but often it needs to be created to meet the requirements of a specific project. Project Management Research Project provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in the Master of Project Management. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. Following their investigation students will submit and present their findings and results based on statistical and analytical techniques and make recommendations for future research. This unit will be undertaken in one semester part-time, and it will be followed by EPM5652 Project Management Research Project B (Part time). For one semester version see EPM5660 Project Management Research Project.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to:
1. Select an appropriate research methodology based on the content of the research; 2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 3. Articulate and apply literature review strategies to survey and critically analyse the existing literature; 4. Conduct data collection and analysis of primary and secondary data using qualitative or quantitative methodologies; 5. Interpret results and findings, draw conclusions and make recommendations to a variety of audiences - specialised and non-specialised; and

Class Contact: Lecture3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Veal A. J., (2005) 2nd ed. Business Research Methods: a Managerial Approach Pearson NSW Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London

Assessment: EPM5651 is the first of a two unit project. On the completion of the second unit (EPM5652) students receive the final grade which includes work and assessment conducted during this unit. Total weighting for the assessment conducted over two units is as follows: Presentation, Project Presentation, 20%. Report, Final Research Report (approx 14000 words), 80%.

EPM5652 Project Management Research Project B (Part-Time)

Locations: Footscray Park.

Prerequisites: EPM5640 - Research Methods

Description: Effective project management is based on evidence. Such evidence can be extracted from the existing literature and/or previous project experience but often it needs to be created to meet the requirements of a specific project. Project Management Research Project provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in the Master of Project Management. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. Following their investigation students will submit and present their findings and results based on statistical and analytical techniques and make recommendations for future research. This unit will be undertaken in one semester part-time, and it will be preceded by EPM5651 Project Management Research Project A (Part time). For one semester version see EPM5660 Project Management Research Project.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to:
1. Select an appropriate research methodology based on the content of the research; 2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 3. Articulate and apply literature review strategies to survey and critically analyse the existing literature; 4. Conduct data collection and analysis of primary and secondary data using qualitative or quantitative methodologies; 5. Interpret results and findings, draw conclusions and make recommendations to a variety of audiences - specialised and non-specialised; and

Class Contact: Sessions with supervisor.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Veal A. J., (2005) 2nd ed. Business Research Methods: a Managerial Approach Pearson NSW Collins J. & Hussey R., (2009) 3rd ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London

Assessment: EPM5652 is the second of a two unit project. On the completion of this unit students receive the final grade which includes work and assessment conducted during EPM5651. Total weighting for the assessment conducted over two units is as follows: Presentation, Project Presentation, 20%. Report, Preliminary Research Report (approx 4000 words), 30%. Report, Final Research Report (approx. 14,000 words), 50%.

EPM5660 Project Management Research Project

Locations: Footscray Park.

Prerequisites: EPM5640 - Research Methods

Description: Effective project management is based on evidence. Such evidence can be extracted from the existing literature and/or previous project experience but often it needs to be created to meet the requirements of a specific project. Project Management Research Project provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in the Master of Project Management. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. Following their investigation students will submit and present their findings and results based on statistical and analytical techniques and make recommendations for future research. This unit will be normally undertaken in one semester full-time. A two semester version is also available (EPM5651 Project Management Research Project A and EPM5652 Project Management Research Project B).

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to:
1. Select an appropriate research methodology based on the content of the research; 2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 3. Articulate and apply literature review strategies to survey and critically analyse the existing literature; 4. Conduct data collection and analysis of primary and secondary data using qualitative or quantitative methodologies; 5. Interpret results and findings, draw conclusions and make recommendations to a variety of audiences - specialised and non-specialised; and

Class Contact: Lecture3.0 hrsTutorial3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Veal A.J., (2005) 2nd ed. Business Research Methods: A Managerial Approach Pearson NSW Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London

Assessment: Presentation, Project Presentation, 20%. Report, Preliminary Research

Report (approx 4000 words), 30%. Report, Final Research Report (approx 14000 words), 50%.

EPM5700 Project Management and Information Technology

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit addresses the ways in which information technology (IT) can facilitate the project management process in relation to feasibility and sensitivity analysis, planning and monitoring, information processing and decision support functions. It focuses on the application of software packages in the areas of both General Project Management Information Systems and Specialised Project Management Information Systems. The subject content includes computerised procurement considerations, identification of available computer hardware and software and analysis of current IT trends. IT based Project Management analytical systems (spreadsheets/financial models, planning and resource control, Data Base Management Systems (DBMS), and Quantitative and Qualitative Risk Analysis) are critically reviewed. Problem solving in relation to change and risk management and issues of quality control are also addressed. Learning scenarios which highlight the emergent and dynamic nature of IT and project management will be used to contextualise course content.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and appraise hardware and software applications and defend their application in specific project environments; 2. Critically evaluate the relevance of selected project management theoretical frameworks to a variety of project scenarios; 3. Justify the selection of appropriate software to capture complex financial transactions and resolve resource conflicts across the life of projects; 4. Formulate a strategy for the implementation of project management software which addresses project risk identification and response; and 5. Exemplify the skills required for the effective functioning of a multi-disciplinary project planning control group.

Class Contact: Lab3.0 hrsLecture3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Kathy Schwalbe. 2013 7 Information technology project management Boston, Mass. : Thomson Course Technology MS Project Training Manuals 2012 Students will be provided with class notes and additional resources online, in line with the topics.

Assessment: Assignment, Individual Research Project (2000 – 2500 words), 20%. Assignment, Group Case Study Project (4000 – 5000 words), 40%. Examination, Final Examination, 40%.

EPM5710 Project Procurement Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit develops students' understanding of the interplay between aspects of the Australian legal system by examining the role of the Victorian and Commonwealth Parliament; the process and effect of passing legislation; and the impact on business and procurement contracting through the judicial interpretation of those laws in the hierarchy of Australian Courts. It addresses the responsibilities of various stakeholders as well as their liabilities by comparing different types of standard contract documents. The law relating to principles and practice of project procurement management and the formation of a contract (including formation and terms of a contract; avoidance; discharge of a contract; quantum merit; and dispute resolution and remedies) are also considered. Practical assessments will equip students to both develop skills in analysing contractual issues and facilitate relationships between various stakeholders in a project. The roles and responsibilities of each stakeholder, risk apportionment between various stakeholders and determination of risks to be covered by insurances, bonds or other risk allocation instruments are all investigated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate relevant aspects of the Australian legal system with respect to the role of Commonwealth and Victorian Parliaments, the process of passing legislation and the impact on organisational tenders & projects; 2. Conceptually map the operations of Victorian and Commonwealth court systems, in particular, the hierarchy and authority of the courts; 3. Critically review the general principles and application of contract law, including the law relating to tenders, as applied to projects; 4. Interpret the AS4000 form of contract in relation to the principles of project management and explore its interaction with other standard forms of contract and project procurement management; and 5. Critically analyse authentic project agreements and extrapolate principles to the design and administration of a contract.

Class Contact: Lecture3.0 hrs

Required Reading: Carter J. W., (2013) 6th ed. Contract law in Australia Chatswood, N.S.W. : LexisNexis Butterworths Austroads Building and construction procurement guide: principles and options Austroads

Assessment: Assignment, Individual assignment (1000 words), 20%. Case Study, Group Assignment & Presentations (3000 - 4000 words per group), 40%. Examination, Final Examination (2 hours), 40%.

EPM5720 Facility Life Cycle Costing

Locations: Footscray Park.

Prerequisites: Nil.

Description: This Unit of Study investigate theories used in planning and maintaining facilities and the factors influencing the life of a project performance. Students will be introduced to all aspects of total facility life cycle costing including inflation, depreciation and taxation consequences and cost optimisation. Additionally asset management and maintenance theories and its impact on formulation of maintenance policies will be discussed through practical case studies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elucidate life cycle costing theory, terminology, relevance to simple and complex assets, facilities, benefits, total asset management concepts as they manifest in contemporary project management scenarios; 2. Investigate and critically reflect on relevant issues including functionality, standards, asset accounting, relevant economic parameters, return on investment, and measures of worth; 3. Apply life cycle costing theory to simple and complex assets, with and without inflation, depreciation and taxation considerations, choice of alternative asset solutions; 4. Critique and apply as appropriate theoretical frameworks related to facility management, policy formation, information systems, operations and maintenance; and 5. Construct and defend life cycle cost evaluations of commercial income-producing facilities to various clients and stakeholders.

Class Contact: Lecture3.0 hrs

Required Reading: Various texts are currently being reviewed - it is anticipated that there may be one required text and up to two recommended texts. Current texts being reviewed include: - Carter, J. W., "Contract law in Australia", (2013) (6th Ed) - Pentony, B et Al., "Understanding business law", (2013) (6th Ed) - Seddon, N, "Government contracts: federal, state and local", (2013) (5th Ed) Students will also be directed to journal articles for supplementary reading as they become relevant and

available.Blank L. & Tarquin A., (2012) 7th ed. Engineering Economy McGraw Hill Kirk S. J. and Dell'Isolla A. J., (1995) 2nd ed. Life Cycle Costing for Design Professionals McGraw Hill Standard Australia (1999) 1999 AS/NZS 4536:1999: Life Cycle Costing - An application guide Standard Australia

Assessment: Assignment, Individual Research Project (1000 words), 20%. Project, Group Research Project (6000 words per group), 40%. Examination, Final Examination (3 hours), 40%.

EPM5730 Project Stakeholder Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: Internal and external stakeholders have a key role to play in the success or otherwise of a project. Stakeholders range from multinational organisations to communities, individuals and government authorities. This unit critically reviews traditional and emerging stakeholder management theories in order to investigate how they apply to contemporary project scenarios both in Australia and internationally. Students will learn how to identify and engage project stakeholders, prioritise their importance and evaluate their potential and actual contribution to project success. The relationship between the role of project manager and the expectations and perspectives of diverse stakeholders is also considered.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate contemporary managerial theory and management processes for dealing with stakeholders (individuals, groups and organisations) and apply as appropriate to various project management scenarios; 2. Critically analyse how management frameworks; current trends in organisational structure; entrepreneurial styles of management; principles of networking and emerging business trends impact stakeholders and can be impacted by stakeholders; 3. Design practical tools which acknowledge the diversity of stakeholders to support stakeholder management; and 4. Hypothesise how stakeholder management in projects can support the concept of sustainability.

Class Contact: Lecture 3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Freeman, RE and Harrison,JS 2010 1 Stakeholder Theory: The state of the art. Cambridge University press, Cambridge. PMI 2013 5 Guide to Project Management Body of Knowledge PMI Recommended reading: Donaldson, D & Preston, LE 1995, The stakeholder theory of the corporation: Concepts, evidence, and implications. Academy of Management Review, vol. 20, no.1, pp. 65-91. Jensen, MC 2010, Value maximization, stakeholder theory, and the corporate objective function. Journal of Applied Corporate Finance, vol. 22, no. 1, pp. 32-42. Freeman, RE Donaldson, T & Preston, LE Wicks, AC & Parmar, B 2004, Stakeholder theory and "the corporate objective revisited". Organization Science, vol. 15, no. 3, pp. 364-369. Brenner, SN 1992, The Stakeholder Theory of the Firm, Business Ethics Quarterly, vol. 2, no. 2, pp. 99-119. Phillips, R & Freeman, E 2003, Stakeholder theory and Organisation Ethics, Berrett-Koehler Publishers, San Francisco.

Assessment: Assignment, Research Project Presentation, 10%. Project, Research Project (4000 words group project on case study), 25%. Project, Individual Research Project (2000 words), 15%. Examination, Final Examination - 3 Hours, 50%.

EPM5740 Project Risk Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this course, participants will develop the requisite knowledge and skills to identify and classify complex aspects of risk management within a project. Project teams will learn how to plan, control and review risks associated with a project and develop appropriate risk mitigation strategies. The project risk planning process and its position within the overall management function is considered. The unit addresses the conduct of control activities in accordance with the ISO 31000: 2009 Standard and other relevant industry-based Risk Management Standards.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise what risk management is and make risk identification an integral component of decision-making in projects; 2. Discern threats and opportunities and conceptually map their relative importance in the project; 3. Critically apply tools and techniques to assess, quantify, qualify, prioritise and document risks; 4. Analyse risks as a part of risk assessment activities and construct a risk management plan; and 5. Critically examine and evaluate the responsibilities of personnel assigned to manage, monitor and control project risks.

Class Contact: Lecture 3.0 hrs

Required Reading: Crouhy M & Galai, D.(2006) 1 Essentials of risk management McgGraw-Hill Publishing Company Hopkin P. (2010). 1 Risk Management Dewey Publications M, Rafferty J, Reilly C & Higgin D, (2012). 1 Risk Management in Projects Loosemore

Assessment: Assignment, Project Risk Assignment & Presentation, 60%. Examination, Final Examination (2 hours), 40%. Total combined assessment word equivalence is approximately 8,000 words.

EPM5750 Project Investment Analysis

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit will develop skills and techniques to assess and manage project feasibility in general and its financial viability in particular. The associated role and objectives of project managers and developers will be investigated. Market analysis and sound financial decision making techniques will be addressed. Topics include: financial management of projects, project marketing, land and property valuation techniques; and developing criteria to underpin financial decision making processes that incorporate factors such as macro-economic conditions, market surveys and predictions.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Generalise project development processes to assess feasibility and financial viability of projects; 2. Identify the conditions inherent in a complex project and propose and justify the additional requirements for such projects; 3. Critically review the role and objectives of developers and project managers in various project management scenarios; 4. Undertake an investment analysis to assess the viability of a project; 5. Predict and defend the potential of a project based on extensive research and investigation; and 6. Conceptually map decision-making models which incorporate various tools and techniques and recommend their potential applications.

Class Contact: Lecture 3.0 hrs

Required Reading: Bierman H. & Smidt S (2006) 9 IThe capital budgeting decision:. economic analysis and financing of investment projects N.Y. Rowland P.J 2 Property investments and their financing North Ryde, N.S.W. : LBC Information Services Whipple R.T.M. (2008) 1 Property Valuation & analysis Law Book Company, Sydney

Assessment: Assignment, Individual Assignment (2000 words), 20%. Project, Group Project (4000 words), 40%. Examination, Final Examination - 3 hours, 40%.

EPM5760 Project Construction Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: The focus of this unit is contemporary and emerging construction systems and technology with respect to available procurement options. Issues around build-ability and use-ability are considered and lessons for future application extrapolated. Appropriate forms of traditional and non-traditional project delivery options such as D&B, GMP, BOO/BOT are considered, along with the use of modern frameworks to improve construction efficiency. Additional topics include alternative means of protection of structures (including fire and external environmental conditions); safety factors and cost implications of materials handling on construction sites; effective resource planning; and cost, time and quality optimisation techniques.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Plan, construct and manage the delivery of efficient, and effective strategies and inputs over the course of the construction process to achieve value for money on diverse and complex projects in alignment with Construction Extension to the PMBOK Guide. 2. Evaluate the success of construction solutions by measuring their results against theory-based criteria and standards of performance taking into consideration construction techniques, methods and processes for commercial and government organisations. 3. Articulate and apply the ethical and legal requirements for different types of delivery methods, supplier selection processes, contract negotiations, contract administration requirements and overall contract management. 4. Critically review the efficacy of contract delivery systems in the construction industry in relation to occupational health and safety (OH&S) requirements, activity management, plant and machinery resource management and procurement requirements particular to the construction industry. 5. Conceptually map construction management processes relevant to resource utilisation on a complex project.
Class Contact: Lecture 3.0 hrs
Required Reading: Students will be provided with class notes and additional resources online, in line with the topics Richard Lambeck, John Eschemuller (2009) 1st ed. Urban construction project management McGraw-Hill Richard H. Clough, Glenn A. Sears, S. Keoki Sears (2008) 1st ed. Construction project management New York : Wiley PMI (2007) 3rd ed. Construction Extension to the PMBOK Guide PMI PMI (2013) 5th ed. Guide to Project Management Body of Knowledge PMI
Assessment: Project, Individual Research Project (2000 – 3000 words), 20%. Project, Group Research Project (8000 – 9000 words), 40%. Examination, Final Examination, 40%.

HAP6901 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs

autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HAP6902 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes

below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HAP6911 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HAP6912 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the

research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HCP6901 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, ResearchThesis, Pass/Fail.

HCP6902 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, ResearchThesis, Pass/Fail.

HCP6911 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, ResearchThesis, Pass/Fail.

HCP6912 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem

- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisor.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, ResearchThesis, Pass/Fail.

HEP6901 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar
Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HEP6902 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and

responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HEP6911 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HEP6912 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HES0009 Directed Studies 3A

Locations: Footscray Park.

Prerequisites: Nil.

Description: This is an enabling unit, which examines the citizenship role of students, and their ability to develop and sustain an engaging science based program that provides the community with access to science content. This unit is designed to provide students with an opportunity to demonstrate their knowledge and capability in a range of areas, including communication skills and leadership. By taking the students out of the classroom and into community settings students are able to better understand the relevance of their study areas. The preparation and presentation of scientific information to a diverse audience reinforces the students knowledge and provides confidence for their future studies. To establish this, the unit draws upon the knowledge and practices of the core units and the scientific principles covered in the two discipline units and examines ways and means of deconstructing and reconstructing such academic content so as to best be delivered to community

groups. Hands on activities are developed as is a literature report to compliment and accompany the science based program. A working with children check is required for this unit and must be obtained prior to any activities undertaken off site.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Acquire knowledge in specific areas of the physical sciences and creatively present this information to a diverse audience; 2. Evaluate and reflect upon their citizenship role within the community as science advocates and their role as mentors; 3. Reflect on the learning process leading to their mentoring role and confidence gained as a result of this role; and 4. Demonstrate insight into the various ways a reasonably detailed scientific concept and/or information can be disseminated and communicated.

Class Contact: Lab1.0 hrTutorial2.0 hrs

Required Reading: Bowater, Laura., Yeoman, Kay. (2012) Science Communication: A Practical Guide for Scientists Wiley

Assessment: Assignment, Five (5) Small assignments (preparation of literature to accompany outreach program's five (5) projects), Pass/Fail. Workshop, Construction of working models that provide an understanding of the concepts underlining each of the outreach activities (attendance is mandatory), Pass/Fail. Other, Community project (development, delivery on site and evaluation, attendance is mandatory), Pass/Fail. In order to obtain a pass in this Unit, students are required to meet the attendance requirements of the unit and pass the Community Project component. Prior to undertaking the Community Project, students must have demonstrated their content knowledge by passing the semester test within their discipline unit. The community project involves the undertaking of hands on activities (construction based) that are underpinned and cover scientific concepts; the project entails five (5) 90 minute sessions. These hands on activities are undertaken off campus and are delivered to culturally diverse groups.

HES0013 Directed Studies 3A

Locations: Footscray Park.

Prerequisites: Nil.

Description: This is an enabling unit, which examines the citizenship role of students, and their ability to develop and sustain an engaging science based program that provides the community with access to science content. This unit is designed to provide students with an opportunity to demonstrate their knowledge and capability in a range of areas, including communication skills and leadership. By taking the students out of the classroom and into community settings students are able to better understand the relevance of their study areas. The preparation and presentation of scientific information to a diverse audience reinforces the students knowledge and provides confidence for their future studies. To establish this, the unit draws upon the knowledge and practices of the core units and the scientific principles covered in the two discipline units and examines ways and means of deconstructing and reconstructing such academic content so as to best be delivered to community groups. Hands on activities are developed as is a literature report to compliment and accompany the science based program. A working with children check is required for this unit and must be obtained prior to any activities undertaken off site.

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Acquire knowledge in specific areas of the physical sciences and creatively present this information to a diverse audience; 2. Evaluate and reflect upon their citizenship role within the community as science advocates and their role as mentors; 3. Reflect on the learning process leading to their mentoring role and confidence gained as a result of this role; and 4. Demonstrate insight into the various ways a reasonably detailed scientific concept and/or information can be disseminated and communicated.

Class Contact: Sixty (60) hours per semester, comprising of face-to-face workshops, tutorials and off site delivery (community project).

Required Reading: Bowater, Laura., Yeoman, Kay. (2012) Science Communication: A Practical Guide for Scientists Wiley

Assessment: Assignment, Five (5) Small assignments (preparation of literature to accompany outreach program's five (5) projects), Pass/Fail. Workshop, Construction of working models that provide an understanding of the concepts underlining each of the outreach activities (attendance is mandatory), Pass/Fail. Other, Community project (development, delivery on site and evaluation, attendance is mandatory), Pass/Fail. In order to obtain a pass in this Unit, students are required to meet the attendance requirements of the unit and pass the Community Project component. Prior to undertaking the Community Project, students must have demonstrated their content knowledge by passing the semester test within their discipline unit. The community project involves the undertaking of hands on activities (construction based) that are underpinned and cover scientific concepts; the project entails five (5) 90 minute sessions. These hands on activities are undertaken off campus and are delivered to culturally diverse groups.

HES0014 Directed Studies 3B

Locations: Footscray Park.

Prerequisites: HES0013 - Directed Studies 3A

Description: This is the second of the enabling units in this course which builds upon the work completed in Directed Studies 3A. In this Unit the skills and knowledge gained through the Core and discipline units are again utilised in the preparation and presentation of a Community Program. Students are expected to improve on the work undertaken in Semester 1 with a more challenging project. This will further enhance their leadership and study skills and personal and educational confidence and enable them to prepare for their future Higher Educational studies. The unit again utilises the student's skills and knowledge from their core and discipline units and provides them with opportunities to communicate this knowledge to a diverse audience within a community setting. Students are required to research and assess academic content in general science, reinterpret this information and to then communicate the theoretical fundamentals via an engaging process that acknowledging a diverse audience. A working with children check is required for this unit and must be obtained prior to any activities undertaken off site.

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise and access processes of extracting science based information so as to identify underlying fundamentals; 2. Investigate creative ways to communicate fundamental information to a diverse audience; 3. Reflect on their citizenship role within the community and their role as mentors via a community based program; 4. Demonstrate a knowledge base in general science and articulate synergies between disciplines; and 5. Explain and articulate the benefits of utilising diverse ways of communicating content as a means of establishing a learning process.

Class Contact: Sixty (60) hours per semester, comprising of face-to-face workshops, fieldwork and the development and running of a community based program. The Community based program runs within the semester timeframe.

Required Reading: Bowater, Laura., Yeoman, Kay. (2012) Science Communication: A Practical Guide for Scientists Wiley

Assessment: Assignment, Three (3) Small Assignments - preparation of literature to accompany outreach program's three (3) projects), Pass/Fail. Workshop, Construction of working models that provide an understanding of the concepts underlining each of the outreach activities (attendance is mandatory), Pass/Fail. Other, Community based program (development, running and

evaluation/refinement, attendance is mandatory), Pass/Fail. In order to obtain a pass this Unit students are required to meet the attendance requirements of the Unit and pass the Community Project component. Prior to undertaking the Community Project, students must have demonstrated their content knowledge by passing a semester test within their discipline unit. The community project involves the undertaking of hands on activities (construction based) that are underpinned and cover scientific concepts; the project entails five (5) 90 minute sessions. These hands on activities are undertaken off campus and are delivered to culturally diverse groups.

HGP6901 Research Thesis (Full Time)

Locations: St Albans.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HGP6902 Research Thesis (Full Time)

Locations: St Albans.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HGP6911 Research Thesis (Part Time)

Locations: St Albans.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to

demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HGP6912 Research Thesis (Part Time)

Locations: St Albans.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HIP6901 Research Thesis (Full Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation

of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HIP6902 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HIP6911 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge

- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HIP6912 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HLP6901 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:

- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs

autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HLP6902 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs

autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HLP6911 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field

- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs

autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HLP6912 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs

autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisor.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HMP6901 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to

demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HMP6902 Research Thesis (Full Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HMP6911 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HMP6912 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar
Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HOP6901 Research Thesis (Full Time)

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar
Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HOP6902 Research Thesis (Full Time)

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of

work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HOP6911 Research Thesis (Part Time)

Locations: Werribee.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HOP6912 Research Thesis (Part Time)

Locations: Werribee.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors

Assessment: The student will demonstrate substantial progress towards completion of

the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HPP6901 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HPP6902 Research Thesis (Full Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs

- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HPP6911 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.
- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HPP6912 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of:

- expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field
- intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem
- expert cognitive, technical and creative skills to:
- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature
- expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations.
- capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals.

- intellectual independence, initiative and creativity in new situations and/or for further learning
- ethical practice and full responsibility and accountability for personal outputs
- autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HSP6901 Research Thesis (Full Time)

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar
Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HSP6902 Research Thesis (Full Time)

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar
Required Reading: To be determined in consultation with the supervisors.
Assessment: The students will need to demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit would be assessed by the supervisory team, and by the Faculty Postgraduate Research Committee through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HSP6911 Research Thesis (Part Time)

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis

format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HSP6912 Research Thesis (Part Time)

Locations: Werribee.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HTP6901 Research Thesis (Full Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal

interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HTP6902 Research Thesis (Full Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HTP6911 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors.

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

HTP6912 Research Thesis (Part Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis

format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem expert cognitive, technical and creative skills to: design, develop and implement a research project/s to systematically investigate a research problem develop, adapt and implement research methodologies to extend and redefine existing knowledge manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. intellectual independence, initiative and creativity in new situations and/or for further learning ethical practice and full responsibility and accountability for personal outputs autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar

Required Reading: To be determined in consultation with the supervisors

Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the School and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

JCB0101 Biology 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit provides an up-to-date view of modern biology that will emphasise knowledge and practical skills required for future forays into the Science and Health Science disciplines. The unit covers Biological Organisation, Macromolecules, Functioning Cells and organisation, Microscopy, Cellular energetics, Plant biology, Ecology and Eco systems, DNA, Inheritance and recombinant DNA technology / applications

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise the basic principles and concepts of biology; 2. Articulate the organisation of life and detail how cells communicate; 3. Demonstrate skills in the application of genetic theory; 4. Prove the nature and organisation of biology via experimentation; 5. Articulate how cells transfer energy through living systems; and 6. Explore the issues relating to human involvement in Ecology.

Class Contact: Lab 3.0 hrs Tutorial 2.0 hrs

Required Reading: Raven, P., Johnson, G., Mason, K., Losos, J ., Singer, S. (2013) 10th Ed., Biology Mcgraw Hill.edn. Brooks/Cole.

Assessment: Laboratory Work, Five (5) Laboratory Reports - written laboratory reports, 20%. Assignment, Theme: Cellular Structure (construction based assignment), 10%. Test, Two (2) Semester Tests - Multiple Choice and Short Answers (1 hour each), 20%. Examination, Two (2) Final Exams - Multiple Choice, Short and long Answers, (1.5 hours each), 40%. Report, Problem Based Report Based on Ecology, 10%. In order to pass this Unit students are required to attend 80% of the laboratory classes and obtain a pass in this assessment task. .

JCB0102 Biology 2

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit provides an up-to-date view of modern biology (with a strong emphasis on human physiology) and focuses on developing a knowledge base and practical skill set required for future studies in the Science and Health Science discipline areas. This unit covers structure and function of the animal body, tissue types, organs and organ systems, regulation of homeostasis, neural signalling; the central nervous system, neural signaling and regulation, internal transport, gas exchange, processing food & nutrition, disposal of metabolic wastes, endocrine regulation and evidence for evolution and micro evolutionary processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise the basic principles and concepts of biology relevant to the areas covered within the unit; 2. Appraise the structure and life processes in animals; 3. Demonstrate skills in the application of evolutionary theory; 4. Demonstrate skills in a laboratory setting and articulate results in a written format; 5. Detail how animals signal, regulate and sense the environment; and 6. Qualify the issues relating to human involvement in causing problems with various physiological processes.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Raven, P., Johnson, G., Mason, K., Losos, J ., Singer, S. (2013) 10th Ed., Biology Mcgraw Hill.

Assessment: Report, Five (5) Laboratory Reports - written laboratory reports, 20%. Test, Two (2) Semester Tests - Multiple Choice and Short answer (1 hour each), 20%. Examination, Two (2) Final Exams - Multiple Choice, Short and long answer (1.5 hours each), 40%. Assignment, Assignment, 20%. In order to pass this unit students are required to attend 80% of the laboratory classes and obtain a pass in this assessment task.

JCB0110 Introduction to Chemistry

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit introduces chemistry relevant to a number of science, medical and engineering based courses and industries via a theoretical and laboratory based approach. Topic areas including atomic theory, introduction to solution chemistry, organic nomenclature, common chemical reactions/phenomena and molecules relevant to life are explored as are the synergies between them and other discipline areas. How these synergies can be effectively and progressively used in effective problem solving is also investigated. Common laboratory procedures are extensively explored as is the written format of a laboratory report. Data collection, experimental methodologies and design are investigated and practiced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Solve chemical problems (including those that incorporate a mathematical element) that encompass a number of given topic areas; 2. Apply skills in the use

of laboratory glassware and associated laboratory procedures and to be acquainted with methods used to achieve qualitative and quantitative analysis; 3. Deliberate the relevance of chemistry in the world around them and outline its impact and relationship in other areas of science; 4. Articulate concepts (such as solution chemistry) covered (via a number of alternate ways) so as to use them in other areas of science to assist in explaining other phenomena; and 5. Differentiate processes in experimental design and literature requirements required in reporting and the analysis of data.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Nivaldo J. Tro (2014) 5th Introductory Chemistry Essentials Prentice Hall

Assessment: Assignment, Four (4) Small assignments (calculation based), 20%. Laboratory Work, Laboratory reports, 20%. Presentation, Demonstration Presentation (Demonstration of common chemical reactions and molecules relevant to life), 10%. Test, Two (2) Semester Tests (1 hour each), 10%. Examination, Two (2) Examinations - combines both theoretical and practical (1.5 hours each), 40%. In order to pass this Unit students are required to attend 80% of the laboratory classes and obtain a pass in this assessment task.

JCB0111 Chemistry 1

Locations: Footscray Park.

Prerequisites: Nil

Description: The unit provides a comprehensive overview of chemistry essential to further studies in the area of chemistry. The unit engages students to extrapolate useful information from data and solve problems that although chemical in nature provided additional training in problem solving skills. Topic areas covered include periodicity and atomic theory, molecular orbital theory, colligative properties and solution chemistry, stoichiometry, environmental gaseous chemistry, nuclear magnetic resonance/IR spectrophotometry and an introduction to organic mechanisms. How these concepts relate to one another will be examined via theory, practicum and mathematical application.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Ascertain how their breath of knowledge within the discipline can both reflect their understanding of other areas of science; 2. Solve chemical based problems that are layered (intentionally so) via a number of means; 3. Adapt skills in laboratory procedures, instrumentation so as to achieve qualitative and quantitative analysis; 4. Assess concepts covered so as to prepare for further studies in the discipline area; and 5. Practice experimental design and engage in the process of literature reporting and research so as to achieve insights into the dichotomy of research.

Class Contact: Lab 3.0 hrs Tutorial 2.0 hrs

Required Reading: Nivaldo J. Tro (2013) 3rd Chemistry: A Molecular Approach Prentice Hall

Assessment: Assignment, Four (4) Small Assignments (Three (3) calculation based and One (1) theory based), 20%. Report, Laboratory reports, 30%. Test, Two (2) Semester Tests, 10%. Examination, Examination (2 hours), 40%. In order to pass this Unit students are required to attend 80% of the laboratory classes and obtain a pass in this assessment task.

JCB0112 Chemistry 2

Locations: Footscray Park.

Prerequisites: JCB0111 - Chemistry 1 JCB0110 - Introduction to Chemistry JCB0111 - Chemistry 1 or JCB0110 - Introduction to Chemistry

Description: The unit follows on from Chemistry 1 and draws upon concepts conceptualized within that unit to provide a deeper and more expansive understanding of chemistry. Alongside theoretical explorations of chemistry topics, laboratory based work and problem based workshops will further explore chemical concepts will develop the student's practical skills, problem solving skills and their role as responsible communicators. This pedagogy is intended to allow the student to assert and ascertain more advanced laboratory, research and communication skills. Topic areas covered include environmental chemistry, chemical equilibrium, chemical kinetics, nuclear chemistry, functional group chemistry, electrochemistry, nuclear chemistry and mass spectroscopy. Students will also communicate concepts to peers within workshops to better grasp their own understanding of concepts.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate the strong links and synergies between chemical processes, biological systems and physical processes; 2. Solve chemical based problems that require a background in chemistry; 3. Utilise research protocols and laboratory instrumentation, via consultation to solve analytical problems; and 4. Effectively and responsibly communicate knowledge to peers as a means of developing and recognising their educational citizenship in society.

Class Contact: Tutorial 1.0 hr Sixty (60) hours per semester, comprising of face-to-face lectures, tutorials/laboratory sessions and workshops. Additional support is available (additional tuition) and significant independent learning time is advised. Drop in session are available and 1:1 assistance is provided.

Required Reading: Nivaldo J. Tro. (2013) 3rd Chemistry: A Molecular Approach Prentice Hall

Assessment: Assignment, Two (2) Small Assignments - calculation based, 10%. Report, Laboratory reports, 20%. Other, Problem based workshops (develop and present to peers chemistry based demonstrations), 20%. Test, Two (2) Semester Tests (1 hour each), 10%. Examination, Two (2) Examinations - considers both theoretical and practical (1.5 hours each), 40%. In order to pass this Unit students are required to attend 80% of the laboratory classes and obtain a pass in this assessment task.

JCM0110 Mathematics - Introduction

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit provides students with introductory maths levels required for general science, health science, biological science and related areas including for those with an education and arts focus. The unit covers and engages students in basic numeracy, arithmetic and mathematical operations, percentages, proportions and ratio, basic algebra using linear expressions, and graph sketching of linear equations. This unit is delivered in a combination of tutorials, workshops and lectures and a combination of guided and independent problem solving exercises are utilised.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform mathematical calculations (such as solving expressions using basic mathematical operations, calculations using percentages and ratio and calculations involving exponentials and logarithms) typical to Science based problems; 2. Manipulate and solve linear equations both graphically and algebraically; and 3. Formulate and solve problems using simultaneous linear equations.

Class Contact: Tutorial 1.0 hr Sixty (60) hours per semester, comprising of face-to-face tutorials. Additional support is available (additional tuition) and significant independent learning time is advised. The University also offers additional assistance and service in mathematics.

Required Reading: Notes are provided to students at various points throughout the

unit.

Assessment: Test, Three (3) Class tests (1 hour each), 30%. Test, Mid semester test - In class activity, 25%. Examination, Final Examination (3 hours), 45%.

JCM0112 Mathematics 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide students with fundamental understanding of basic mathematical concepts. The following unit prepares students in the following areas of Mathematics - Basic algebra using various expressions - Graph sketching of linear, quadratic and trigonometric functions, and - Basic calculus, including Limits, differentiation and anti-differentiation/integration.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform mathematical calculations; 2. Manipulate and solve algebraic expressions 3. Graph some polynomial and trigonometric type functions 4. Understand the concepts and mathematics of change through calculus; and 5. Problem solve in mathematics.

Class Contact: Tutorial2.5 hrsSixty (60) hours per semester, comprising of face-to-face tutorials. Additional support is available (additional tuition) and significant independent learning time is advised. The University also offers additional assistance and service in mathematics.

Required Reading: Students will be provided with Notes. These will constitute text requirements.

Assessment: Test, Three (3) Class tests (10% each), 30%. Examination, Final Examination (3 hours) (pass is required), 70%.

JCM0113 Mathematics 2

Locations: Footscray Park.

Prerequisites: JCM0112 - Mathematics 1JCM0110 - Mathematics - IntroductionEither JCM0112 - MATHEMATICS 1 or JCM0110 - MATHEMATICS INTRODUCTION.

Description: This unit prepares students for the statistical content in Science, Health Science, Social Science and Education based courses. The unit via a mixture of lectures, tutorials and workshops covers univariate statistics, bivariate statistics, the normal distribution and binomial distribution. These areas of study will be engaged via combination of guided and independent problem solving exercises.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Calculate and interpret the statistical content inherent to Science based courses; 2. Select appropriate statistical tools to analyse and interpret statistical data; and 3. Apply statistical methods to solve given problems.

Class Contact: Sixty (60) hours per semester, comprising of face-to-face tutorials. Additional support is available (additional tuition) and significant independent learning time is advised. The University also offers additional assistance and service in mathematics.

Required Reading: Students will be provided with Notes. These will constitute text requirements.

Assessment: Test, Two (2) Class tests, 25%. Assignment, One (1) Assignment - Statistical Analysis, 25%. Examination, Final Examination (3 hours), 50%.

JHL0110 English Language & Communications Skills A

Locations: Footscray Park.

Prerequisites: Nil

Description: Communications skills that encompass synthesis, summarising, referencing, report writing, literature review writing and essay writing are developed primarily but not exclusively through a scientific context, Presenting ideas and concepts in ways other than in the written and verbal form will be examined and developed as will aspects of science journalism and science media. Debating and communicating with and for a variety of audiences will be developed as will presentations skills for academic purposes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Derive skills in written communication, grammatical structures , summarisation and referencing; 2. Demonstrate oral presentation techniques and verbal exchanges; 3. Communicate information clearly to a diverse audiences; 4. Critique and review information making use of references; and 5. Initiate the process of selecting and utilising peered reviewed information in research practice.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Silyn-Roberts, H. (2012) 3rd Writing for Science (a practical handbook for science, engineering and technology students) Prentice Hall

Assessment: Report, Four (4) Reports - incorporate referencing skills/grammatical structures, 40%. Presentation, A1 poster that links in with oral presentation, 10%. Presentation, Oral presentation that links in with poster presentation, 10%. Examination, Final Exam (3 hours, Essay format), 40%.

JHL0111 English Language and Communication Skills B

Locations: Footscray Park.

Prerequisites: JHL0110 - English Language & Communications Skills A

Description: The synthesis of information and the accurate and effective use of references to inform this information is of enormous importance in academia and research. This unit designed for Foundation Studies students focuses on written and communications skills including instruction writing, literature reporting and reviewing, all of which are developed through a scientific context. An emphasis on the utilisation of refereed and peered reviewed literature is underpinned by the development of researching skills.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Establish skills in researching, summarising, synthesizing and referencing for scientific writing purposes. 2. Synthesise effective instruction writing techniques and access its effectiveness via diverse audience. 3. Question, scrutinise and review information 4. Scrutinise and judge peered reviewed information in research practice

Class Contact: Sixty (60) hours per semester, comprising of lectures and workshops. Additional support is available for this unit and significant independent learning time is advised.

Required Reading: Silyn-Roberts, H. (2012) 3rd Writing for Science (a practical handbook for science, engineering and technology students) Prentice Hall

Assessment: Report, Four (4) Reports - Incorporate referencing skills and focusing on synthesis, argumentative, report, literature reviewing, 40%. Assignment, Comparison/Contrast writing development and making use of a hands on approach in informing this assignment, 20%. Examination, Final Exam - Essay format (3 hours), 40%.

JSP0102 Physics 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide students with a fundamental understanding of basic physics concepts. This unit emphasises on building a strong foundation of understanding in key concepts including numbering systems and

standards of measurements, introduction to kinematics with one and two dimensional motion, forces and friction, work, energy and power, momentum and impulse, rotational mechanics. The unit has a strong focus on making use of demonstrations and hands on activities to engage with physics based principles.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse motion in one and two dimensions and apply kinematic equations to calculate displacement, velocity and acceleration; 2. Articulate the interaction of forces, both conservative and non-conservative, on an object; 3. Analyse the conversion of mechanical energy and work; 4. Review the concepts of conservation of energy and conservation of momentum to describe interactions between two bodies or objects; and 5. Manage demonstrations and hands on activities to demonstrate physics based knowledge.

Class Contact: Sixty (60) hours per semester, comprising of face-to-face tutorials, workshops and laboratory classes. Additional support is available (additional tuition) and significant independent learning time is advised.

Required Reading: Knight, Randal, D. (2012) 3rd Physics for Scientists and Engineers: A Strategic Approach with Modern Physics Addison-Wesley

Assessment: Test, Three (3) Class tests, 15%. Assignment, Problem based assignment, 10%. Laboratory Work, Laboratory Work (Four (4) written laboratory reports), 20%. Assignment, Demonstration assignment that makes use of physics principles, 15%. Examination, Final Examination (3 hours), 40%. In order to pass this Unit students are required to attend 80% of the laboratory classes and obtain a pass in this assessment task.

JSP0103 Physics 2

Locations: Footscray Park.

Prerequisites: JSP0102 - Physics 1

Description: This unit of study aims to provide students with fundamental understanding of basic physics concepts in the area of light, sound, electrostatics and magnetism. Significant conceptual theories are examined via problem based approaches, demonstrations, calculations and hands on approaches. Students will also develop, deliver and refine programs designed to engage a community group in the area of light and electrostatics. Aspects of astronomy that focus on light will also be examined.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Qualify a conceptual knowledge base in the areas of light, sound, electrostatics, magnetism and astronomy (as related to light); 2. Demonstrate problems solving skills via the use of mathematical based calculations; 3. Substantiate competency in the use of physics based instrumentation in the field and in laboratory/simulated environments; and 4. Exhibit demonstrations and hands on activities to communicate conceptual physics associated with light and electrostatics to a diverse audience.

Class Contact: Sixty (60) hours per semester, comprising of face-to-face tutorials, workshops and laboratory classes. Additional support is available (additional tuition) and significant independent learning time is advised.

Required Reading: Knight, Randal, D. (2012) 3rd Physics for Scientists and Engineers: A Strategic Approach with Modern Physics Addison-Wesley

Assessment: Assignment, Problem based assignment, 10%. Laboratory Work, Five (5) Written Laboratory Reports, 25%. Other, PBL based presentations of demonstrations associated with light and electrostatics to peers, 25%. Examination, Two (2) Final Examinations (1.5 hours each), 40%. In order to pass this Unit students are required to attend 80% of the laboratory classes and obtain a pass this assessment task.

NBC1100 Building Planning Process 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: Private and municipal building surveyors carry out the statutory role of ensuring that proposed residential building projects meet relevant compliance requirements prior to issuing planning permits. Building Planning Process 1 unit is concerned with the fundamental planning considerations for residential buildings in classes 1 and 10 as defined in the National Construction Code (NCC) and up to three storeys and not more than 2000 square metres in floor area. The main focus is on gathering and assessing documentation that supports the planning application process required to obtain planning permission.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret and apply relevant clauses of the National Construction Code (NCC) for Class1 and Class 10 buildings; 2. Summarise construction methods and materials suitable for buildings in classes 1 and 10; 3. Interpret drawing symbols, notations, acronyms and construction terminology used in the National Construction Code (NCC), Australian standards, working drawings, and building design specifications; 4. Explain legislative and local planning and building requirements governing the issuing of planning approval permits in the jurisdictions relevant to each building specified in the performance evidence; and 5. Exemplify effective communication with a range of skilled professionals, including architects and engineers.

Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hr

Required Reading: National Construction Code Series (2015) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code (2014) Volume 1 Energy efficiency provisions ABCB Publications, Canberra National Construction Code (2015) Volume 2 Energy efficiency provisions ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (each 500 word equivalent), 30%. Test, Three (3) quizzes, 30%. Assignment, Team design project and oral presentation (1500 word equivalent), 40%.

NBC1101 Maths for Builders

Locations: Footscray Park.

Prerequisites: Nil.

Description: Quantitative knowledge and skills are fundamental to many disciplines and many professions. This unit aims to provide building students with opportunities to acquire essential knowledge and skills in fundamental quantitative areas including basic algebra, functions and trigonometry. The unit introduces those aspects of algebra, functions and trigonometry that are considered fundamental in building profession and that are required in subsequent technical units. Students who attain a solid understanding of these fundamentals will be able to make a confident transition to the study of other technical areas in the building discipline.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform basic algebra (identify and calculate labour, material, and overhead costs using MS Excel); 2. Explain different representations of the same concept, such as algebraic and graphical; 3. Adopt mathematical, engineering, building and

scientific terminology and symbols to define concepts (interpret plans and specifications including engineering computations); 4. Measure and interpret building parameters (length, area, volume) and convert units; 5. Apply basic trigonometry to building construction; and 6. Calculate dead and live loads acting on buildings by applying Australian Standards.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. Flanagan & Tate (1997) Cost control in building design Blackwell, Oxford Press Australian Institute of Quantity Surveyors (2000) Volume 1 Australian cost Management Manual Australian Institute of Quantity Surveyors, Canberra. AS1170 (2011) Loading Code Australian Standard AS4055 (2012) Wind Load for Housing Australian Standard NCC2015 National Construction Code The Australian Building Codes Board

Assessment: Test, Three (3) in Class Tests, 20%. Assignment, One (1) individual project, 20%. Examination, End of Semester Examination (3 hours), 60%.

NBC1102 Building and Construction Structures

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to structural concepts, construction materials and construction methodologies applied to simple buildings. The structural considerations include the analysis of loads, load paths, lateral stability, principles governing selection of structural systems and their compliance with Australian Standard Codes, building components including scaffolding, understanding design of temporary structures, and general beam behaviour and statics analysis. Materials topics include selection of suitable materials for differing situations encountered in construction and OH and S and sustainability issues in regards to materials. Construction topics include: site operations, sub-structure, super-structure and enclosure methodologies for simple residential buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic structural analysis and design concepts to contemporary construction practice; 2. Synthesise and communicate resolutions to construction problems by means of sketches and drawings; 3. Propose and evaluate alternative construction systems in a range of situations; 4. Propose and evaluate alternative construction materials in a range of situations; 5. Assess OH and S and sustainability related issues for various construction materials; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only. Barry R., (2014) Barry's advanced construction of buildings Wiley & Sons Inc Wyatt .K., (2013) Principles of Structures Taylor & Francis Ltd. Wilkie. G., (2003) Building Your Own Home New Holland

Assessment: Test, Class test (500 words), 30%. Test, Class test (500 words), 20%. Assignment, One Team Project report and oral presentation (500 words), 20%. Examination, End of Semester Examination (2 hours), 30%.

NBC1103 Basic Structural Mechanics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to the fundamental concepts and principles applied by building professionals in the construction of buildings of all sorts of sizes and purposes. Newtonian Mechanics is adopted to understand what happens to a body when force(s) is/are applied to it. In this unit students will be supported in developing the fundamental skills and understandings needed for core units in the program, such as Building and Construction Structures, Structural Principles in Construction, Building and Construction Studies, and associated with their role as future Building professionals.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate area and volume calculations to produce a bill of quantities; 2. Examine what happens to a body when forces are applied to it; 3. Interpret the effect of live, dead and distributed loads on buildings; 4. Articulate the properties of common building materials such as timber, steel and concrete; and 5. Elaborate the physics behind simple structural members such as columns, beams and truss ties and rods.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only. Whatt and Hough (2013) 5th ed Principles of Structure CRC Press Gupta (2010) 2nd ed Principles of Structural Design CRC Press

Assessment: Test, Three (3) in Class Tests, 15%. Exercise, Individual weekly tutorial problem sheets, 35%. Examination, End of Semester Examination (2 hours), 50%.

NBC1104 Structural Principles in Construction

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit explores and applies structural principles relevant to the erection or demolition of low and medium rise residential structures using conventional methods. The design and construction of medium rise buildings require the input of a range of skilled professionals, including architects and engineers. The building and construction professional plays a significant role within this project team and advocates effective communication with building design professionals, and develops sound and safe practices in relation to structural procedures on site.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply structural principles when planning the erection or demolition of a structure; 2. Analyse and plan for the structural integrity of Class1 and Class 10 buildings; 3. Develop the planning, coordination and management procedures for the laying of footings and floor system, building of structural and non-structural wall systems, the building of roof system and the external wall cladding of structure; 4. Exemplify effective communication with a range of skilled professionals, including architects and engineers; and 5. Develop sound and safe practices in relation to structural procedures on site.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only. R. Barry (2014) 3rd ed. Barry's advanced construction of buildings Wiley-Sons K. Wyatt (2013) Principles of Structures Taylor & Francis Ltd G Wilkie (2003) Building Your Own Home New Holland Gupta (2014) 2nd ed. Principles of Structural Design CRC Press

Assessment: Test, Class Test (500 words), 30%. Test, Class Test (500 words), 20%. Assignment, One (1) Team Case Study report and oral presentation (750 words), 20%. Examination, End of Semester Examination (2 hours), 30%.

NBC1105 Building and Construction Studies 1

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit introduces students to the procedures, principles and methods of construction with particular focus on typical residential buildings. The unit forms the foundation for NBC2104 Building and Construction Studies 2 unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss the types and functions of domestic buildings, and regulations that apply to them; 2. Develop the procurement of minor works and dwellings, the roles and the activities of building clients, designers and contractors, with descriptions of the design and construction processes; 3. Draw simple domestic buildings, as required in the building procurement process; 4. Distinguish between the functions, materials, configuration(s) and details of the major components in domestic buildings; 5. Classify the sources of waste in the construction industry, particularly in housing and the development of strategies and management practices to minimise its effects; 6. Explain the protocols and the aims, objectives and points to be observed when undertaking inspections of domestic buildings; and 7. Discuss the importance of temporary works, particularly scaffolding, formwork and falsework, the regulations governing their use, their design principles and the operational requirements that govern their use.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only. R. Barry (2014) 3rd ed. Barry's advanced construction of buildings Wiley-Sons K. Wyatt (2013) Principles of Structures Taylor & Francis G. Wilkie (2003) Building Your Own Home New Holland Mehta, Scarborough, Armpriest (2008) Building Construction: Principles, Materials and Systems Prentice Hall

Assessment: Test, Class Test (500 words), 30%. Test, Class Test (500 words), 20%. Assignment, One (1) Team Project (500 words), 20%. Examination, End of Semester Examination (2 hours), 30%. The total combined assessment word equivalence is approximately 3000 words.

NBC1106 Measurement and Estimating 1

Locations: Footscray Park.

Prerequisites: Nil

Description: In this unit students are introduced to the techniques required to measure, quantify and cost construction work. Students will read and interpret plans and specifications applicable to medium rise residential and commercial projects in order to inform estimation, planning and supervisory activities. The estimated costs associated with the acquisition of materials and labour on building and construction sites will be established, together with the application of relevant overhead costs and margins. Monitoring techniques for building or construction costing systems will be introduced. The unit forms the foundation for NBC2103 Measurement and Estimating 2 unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exemplify the roles of quantity surveyors/cost engineers in the construction industry; 2. Interpret and apply the principles and logic of the Australian Standard Method of Measurement (ASMM) to inform estimation; 3. Apply cost planning principles to a wide range of medium rise residential and commercial projects; 4. Prepare a simple Bill of Quantities (BoQ); 5. Develop builder's estimates for projects in various contexts; and 6. Apply bidding and tendering principles to medium rise residential and commercial projects.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. Smith, J. and Jaggar, D. (2007) 2nd Edition Building Cost Planning for the Design Team Elsevier, Oxford Australian Institute of Quantity Surveyors (2000) Volume 1 Australian cost Management Manual Australian Institute of Quantity Surveyors, Canberra Flanagan, R. and Tate, B. (1997) Cost Control in Building Design Blackwell, Oxford

Assessment: Assignment, Two (2) Individual Projects (750 words each), 60%. Examination, End of Semester Examination (2 hours), 40%. Students are required to achieve a mark of at least 50% in the exam in order to pass the subject. The total word equivalent for the assessments is no more than 3000 words.

NBC1108 Building Assessment Process 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students examine and apply the National Construction Code (NCC) and associated legislation to Building Class 1 and 10 projects (residential, up to 3 storeys). They will learn about statutory controls and assessment; enforcement proceedings; how occupational health and safety, environmental and heritage legislation interact with the NCC; and the application of the principles of performance-based legislations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and apply the National Construction Code (NCC) for Building Class 1 and 10 projects; 2. Assess when and how to use performance-based provisions; 3. Explain the hierarchy of legislation and the courts; 4. Discuss how Australian Standards and Codes are used in building legislation; 5. Apply occupational health and safety, environmental and heritage legislation provisions to projects; and 6. Adapt and apply the enforcement provisions under current building legislation.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (500 word equivalent, 15% each), 30%. Case Study, Team design project and oral presentation (1000 word equivalent), 40%. Test, Three (3) Quizzes (10% each), 30%. The overall grade for this unit will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. .

NBC2101 Building and Construction Surveying

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit introduces students to the establishment and management of construction site operations through a systematic approach. The related components of construction site operations operate as subsystems which include site information, surveying and preparation, establishment, amenities, protection, safety, management and construction sequence. Students will work individually and collaboratively to assess, propose and present solutions to various construction site set-ups.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the principles of effective site planning (to accommodate site clearance, construction/demolition work, materials storage, access, temporary works and

services, dewatering, plant and amenities, and the efficient organisation of site activities) in a range of challenging situations. Demonstrate how geotechnical investigations are conducted on site; 2. Demonstrate the survey techniques used to set out and monitor construction work: (a) Set out a building on a selected site with minimal profiles, (b) Prepare, test and operate levelling devices, (c) Identify specialised levelling and surveying equipment available on large building projects for various set-out and checking procedures, (d) Compute coordinates and bearings, distances related to grids and general set-out work on large building sites; 3. Analyse and assess environmental protection requirements and waste minimisation measures relevant to construction site operations; 4. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice; 5. Identify the impact of development on traditional owners or custodians and propose solutions which comply with international standards on human rights, sustainable development and the environment for the purpose of ensuring that traditional owners and custodians are able to practice their traditional laws and customs and exercise the full range of connection to Country; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: The textbooks listed below are recommended texts only. Banniser, R. and Baker (1998) 7th ed. Surveying Pearson Prentice Hall Kavanagh, B. (2009) 8th ed. Surveying, Principles and Applications Pearson Prentice Hall, Columbus Paul, R. and Whyte W. (2015) 4th ed. Basic Surveying Taylor & Francis Ltd, Architecture Press Almost any surveying text will be an adequate reference. English texts use language and procedures which are more closely related to Australian practice than USA texts.

Assessment: Assignment, Fieldwork (Two Practical Team Exercises and Reports) (1000 words each), 60%. Examination, End of Semester Examination (2 hours), 40%.

NBC2103 Measurement and Estimating 2

Locations: Footscray Park.

Prerequisites: NBC1106 - Measurement and Estimating 1 Nil

Description: This unit extends on the NBC1106 Measurement and Estimating 1 unit. In this unit students are introduced in more depth to measurement styles and techniques, such as description composition, measurement of different defined building areas, computer measurement software, and Australian Standard Method of Measurement of Building Work (ASMM). Other shortened/simple form methods, core estimating principles, estimating, pricing builder's preliminaries, overheads and supervision are also included. The aim of this unit is to give students a hands-on experience of the tendering process for construction professionals. Students undertake a team research project to determine the optimum parameters for a civil/building infrastructure estimation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret accepted drawing conventions and formats and building documentation in order to apply shortened/simple form methods; 2. Apply building principles and methods to a civil/building infrastructure; 3. Interpret architectural, structural and services drawings of moderately complex projects in order to apply shortened/simple form methods; 4. Measure moderately complex architectural and engineering structures using basic measurement techniques and effectively communicate items that have been measured to a range of specialist and non-specialist stakeholders; 5. Prepare estimating documentation for a building project in collaboration with team members; and 6. Develop and assess tender documentation demonstrating professional judgment.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. Smith, J. and Jaggar, D. (2007) 2nd ed. Building Cost Planning for the Design Team Elsevier, Oxford Australian Institute of Quantity Surveyors (2000) Volume 1 Australian Cost Management Manual Australian Institute of Quantity Surveyors, Canberra Flanagan, R. and Tate, B. (1997) Cost Control in Building Design Blackwell, Oxford

Assessment: Assignment, Two (2) Team Research Projects (1000 words each), 70%. Examination, End of Semester Examination (2 hours), 30%. Students are required to achieve a mark of at least 50% in the exam in order to pass the subject. The total work equivalent for the assessments is no more than 4000 words.

NBC2104 Building and Construction Studies 2

Locations: Footscray Park.

Prerequisites: NBC1105 - Building and Construction Studies 1 Nil

Description: This unit extends on the content of NBC1105 Building and Construction Studies 1. This unit introduces students to construction principles and methods for commercial and industrial buildings, concentrating on low-rise construction and buildings with load-bearing walls up to three stories in height. The unit provides a background to the following for the construction of these classes of buildings: principles of fire safety, inspection procedures, temporary structures, waste and water management planning, relationship between design and construction methods and the integration of building services into the building structure.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate between and present in detail construction principles and processes including building components, systems and services for low rise buildings covered by Building Code of Australia Volume 1; 2. Critically assess construction documentation for constructability and compliance with codes and standards; 3. Work individually and collaboratively to develop the procurement process for a project including objectives, strategies, inspections, temporary works and waste management; 4. Advise the construction requirements for acoustic insulation and fire safety to prospective clients; 5. Resolve routine and unfamiliar problems in regards to construction principles and methods for commercial and industrial buildings using information, technology, logic and ethical decision making; and 6. Apply a range of personal and interpersonal skills to communicate effectively to a variety of specialist and non-specialist audiences within the building construction field.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only. R. Barry (2014) Barry's advanced construction of buildings Wiley-Sons K. Wyatt (2013) Principles of Structures Taylor & Francis Ltd Mehta, Scarborough, Armpriest (2008) Building Construction: Principles, Materials and Systems Prentice Hall

Assessment: Assignment, One (1) Team Project report and oral presentation (1000 words), 30%. Test, Two (2) Class Tests (500 words each), 40%. Examination, End of Semester Examination (2 hours), 30%. The total combined assessment word equivalence is approximately 4000 words.

NBC2108 Building Planning Process 2

Locations: Footscray Park.

Prerequisites: NBC1100 - Building Planning Process 1

Description: NBC2108 Building Planning Process 2, is concerned with the planning

considerations for Class 2 to 9 buildings as specified in Building Code of Australia (BCA). The unit introduces students to planning and preparation required to assess planning application, assessment of planning application documentation, assessment of revised design plans and finalisation of planning permits.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse relevant approving authority requirements for assessing and issuing planning permissions and ensure adherence to relevant administrative processes; 2. Investigate relevant planning application documentation, including drawings, for each building project and assess each application for compliance with relevant legislation, codes, regulations and local planning authority requirements; 3. Analyse documentation supplied by at least one external consultant for each planning application, to ensure information is accurate and complete and to determine compliance of the planning application; 4. Assess all non-compliance and produce a range of alternative solutions for client consideration; 5. Document final planning permission for each building project, noting specific conditions and validity of each permit; 6. Propose a final planning approval ready for relevant authorities and notification to the client; and 7. Exemplify effective communication with a range of skilled professionals, including architects, engineers and builders.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code (2014) Volume 1 Energy efficiency provisions ABCB Publications, Canberra National Construction Code (2015) Volume 2 Energy efficiency provisions ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Team design projects and oral presentation (3000 word equivalent, 35% each), 70%. Test, Two (2) Quizzes (1000 words, 15% each), 30%.

NBC2109 Performance Based Solutions for Building

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is concerned with implementation of the performance-based codes, risk assessment and risk management principles to commercial and residential buildings including all classes and all types of construction. This unit deals with the objectives, functional statements and performance requirements of the Building Code of Australia and reviews the impact of the introduction of performance based solutions and private building certifiers/surveyors.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate the differences between established deemed-to-satisfy protocols and professional judgement relating to performance based solutions; 2. Evaluate documentation for performance based solutions; 3. Justify and document performance based solution decisions and prepare appropriate assessment reports; 4. Judge performance based solutions in relation to the impact on building maintenance and refurbishment; 5. Evaluate and justify the potential benefits in using performance based solutions in place of deemed-to-satisfy provisions; 6. Analyse ethical and professional behaviour in practice; and 7. Exemplify effective communication with a range of skilled professionals, including architects, builders and engineers.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code (2015) Performance Requirements extracted from the National Construction Code 2015 ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Test, Three (3) Quizzes (10% each), 30%. Assignment, Two (2) Individual tutorial assignments (500 word equivalent, 15% each), 30%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%. The overall grade for this unit will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. An overall mark of at least 50%, or an overall grade of 'pass' is required in order to pass the course. .

NBC2110 Building Assessment Process 2

Locations: Footscray Park.

Prerequisites: NBC1108 - Building Assessment Process 1

Description: This unit builds on the theory and practice introduced in NBC1108 Building Assessment Process 1 and is designed to provide students with further understanding of the National Construction Code (NCC) and associated legislation when applied to Building Class 2 to 9 projects (non-residential, up to 3 storeys). Students will learn about statutory controls and assessment; enforcement proceedings; how occupational health and safety, environmental and heritage legislation interact with the NCC; and the application of the principles of performance-based legislations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret and apply the National Construction Code (NCC) for Building Class 2 to 9 projects; 2. Judge design documentation for compliance with building legislation including Workplace Health and Safety, and Disability Discrimination laws, and Australian Standards; 3. Interpret and apply the enforcement provisions under current building legislation; 4. Exemplify effective communication with a range of skilled professionals, including architects, builders and engineers; and 5. Employ sound and safe practices in relation to permits and inspections on site.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (500 word equivalent, 15% each), 30%. Assignment, Team design project and oral presentation (1000 word equivalent), 40%. Test, Three (3) Quizzes (10% each), 30%. The overall grade for this unit will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. An overall mark of at least 50%, or an overall grade of 'pass' is required in order to pass the course.

NBC2203 Building Planning Process 3

Locations: Footscray Park.

Prerequisites: NBC1100 - Building Planning Process 1NBC2108 - Building Planning Process 2

Description: This unit builds on the theory and practice introduced in NBC1100 Building Planning Process 1 and NBC2108 Building Planning Process 2 and is designed to build students capabilities to undertake planning considerations for Class 2 to 9 buildings for multi-use and multi storey construction (greater than 3 stories and type A construction).

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise multi-use and multi storey construction projects, their risks and uncertainties; 2. Analyse and articulate environmental and social impacts on high-rise construction; 3. Evaluate financial concepts to project selection and viability; 4. Critically review contractual relationships and participation strategies; 5. Analyse the management of multi-purpose and multi-storey projects; and 6. Exemplify effective communication with a range of skilled professionals, including architects, engineers and builders.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code (2014) Volume 1 Energy efficiency provisions ABCB Publications, Canberra National Construction Code (2015) Volume 2 Energy efficiency provisions ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Case Study, Two (2) Team design project and oral presentation (3000 word equivalent, 35% each), 70%. Test, Two (2) Quizzes (1000 words, 15% each), 30%.

NBC2204 Building Systems and Services 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: Both domestic and commercial buildings are built systems comprised of numerous sub-systems. One of the major components of such built systems is building services. Sustainability is an important element in all facets of construction including building services. This unit will introduce building ergonomics, including its effects on human performance and comfort; and engineering services associated with residential, low rise commercial and industrial building projects. Using industry regulations, standards and codes of practice, students will examine the principles of building services requirements, installation, operation and maintenance relating to: energy usage and needs; natural, extractive and air conditioning ventilation; natural and artificial lighting; security and communications, hydraulic service supply and disposal systems; fire protection; and acoustics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise building ergonomic factors affecting human performance and comfort; 2. Interpret regulatory and technical requirements relevant to reticulated (electrical, water, gas, sewerage and drainage, telecommunications) and designed building services (HVAC, fire, internal transportation) installations; 3. Interpret building acoustic requirements using industry regulations, standards and codes; 4. Develop energy efficient and sustainable design with respect to building services, including lighting, power, heating, cooling, mechanical services, hot water, and water usage; 5. Critically review the principles of integrated intelligent building services; and 6. Analyse design documentation and carry out on-site inspections of services installations and assess their compliance with relevant statutes, codes and standards.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2014) Volume 1 Energy Efficiency Provisions ABCB Publications, Canberra Handbook (2011) Using on-site renewable and reclaimed energy sources ABCB Publications, Canberra Handbook (2011) Energy efficiency provisions for electricians and plumbers ABCB Publications, Canberra In addition, a very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.

Assessment: Assignment, Individual tutorial assignment (500 word equivalent), 30%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%. Test, Three (3) Online Quizzes (10% each), 30%.

NBC3101 Project Management Practice

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit is designed to provide an understanding of the principles of project management practice and the roles and responsibilities of stakeholders and others in a project team. Utilising the PMBOK© (Project Management Body of Knowledge) Guide as a reference, the unit explores 10 Knowledge Areas in project management and instigates the process of applying these to contemporary and emerging project environments. The unit delivers a comprehensive understanding of how due diligence manifests in a project life cycle. It addresses what is to be delivered in a project (scope), how it is to be delivered (plan), the delivery and implementation (execution) and finally reporting and review. As projects are situated within organisations, relevant concepts of organisational management and human resource management are also analysed.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply knowledge, skills, tools and techniques to project activities through the lens of an established project management process (PMBOK©); 2. Analyse and critique the 10 Knowledge Areas of project management; 3. Assess the use of Project Communications tools and techniques in the areas of planning, assessing, quantifying, qualifying, control, monitoring and disposition of project information relevant to all stakeholders and at all levels of the organisation; 4. Appraise the dynamics of working collaboratively within a project environment and developing distributed leadership skills; and 5. Predict the impact of risk in various project management scenarios.

Class Contact: Lecture 3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. (PMBOK© GUIDE) (2013), A Guide to the Project Management Body of Knowledge 5 Project Management Institute Larson E W, Gray G W (2011) Project Management: the managerial process 5 McGraw Hill - Irwin Series Lock Dennis (2013) Project Management 1 Ashgate Publishing Ltd Hartley, Stephen (2008) Project Management: Principles, processes and practice 2 Pearson Education Australia

Assessment: Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral Presentation (1000 words), 30%. Examination, Final Examination (2 hours), 50%. The total word equivalent for the assessments is 3-4000 words.

NBC3102 Building Development and Compliance 2

Locations: Footscray Park.

Prerequisites: NEA2201 - Building Development and Compliance

Description: This unit extends on the content in the unit NEA2201 Building Development and Compliance and will provide students with knowledge of the specialist forms of construction and complex statutory controls and their relevance to multi-unit residential development and high-rise commercial buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse the fundamentals of conventional and innovative forms of construction for multi-unit residential and high-rise commercial buildings; 2.

Contextualise the nature of building construction in heavily-developed urban environments; 3. Appraise the common structural features and services installations specific to tall buildings; 4. Assess the involvement of principal consultants and contractors; 5. Critically review knowledge of urban development and building regulatory procedures, codes and standards to present graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios; 6. Exemplify a leadership role in space and amenity planning; and 7. Justify major plant and equipment, techniques and practices typically employed in high-rise construction work.

Class Contact: Lecture1.0 hrTutorial3.0 hrs

Required Reading: State of Victoria Department of Sustainability and Environment, (2004) Guidelines for higher density residential development Victorian Government Department of Sustainability and Environment, East Melbourne. Ching, FDK, Onoye, BS, Zuberbuhler, D, (2009) Building structures illustrated: patterns, systems, and design John Wiley & Sons, Inc, Hoboken, New Jersey Australian Building Codes Board (ABCB), (2010) Volume One Building Code of Australia (BCA) ABCB Publications, Canberra Australian Building Codes Board (ABCB), (2010) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra

Assessment: Assignment, Individual tutorial work (100 word equivalent), 20%. Case Study, Team design project and oral presentation (1000 word equivalent), 50%. Portfolio, Individual Portfolio (2000 words equivalent), 30%. The portfolio is to feature work done in the tutorials and at home, including graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios, a reflective journal, and a self and peer assessment.

NBC3103 Project Management Principles

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to assist the participants to identify the roles of stakeholders engaged in specific projects and the interaction between them. Project management processes will be considered at both theoretical and applied levels using authentic industry-based scenarios drawing on students' existing knowledge and experience. In the project initiation phase the development of a project charter, scoping and network analysis, time management, cost management and quality management are addressed. Participants work collaboratively within a simulated project environment and investigate the impact of human behaviour and group dynamics in project management. A key feature of the unit is the critique of the PMBOK© (Project Management Body of Knowledge) framework.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Report on and differentiate the notions of portfolios, programs and projects; 2. Critically apply knowledge, skills tools and techniques to project activities through project management processes; 3. Conceptually map and elaborate the ten (10) Knowledge Areas of Project Management (PMBOK©); 4. Devise a Project Charter which addresses scoping and network analysis for initiating a project in various contexts; 5. Assess complex project information relevant to all stakeholders and at all levels of the organisation; and 6. Develop strategies for risk assessment and safety in accordance with OHS legislation and regulations.

Class Contact: Lecture3.0 hrsTutorial1.0 hr

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. (PMBoK 5 Guide) (2013) 5th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Larson E. W., Gray G. E., (2011) 5th ed. Project Management: the managerial process McGraw Hill - Irwin Series Lock, Dennis (2013) 1st ed. Project Management Ashgate Publishing Ltd

Assessment: To pass the unit a student must pass all the assessment items, i.e. score 50% of the mark awarded to each item. Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral (1000 words) + Presentation (2000 - 3000 words), 30%. Examination, Final Examination (2 Hours), 50%. The total word equivalent for the assessments is 3-4000 words. .

NBC3107 Procurement Management

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit develops students' understanding of the interplay between aspects of the Australian legal system. It addresses the responsibilities of various stakeholders as well as their liabilities by comparing different types of standard contract documents. The law relating to principles and practice of project procurement management and the formation of a contract are also considered. Practical assessments will equip students to both develop skills in analysing contractual issues and facilitate relationships between various stakeholders in a project. The roles and responsibilities of each stakeholder, risk apportionment between various stakeholders and determination of risks to be covered by insurances, bonds or other risk allocation instruments are all investigated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate relevant aspects of the Australian legal system with respect to the role of Commonwealth and Victorian Parliaments, the process of passing legislation and the impact on organisational tenders & projects; 2. Conceptually map the operations of Victorian and Commonwealth court systems, in particular, the hierarchy and authority of the courts; 3. Critically review the general principles and application of contract law, including the law relating to tenders, as applied to projects; 4. Interpret the AS4000 form of contract in relation to the principles of project management and explore its interaction with other standard forms of contract and project procurement management; and 5. Critically analyse authentic project agreements and extrapolate principles to the design and administration of a contract.

Class Contact: Lecture3.0 hrs

Required Reading: Various texts are currently being reviewed - it is anticipated that there may be one required text and up to two recommended texts. Current texts being reviewed include: Carter, J.W., (2013) 6th ed Contract Law in Australia LexisNexis Australia Pentony, B et AL, (2013) 6th ed Understanding Business Law LexisNexis Australia Seddon, N., (2013) 5th ed Government contracts: federal, state and local Annandale, N.S.W. : Federation Press

Assessment: Project, Individual Project (1000 words), 20%. Project, Group Project (2000 words), 30%. Examination, Final Examination (3 hours), 50%. The combined equivalence of assessments is 5-6000 words.

NBC3110 Building Surveying Project 1

Locations: Footscray Park.

Prerequisites: NEF3101 - Project Management

Description: Building Surveying Project 1 is the culmination of student experience in the Bachelor of Building Surveying program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial construction management project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of the various components required for successful completion of the project. Wherever possible, projects will be

sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Surveying Project 1 focuses on the scoping, designing and planning of the project. Project proposals will be presented as both a written report and as an end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Building Surveying Project 2 where their project outcomes will be created, delivered and evaluated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the likely components and deliverables of their negotiated project; 2. Effectively plan the negotiated project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Evaluate the feasibility of a range of solutions to anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Synthesise, prototype, critically analyse and/or test project designs ensuring that design outcomes meet client specifications; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.

Required Reading: None required. Notes from lecturers will be provided to students.

Assessment: Project, Project Proposal (See detail below), 60%. Project, Project Management Plan (See detail below), 30%. Presentation, Oral Presentation (10 minutes), 10%. Project Proposal - Approximately 5,000 words equivalent (equivalent to 15 pages) for a project involving one student, increasing by 20% for each additional participant. The report should contain a clear scope for the project and proposed solutions/designs. Project Management Plan - Approximately 10 pages increasing by 20% for each additional participant. The Project Management Plan should contain a Gantt chart showing a detailed break-down of the work that needs to be undertaken, identification of resources, risk analysis and records of meetings and communications with the supervisor and other parties involved with the project. All assessments are hurdle assessments requiring students to pass the assessment before being eligible to submit the next assessment. .

NBC3203 Building Assessment Process 3

Locations: Footscray Park.

Prerequisites: NBC2110 - Building Assessment Process 2

Description: This unit builds on the theory and practice introduced in NBC1108 Building Assessment Process 1 and NBC2110 Building Assessment Process 2. The National Construction Code (NCC) and associated legislation relevant to High Rise Construction (buildings taller than 3 storeys) will be examined and applied.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret Codes and Standards of Class 2 to 9 buildings beyond 3 stories including Type A construction; 2. Interrogate and advise on compliance of design documentation for Class 2 to 9 buildings taller than 3 storeys; 3. Negotiate initial, advanced and final construction inspections of Class 2 to 9 buildings taller than 3 storeys; 4. Exemplify effective communication with a range of skilled professionals, including architects, builders and engineers; and 5. Formulate sound and safe practices in relation to permits and inspections on site.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. National Construction Code Series (2015) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra

Assessment: Test, Three (3) Online Quizzes (10% each), 30%. Assignment, Two (2) Individual tutorial assignments (500 word equivalent, 15% each), 30%. Case Study, Two (2) Team design project and oral presentation (2000 word equivalent, 20% each), 40%. The overall grade for this unit will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. An overall mark of at least 50%, or an overall grade of 'pass' is required in order to pass the course.

NBC3204 Complex Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: NBC3204 Complex Construction is concerned with the procedures, principles and methods of construction used for complex projects including tall buildings (over 300m in height) and designated by the National Construction Code (NCC) as being within Building Class 2 to 9.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the temporary works, particularly scaffolding, formwork and falsework and plant selection processes used for complex or high-rise construction; 2. Justify the use of foundations systems, major excavation, stabilisation and dewatering techniques in the construction of basement levels of tall buildings; 3. Verify the functions, materials and details of the major components, the waste management strategies used and the regulatory inspections made when constructing a complex or high-rise project; 4. Diagnose and plan the rectification of common building faults; 5. Assess and report on the issues encountered by complex or high-rise buildings including funding, ownership, design, construction and social and environmental issues; and 6. Advocate the development and implementation of innovative building practices.

Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code Series (2015) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code Series (2015) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code Handbook (2010) Applying energy efficiency provisions to new building work associated with existing class 2 to 9 buildings ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (1000 word equivalent, 20% each), 40%. Test, Two (2) Online Quizzes (10% each), 20%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%.

NBC3205 Building Systems and Services 2

Locations: Footscray Park.

Prerequisites: NBC2204 - Building Systems and Services 1

Description: This unit builds on the theory and practice introduced in NBC2204 Building Systems and Services 1, and is designed to provide students with further

knowledge of Building Energy Management Systems (BEMS) and strategies for non-residential buildings under the Building Code of Australia. The unit is concerned with air-conditioning, ventilation, communications and security systems, fire safety services, transportation systems and building services maintenance and management strategies and procedures for commercial class buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elucidate the concept of Energy Management, the associated economic assessment and the importance of Building Energy Management Systems (BEMS); 2. Interpret the principles of air conditioning and ventilation systems, flow analysis for natural ventilation and the plant and ducting requirements for air conditioning installations; 3. Assess fire detection and alarm systems and fire suppression systems with respect to the relevant codes and standards; 4. Articulate the basic elements of a communication system and the basic elements of a security system; 5. Interpret the types, functions and regulations concerning lifts, escalators, and moving walkways; and 6. Articulate the importance of maintenance in terms of function, procedures and operations.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2014) Volume 2 Energy Efficiency Provisions ABCB Publications, Canberra National Construction Code Handbook (2013) Lifts used during evacuation ABCB Publications, Canberra National Construction Code Handbook (2006) Digital building telecommunications access ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Individual tutorial assignment (1000 word equivalent), 30%. Case Study, Two (2) Team design projects and oral presentations (3000 word equivalent, 35% each), 70%.

NBC3220 Building Surveying Project 2

Locations: Footscray Park.

Prerequisites: NBC3110 - Building Surveying Project 1

Description: Building Surveying Project 2 is the implementation of the negotiated project (NBC3110 Building Surveying Project 1) and represents the culmination of student experience in the Bachelor of Building Surveying program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial construction management project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of, the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Surveying Project 2 focuses on the implementation, delivery and evaluation of project outcomes to the satisfaction of the client and the academic requirements of Victoria University. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise and deliver to the satisfaction of the client the negotiated project outcomes; 2. Analyse and deliver independently or as part of a team all requisite aspects of construction management practice including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Propose and present a range of solutions to real and anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Produce a range of high quality professional and technical documents including project reports; and PowerPoint presentations; and 5. Communicate effectively with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.

Required Reading: None required. Notes from lecturers will be provided to students.

Assessment: Project, Assessment of the project outcomes against the agreed proposal, 30%. Report, Project Report, 60%. Presentation, Oral Presentation (15 minutes), 10%. The total word equivalent for the assessments is no more than 5-6000 words, increasing by 20% for each additional participant. .

NBC4101 Construction Management

Locations: Footscray Park.

Prerequisites: Nil

Description: The focus of this unit is contemporary and emerging construction systems and technology with respect to available procurement options. Issues around build-ability and use-ability are considered and lessons for future application extrapolated. Appropriate forms of traditional and non-traditional project delivery options are considered, along with the use of modern frameworks to improve construction efficiency. Additional topics include alternative means of protection of structures (including fire and external environmental conditions); safety factors and cost implications of materials handling on construction sites; effective resource planning; and cost, time and quality optimisation techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Plan, design and manage the delivery of efficient, and effective strategies and inputs over the course of the construction process to achieve value for money on diverse and complex projects; 2. Evaluate the success of construction solutions by measuring their results against theory-based criteria and standards of performance, taking into consideration construction techniques, methods and processes for commercial and government organisations; 3. Critically analyse and apply the ethical and legal requirements for different types of delivery methods, supplier selection processes, contract negotiations, contract administration requirements and overall contract management; 4. Critically review the efficacy of contract delivery systems in the construction industry in relation to occupational health and safety (OH&S) requirements, activity management, plant and machinery resource management and procurement requirements particular to the construction industry; and 5. Conceptually map construction management processes relevant to resource utilisation on a complex project.

Class Contact: Lecture3.0 hrsTutorial1.0 hr

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics.Richard Lambeck, John Eschemuller (2009) 1st ed. Urban construction project management (McGraw-Hill Construction Series) McGraw-Hill S. Keoki Sears, Glenn A. Sears, Richard H. Clough, Jerald L. Rounds, Robert O. Segner (2015) 6th ed. Construction project management New York : Wiley

Assessment: Project, Individual Case Study Project (1000 - 1500 words), 20%. Project, Group Case Study Project (2000 - 2500 words), 40%. Examination, Final

Examination - (2 hours), 40%. The combined equivalence of assessments is 5000 to 6000 words.

NBC4102 Project Management and Information Technology

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit addresses the ways in which information technology (IT) can facilitate the project management process in relation to planning and monitoring, information processing and decision support functions. It focuses on the application of software packages in the areas of both General Project Management Information Systems and Specialised Project Management Information Systems. The subject content includes the critical review of computerised procurement. Problem solving in relation to change and risk management and issues of quality control are also addressed. Learning scenarios which highlight the emergent and dynamic nature of IT and project management will be used to contextualise course content.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise hardware and software applications and defend their application in specific project environments; 2. Critically evaluate the relevance of selected project management theoretical frameworks to a variety of project scenarios; 3. Justify the selection of appropriate software to capture complex financial transactions and resolve resource conflicts across the life of projects; 4. Formulate a strategy for the implementation of project management software which addresses project risk identification and response; 5. Exemplify the skills required for the effective functioning of a multi-disciplinary project planning control group.

Class Contact: Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Kathy Schwalbe, (2013) 7th ed. Information Technology Project Management (Revised) Boston, Mass. : Thomson Course Technology MS Project Training Manuals 2013 Students will be provided with class notes and additional resources online, in line with the topics.

Assessment: Assignment, Individual Case Study Project (1000 words), 20%. Assignment, Group Case Study Project (2000 words), 40%. Examination, Final Examination (2 hours), 40%. Total word equivalence of the assessments is 5000 to 6000 words.

NBC4104 Building Life Cycle Costing

Locations: Footscray Park.

Prerequisites: Nil

Description: This Unit of Study investigates theories used in planning and maintaining facilities and the factors influencing the life of a project performance. Students will be introduced to all aspects of total facility life cycle costing including inflation, depreciation and taxation consequences and cost optimisation. Asset management and maintenance theories and their impact on formulation of maintenance policies will be discussed through practical case studies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise life cycle costing theory, terminology, relevance to simple and complex assets, facilities, benefits, total asset management concepts as they manifest in a wide range of contemporary project management scenarios; 2. Critically review relevant issues including functionality, standards, asset accounting, relevant economic parameters, return on investment, and measures of worth in relation to building assets; 3. Interpret life cycle costing theory in relation to simple and complex assets, with and without inflation, depreciation and taxation considerations, choice of alternative asset solutions; 4. Critique appropriate theoretical frameworks related to facility management, policy formation, information systems, operations and maintenance; 5. Devise collaboratively an appropriate life cycle cost evaluations of commercial income-producing facilities to various clients and stakeholders.

Class Contact: Lecture 3.0 hrs

Required Reading: There are a number of other textbooks that can be used in conjunction with the required texts below. Some of these texts are available online by subscription. Students please check with the Main Library. Lecture Materials and Associated Notes. Leland Blank and Anthony Tarquin, (2012) 2nd ed. Engineering Economy McGraw Hill Kirk, S. J. and Dell'Isolla, A. J., (1995) 2nd ed. Life Cycle Costing for Design Professionals McGraw Hill Standards Australia (1999) AS/NZS 4536:1999 Life Cycle Costing - An application guide Standards Australia & Standards New Zealand Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Assignment, Individual Case Study Project (1000 words), 20%. Project, Two (2) Group Case Study Projects (1500 words each), 40%. Examination, Final Examination (2 hours), 40%. Total word equivalence of the assessments is 5-6000 words.

NBC4107 Major Project 1

Locations: Footscray Park.

Prerequisites: NEF3101 - Project Management OR have completed 288 credit points from the Course.

Description: Major Project 1 is the culmination of student experience in the Bachelor of Building (Construction Management) program. It provides students with the opportunity to apply and integrate and apply their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial construction management project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Major Project 1 focuses on the scoping, designing and planning of the project. Project proposals will be presented as both a written report and as an end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Major Project 2 where their project outcomes will be created, delivered and evaluated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the likely components and deliverables of their negotiated project; 2. Effectively plan the negotiated project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Evaluate the feasibility of a range of solutions to anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Synthesise, prototype, critically analyse and/or test project designs ensuring that design outcomes meet client specifications; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: Seminar 2.0 hrs

Required Reading: None required. Notes from lecturers will be provided to students.
Assessment: Project, Project Proposal (See detail below), 60%. Project, Project Management Plan (See detail below), 30%. Presentation, Oral Presentation (10 minutes), 10%. Project Proposal - Approximately 5,000 words equivalent (equivalent to 15 pages) for a project involving one student, increasing by 20% for each additional participant. The report should contain a clear scope for the project and proposed solutions/designs. Project Management Plan - Approximately 10 pages increasing by 20% for each additional participant. The Project Management Plan should contain a Gantt chart showing a detailed break-down of the work that needs to be undertaken, identification of resources, risk analysis and records of meetings and communications with the supervisor and other parties involved with the project. All assessments are hurdle assessments requiring students to pass the assessment before being eligible to submit the next assessment.

NBC4108 Major Project 2

Locations: Footscray Park.
Prerequisites: NBC4107 - Major Project 1
Description: Major Project 2 is the implementation of the negotiated project (NBC4107 Major Project 1) and represents the culmination of student experience in the Bachelor of Building (Construction Management) program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial construction management project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of, the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Major Project 2 focuses on the implementation, delivery and evaluation of project outcomes to the satisfaction of the client and the academic requirements of Victoria University. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Deliver to the satisfaction of the client the negotiated project outcomes; 2. Perform independently or as part of a team all requisite aspects of construction management practice including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Propose a range of solutions to real and anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Produce a range of high quality professional and technical documents including project reports; and PowerPoint presentations; and 5. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.
Class Contact: One (1) hour per week and (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.
Required Reading: None required. Notes from lecturers will be provided to students.
Assessment: Project, Assessment of the project outcomes against the agreed proposal, 30%. Report, Project Report, 60%. Presentation, Oral Presentation (15 minutes), 10%. The total word equivalent for the assessments is no more than 5-6000 words, increasing by 20% for each additional participant.

NBD1100 Built Environment Communication and Skills

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces students to fundamental communication concepts applied by professionals in the built environment. The unit explores writing and presentation, academic referencing and library skills, oral and written communication, negotiation, teamwork, conflict resolution, fundamental mathematics as applicable in the built environment, interpretation commonly used in industry documentation, effective plan and specification reading and analysis, cultural diversity and indigenous and ethical issues. The topics are discussed in a context relevant to built environment professionals through practical exercises. The course introduces awareness of cultural diversity and its management in a multicultural work force. In this unit students will be supported in developing the fundamental skills and understandings needed for core and professional units in the program, such as Building Design Communication, Built Environment 1 and 2, Environmentally Sustainable Design 1 and 2, Building Contract Documentation and Administration, Urban Design and Development and Building Design Project 1 and 2, and associated with their role as future Building Design professionals.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Communicate effectively with others orally and in writing on a range of built environment-related topics using appropriate language; 2. Work individually and with others, as both a team member and leader in both formal and informal teams, to complete tasks; 3. Interpret and report on commonly used built environment project documentation; 4. Apply basic mathematical and trigonometric solutions to built environment problems; and 5. Recognise the professional responsibilities of built environment professionals as well as ethical and sustainability issues in built environment practice.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr
Required Reading: VU, College of Arts, (2013) 10th ed. Handbook of Communication Skills for First Year Students in the College of Engineering and Science. Victoria University. VU, School of Engineering and Science, (2009) 2nd ed. PBL in Engineering Melbourne: Victoria University In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.
Assessment: Essay, Individual Reflection Essay (500 words), 30%. Case Study, One (1) Individual Case Study Report (500 words), 20%. Presentation, One (1) Team Oral Presentation (fifteen (15) minutes), 10%. Project, One (1) Team Project Report (1500 words), 40%.

NBD1101 Building Design Documentation

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit is based on a series of problems designed to introduce students to the architectural design process and detailing. The problems will therefore emphasise OHS regulations, organisational policies and procedures (including quality assurance requirements), interpretation of the project brief, creative and innovative thinking in design, and generating and evaluating alternatives against a range of technical criteria. The unit introduces students to professional drawing practice and using computer-aided design software as relevant to built environment professionals.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Comply with occupational health and safety (OHS) regulations applicable to workplace operations; 2. Apply organisational policies and procedures, including

quality assurance requirements where applicable; 3. Select and apply appropriate techniques for the documentation and communication of finalised design; 4. Produce two and three-dimensional drawings for residential and commercial building projects; and 5. Complete working drawings to industry best practice and as determined by the project brief.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr
Required Reading: VU, School of Engineering and Science, (2009) 2nd edn PBL in Engineering Manual Melbourne: Victoria University In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.
Assessment: Test, Individual test, 30%. Presentation, Team Oral Presentation (5 minutes per student), 10%. Project, Teamwork including technical reports, 40%. Portfolio, Individual portfolio, 20%.

NBD2100 Built Environment 1

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design Documentation NBD1100 - Built Environment Communication and Skills NBC1105 - Building and Construction Studies 1
Description: This unit is an introduction to the impacts of the building design and construction industry on the environment. Requirements for regional and urban development including the legislative framework for planning control, feasibility studies, consultation and communication processes are also explored.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate the basic theoretical and practical concepts used in urban planning; 2. Propose methods for improving the environmental and social sustainability of the built environment using information, technology, logic and ethical decision making; 3. Apply appropriate design responses for particular Australian climate zones; 4. Review building materials on an environmentally preferred basis with particular reference to embodied energy, usage and waste; and 5. Communicate effectively with a range of skilled professionals, including architects, builders and engineers.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Assignment, Two (2) Assignments (500-1000 words each - teams of 3-4 students) (30% Assignment 1 and 20% Assignment 2), 50%. Portfolio, Two (2) individual portfolios, personal reflections and oral presentation (10% each), 20%. Examination, Final Examination, 30%.

NBD2200 Building Contract Documentation and Administration

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design Documentation NBD1100 - Built Environment Communication and Skills
Description: This unit introduces students to the roles and responsibilities associated with the preparation of contract documents. The administration of construction contracts and contract management will also be introduced.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare the different types of building contract arrangements and prepare working drawings from a design sketch; 2. Apply systems and management procedures for the control of contract documentation and cost control; 3. Formulate a tendering process for collecting and analysing tenders; 4. Identify and prepare the documentation required to obtain a building approval and formulate and implement quality management policies for documentation; and 5. Communicate effectively with a range of skilled professionals, including government officials, architects, builders and engineers.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr
Required Reading: The textbooks listed below are recommended texts only. Charles W. Cook (2014) 1st ed. Successful Contract Administration: For Constructors and Design Professionals Taylor & Francis Group CSI (2011) 1st ed. The CSI Construction Contract Administration Practice Guide John Wiley and Sons Ltd A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Project, Individual project (1000 words equivalent), 20%. Project, Team Project and Presentation (1000 words equivalent), 40%. Examination, Final Examination (2 hrs) (2000 words equivalent), 40%.

NBD3100 Built Environment 2

Locations: Footscray Park.
Prerequisites: NBD2100 - Built Environment 1
Description: This unit extends on the content of NBD2100 Built Environment 1. In this unit students will be introduced to the roles and responsibilities of building design professionals in relation to the design and planning of the built environment. An introduction to the development of both urban and regional Australia in terms of infrastructure provision and built environment outcomes will be provided. Students will be introduced to the various aspects of decision making which affect outcomes for both urban and regional environments. The impact of how current trends can reduce the environmental footprint associated with the development of the built environment will also be explored.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design a project proposal compliant with a local authority's development plan; 2. Devise a project feasibility study; 3. Critically review building materials and construction techniques which have a low impact on the natural environment; 4. Critically approach design of buildings that are in harmony with their surroundings; 5. Demonstrate high level graphical illustration skills to communicate finalised designs to a wide audience and communicate effectively with a range of skilled professionals, including government officials, architects, builders and engineers.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: A very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.
Assessment: Portfolio, Two Individual portfolios (30% Portfolio 1 and 20% Portfolio 2), 50%. Portfolio, Two Team portfolios, poster and physical model which represent students' skills in sustainable urban and regional design and planning (25% each)., 50%.

NBD3101 Environmentally Sustainable Design 2

Locations: Footscray Park.
Prerequisites: NEA3202 - Environmentally Sustainable Design 1
Description: Global warming has reinforced the importance of designing green buildings with lowering the energy consumption of existing buildings. This unit of study focuses on both aspects. In the first stage of the unit, students will become familiar with principles of environmentally sustainable design as well as principles of heat transfer in buildings. Students will design green buildings. The second stage of the unit covers an introduction to building performance analysis tools (software as

used by architects and engineers in compliance with energy efficiency provisions of the Building Code of Australia), computer simulation modelling of buildings including thermal and solar performance, natural ventilation, natural and artificial lighting and computational fluid dynamics (CFD). At the end of the second stage students will analyse alternative design scenarios to optimise the thermal and lighting performance of buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate deep insights into a wide range of engineering and technological approaches to the design of green buildings; 2. Adopt a critical approach to designing buildings that are energy efficient and in harmony with their surroundings; 3. Model and simulate complex integrated building designs in the area of thermal performance, natural ventilation, air conditioning, solar penetration, thermal comfort, and natural/artificial lighting; and 4. Devise professional graphical illustration skills with which students can communicate their designs to a wide audience.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Portfolio, Individual Portfolio, 15%. Portfolio, Individual Portfolio, 15%. Portfolio, Two team portfolios, poster and physical model., 50%. Examination, End of semester examination., 20%.

NBD3102 Building Design Project 1

Locations: Footscray Park.

Prerequisites: NEF3101 - Project Management Completion of at least 144CP

Description: Building Design Project 1 is the culmination of student experience in the Bachelor of Building Design program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial building design project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Design Project 1 focuses on the scoping, designing and planning of the project. Project proposals will be presented as both a written report and as an end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Building Design Project 2 where their project outcomes will be created, delivered and evaluated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the likely components and deliverables of their negotiated project, effectively plan the negotiated project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 2. Evaluate the feasibility of a range of solutions to anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 3. Synthesise, prototype, critically analyse and/or test project designs ensuring that design outcomes meet client specifications; 4. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 5. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.

Required Reading: A very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Project, Project Proposal (See detail below), 60%. Project, Project Management Plan (See detail below), 30%. Presentation, Oral Presentation (10 minutes), 10%. Project Proposal - Approximately 5,000 words equivalent (equivalent to 15 pages) for a project involving one student, increasing by 20% for each additional participant. The report should contain a clear scope for the project and proposed solutions/designs. Project Management Plan - Approximately 10 pages increasing by 20% for each additional participant. The Project Management Plan should contain a Gantt chart showing a detailed break-down of the work that needs to be undertaken, identification of resources, risk analysis and records of meetings and communications with the supervisor and other parties involved with the project. All assessments require students to pass the assessment before being eligible to submit the next assessment. Each assessment task represents a pre-requisite knowledge and skill required to progress to the next assessment task and the entire unit is a pre-requisite for the sequel unit NBD3202. .

NBD3200 Urban Design and Development

Locations: Footscray Park.

Prerequisites: NBD2100 - Built Environment 1

Description: In this unit, students are introduced to study of urban design issues that are essential in professional practice, thus necessary content in the Bachelor of Building Design program. Topics review and deepen the student's existing knowledge of sustainable communities, environmental issues and the movement of pedestrians and traffic in urban renewal. Specialist focus on heritage, diverse cultures, urban poverty, human behaviour and emergency management in urban locations will be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate deep insight into a wide range of urban design and development approaches to the design of sustainable environments; 2. Analyse heritage and environmental issues in urban renewal; 3. Propose creative strategies to accommodate the diversity of human behaviour in the design of public urban spaces and communicate effectively with a range of skilled professionals, including architects, builders and engineers. 4. Compare and modify movement of pedestrians and traffic within urban design; and 5. Adapt knowledge and skills to include diverse cultural needs and sustainable communities in urban design.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs

Required Reading: The textbooks listed below are recommended texts only. Peter Hall (2014) 4th ed. Cities of Tomorrow: An Intellectual History of Urban Planning and Design Since 1880, Wiley-Blackwell Lance Jay Brown, David Dixon (2014) 2nd ed. Urban Design for an Urban Century: Shaping More Livable, Equitable, and Resilient Cities, Wiley-Blackwell A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become

relevant and available.
Assessment: Portfolio, Individual Portfolio, 30%. Portfolio, Team portfolio, poster and physical model which represent students' skills in urban design and development., 25%. Portfolio, Team portfolio, poster and physical model which represent students' skills in urban design and development., 25%. Examination, End of Semester Examination., 20%.

NBD3201 Project Risk Management

Locations: Footscray Park.
Prerequisites: NEF3101 - Project Management
Description: In this unit, students will develop the requisite knowledge and skills to identify and classify complex aspects of risk management within a project. Project teams will learn how to plan, control and review risks associated with a project and develop appropriate risk mitigation strategies. The project risk planning process and its position within the overall management function is considered. The unit addresses the conduct of control activities in accordance with the ISO 31000: 2009 Standard and other relevant industry-based Risk Management Standards.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise what risk management is and make risk identification an integral component of decision-making in projects; 2. Discern threats and opportunities and conceptually map their relative importance in the project; 3. Critically apply tools and techniques to assess, quantify, qualify, prioritise and document risks; 4. Analyse risks as a part of risk assessment activities and construct a risk management plan; and 5. Critically examine and evaluate the responsibilities of personnel assigned to manage, monitor and control project risks.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: The textbooks listed below are recommended texts only. Crouhy M. & Galai D., (2006) 1st ed. Essentials of risk management McgGraw-Hill Publishing Company Hopkin P., (2010) 1st ed. Risk Management Dewey Publications Rafferty J, Reilly C. & Higgin D., (2012) 1st ed. Risk Management in Projects Loosemore AS/NZS ISO 31000: 2009 Risk management - Principles and guidelines Standards Australia A comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.
Assessment: Assignment, Project Risk Assignment & Presentation, 30%. Assignment, Project Risk Assignment & Presentation, 30%. Examination, Final Examination (2 hours), 40%.

NBD3202 Building Design Project 2

Locations: Footscray Park.
Prerequisites: NBD3102 - Building Design Project 1
Description: Building Design Project 2 is the implementation of the negotiated project (NBD3102 Building Design Project 1) and represents the culmination of student experience in the Bachelor of Building Design program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial building design project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of, the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Design Project 2 focuses on the implementation, delivery and evaluation of project outcomes to the satisfaction of the client and the academic requirements of Victoria University.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise and deliver to the satisfaction of the client the negotiated project outcomes; 2. Analyse and deliver independently or as part of a team all requisite aspects of building design practice including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Propose and present a range of solutions to real and anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Produce a range of high quality professional and technical documents including project reports (including digital drawings, posters and physical models) and PowerPoint presentations; and 5. Communicate effectively with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.
Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.
Required Reading: A very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.
Assessment: Project, Assessment of the project outcomes against the agreed proposal (due in Week 5), 30%. Report, Project Report, 60%. Presentation, Oral Presentation (15 minutes), 10%. The total word equivalent for the assessments is no more than 5-6000 words, increasing by 20% for each additional participant.

NEA2101 Architectural History and Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: Architects are recognised as the primary design professionals in the building industry. This subject acquaints students with insight into the architectural process by discovering the historical evolution of buildings technically and aesthetically and how they relate to the culture and time in which they were built. A selection of design skills is explored to promote conceptual thinking and visual communication. Group workshops are used to promote research and problem solving techniques as well as basic three-dimensional visualisation through model making.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify critical shifts in the historical evolution of Architecture and Building; 2. Demonstrate requisite skills in visual communication through freehand drawing techniques; 3. Elaborate the features of basic architectural design skills, both technical and conceptual; 4. Discriminate the impact of various environmental conditions on the design process; and 5. Conceptually map the Architectural design process and utilise specialised a vocabulary to communicate with other professionals.
Class Contact: Lecture 2.0 hrs Workshop 2.0 hrs
Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Individual portfolios and reports which provide evidence demonstrating that the learning outcomes for the subject have been achieved. The assessment material will include three major section as listed below that illustrate the importance

of architecture in history, skills in abstract thinking and visual communication and skills in three-dimensional 'spatial' problem solving and model making. Report, History of Architecture, 30%. Portfolio, Architecture Design Theory, 30%. Portfolio, Architectural Workshop, 40%.

NEA2201 Building Development and Compliance

Locations: Footscray Park.

Prerequisites: Nil.

Description: NEA2201 Building Development and Compliance aims to give students an understanding of the various forms of building development that can be encountered in suburban settings, ranging from domestic building projects (the housing industry) through to non-residential building projects (the commercial building industry), and an understanding of the codes and standards relevant to building compliance applicable to those two sectors of the building industry in Australia.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and interpret the fundamentals of conventional and innovative forms of construction for both domestic housing and small commercial/industrial buildings; 2. Assess the causes of common building problems, and devise effective treatments; 3. Formulate building schemes and details appropriate to specific forms of construction for both domestic housing and small commercial/industrial buildings; 4. Assess the involvement of various building trades, professions and authorities; 5. Interpret and apply evolving building standards and statutory requirements; 6. Identify the impact of development on traditional owners or custodians and propose solutions which comply with international standards on human rights, sustainable development and the environment for the purpose of ensuring that traditional owners and custodians are able to practice their traditional laws and customs and exercise the full range of connection to their Country; and 7. Communicate with other professionals in the building process using appropriate building terminology.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Wilkie, G., (2003) (Revised edition) Building your own home: a comprehensive guide for owner-builders New Holland Publishers (Australia) Pty Ltd, Sydney Ching, F.D.K., (2008) 4th ed. Building construction illustrated John Wiley & Sons, Inc, Hoboken, New Jersey Australian Building Codes Board (ABCB), (2014) Volume One Code of Australia (BCA) ABCB Publications, Canberra Australian Building Codes Board (ABCB), (2014) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra

Assessment: Other, Continuous assessment, 10%. Assignment, Team work report, 20%. Assignment, Team work report, 20%. Portfolio, Individual portfolio, 50%. The portfolio is to feature work done in tutorials and team work assignments, including graphical and written designs and specifications detailing creative building solutions appropriate to various property development scenarios, a reflective journal, and self and peer assessment.

NEA3101 HVAC Systems 1

Locations: Footscray Park.

Prerequisites: NEM2201 - Thermodynamics 1 NEF2101 - Fluid Mechanics 1 NEM2201 OR VAM2112 & NEF2101 OR VAM3131

Description: This unit is designed to provide students with knowledge of how engineers apply thermodynamics to design air conditioning systems in buildings. Students will develop skills needed in the selection and design of various elements of these systems, such as applied psychrometry for cooling coil sizing or estimating building heating and cooling loads used for duct sizing and selection of thermal plant in buildings. Students will work either individually or collaboratively. The unit builds on the prerequisite knowledge developed in NEM2201 THERMODYNAMICS 1. The knowledge of refrigeration, psychrometry and cooling and heating load estimation can be used in designing air conditioning systems for a wide range of facilities, from high-tech data centres to modern aircraft. Theoretical and practical concepts introduced in this unit will be further expanded in NEA3201 HVAC Systems 2.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply principles of thermodynamics to explain how refrigeration and air conditioning systems perform in a range of external conditions; 2. Explain and critically evaluate basic psychrometric processes and demonstrate how they apply in various types of air conditioning systems; 3. Apply theoretical concepts to compare different approaches used in the design of air conditioning systems to achieve human thermal comfort and adopted for non-occupied spaces; 4. Categorise the components of cooling and heating loads in buildings, examine methods used for their estimation, and carry out cooling and heating load estimation to analyse designs and evaluate alternatives; 5. Explain and assess the impact of air conditioning systems on the environment and suggest ways of minimising it; and 6. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs

Required Reading: Paks, M 1997 Design of Building Air Conditioning Systems, Park 1: Psychrometry AS&TP ASHRAE 2013 Handbook - Fundamentals ASHRAE Jones, WP 2012 2nd Air Conditioning Application and Design Taylor and Francis AIRAH 1997 Air Conditioning: Lead Estimation AIRAH Murray, M, Hamilton, T and Kingstone, T2002 User Guide for the Computer Program ACADS-BSG

Assessment: Assignment, Two assignments (each worth 25%), 50%. Other, Portfolio, class participation/personal reflection and oral presentation, 15%. Examination, End-of-semester examination, 35%. For each assessment component, 50% of available marks must be achieved in order to pass the subject. Teams will consist of 3-4 students. .

NEA3102 Building Electrical Systems

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical Circuits OR NEF2251 - Fundamentals of Electrical and Electronic Engineering

Description: This unit critically examines electrical systems in buildings and reviews the role of the specialist electrical services engineer in designing and overseeing the installation of electrical distribution systems. Relevant regulations, standards and codes of practice are examined and high, medium and low voltage distribution practices are investigated. An overview of the transformers used in power distribution systems is given and their specifications are analysed. The importance of power system distribution protection is highlighted, and the use and configuration of high voltage switchgear and protection devices in this process is evaluated. The calculation of system 'fault' capacity and fault levels is explored. The unit further examines cable properties and cable selection/sizing within buildings based on current, temperature, voltage drop and fault levels. An introduction to switchboard design and construction is given. Important concepts such as earthing of buildings, power factor correction are critiqued. Electric motors are discussed and their use within buildings is examined with special emphasis on the control, starting, and protection of electric motors. The unit discusses energy management in electrical power systems and methods of achieving reliability in building electrical power supply. Standby power generation systems, uninterruptible power supplies (UPS) and the sizing of central battery systems is investigated. The unit concludes with a discussion of harmonics

within power distribution systems, electronic security systems and their use within buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate and plan for the electrical power supply needs of residential, commercial and light industrial buildings; 2. Select and determine the size of all electrical power cables, their circuit protection and distribution control devices for a range of residential, commercial and light industrial buildings; 3. Examine the process of electrical power supply to buildings and the interaction(s) applicable with power supply authorities to ensure a safe and secure supply to buildings; 4. Plan for the emergency supply of electrical power to buildings and decide on appropriate system(s) for buildings and their interface systems with the supply authority provided power to a building; 5. Assess the electrical power needs of building vertical and horizontal transportation systems, and design power supply systems for these systems; 6. Appraise a range of potential problems and maintenance requirements (and their solutions) of a modern building electrical power distribution system; 7. Construct the general 'architecture' of modern building electrical power distribution systems; and 8. Evaluate regulations, standards and codes of practice used in the building industry for electrical installations.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: J.R.Cogdell, 2003 Foundations of Electric Circuits Prentice Hall J.R.Cogdell, 2003 Foundations of Electric Power Prentice Hall Australian Standards AS3000, AS30088 and AS3439.

Assessment: Presentation, Based on Six (6) Projects (1500 words each), 20%. Report, Six (6) Group Project Reports (1500 words each), 60%. Exercise, Tutorial Exercises (1500 words), 20%.

NEA3103 Hydraulic Services Systems

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to acquire a basic understanding of the theoretical principles in the areas of building water supply, sanitary plumbing and stormwater management. This unit will enable students to acquire theoretical knowledge and critical thinking skills and apply these to problems. This unit also provide students an opportunity to enhance their oral and written communication skills as well as other Engineers Australia Professional Capabilities. Topics include; Types and components of building water supply systems. Design Criteria in demands and flows. Design of hot and cold pipework systems. The general requirements for fully vented and modified, single stack and modified sewage plumbing systems, Introduction to wastewater treatment processes and building water harvesting/recycling systems. Design of roof drainage and storm water systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and synthesise a range of numerical problems in water supply, wastewater and stormwater systems; 2. Manage, locate and effectively use information / data relevant to design works; and 3. Initiate, coordinate and manage team projects in water resources management and to recommend and present the optimum solutions professionally.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Ng, A. et al (20**) Building Hydraulic Services Class Notes, Sem 2. Victoria University Australian Standards 3500 (2003) National Plumbing and Drainage Code Parts 0-4 Australian Standards (VU; 20** indicates current year edition)

Assessment: Assignment, Research Investigation, 10%. Assignment, Design Project, 20%. Presentation, Present findings on Assignment 1, 10%. Examination, End of Semester exam, 60%.

NEA3201 HVAC Systems 2

Locations: Footscray Park.

Prerequisites: NEA3101 - HVAC Systems 1NEA3101 OR VAA3071

Description: This unit builds on the theory and practice introduced in NEA3101 HVAC Systems 1, and is designed to provide students with further knowledge of air and water systems in buildings, their components, as well as an overview of complex HVAC systems employed in today's buildings. Students will develop further skills needed in the selection of components to make them suited for energy-efficient full-load and part-load operation. Controls requirements of various systems will also be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Consolidate their knowledge of engineering principles in operation of air and water systems in buildings; 2. Analyse how alternative configurations applicable to ducted and piped systems design could be used in order to minimise pressure losses; 3. Justify design criteria and carry out a design of ducted and piped systems, including pressure losses estimation; 4. Assess options available to HVAC designers in selecting main types of plant and formulate a suitable proposal for equipment selection; 5. Explain an impact of design decisions on equipment performance under full-load and part-load operation, and on system energy efficiency; and 6. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Paks, M 1997 Design of Building Air Conditioning Systems, Part 1: Psychrometry AS&TP ASHRAE 2010-2013 Handbooks ASHRAE Jones, WP 2001 Air Conditioning Engineering Butterworth Heinemann AIRAH Design Aids AIRAH Notes provided by the lecturer Class notes on WebCT/Blackboard

Assessment: Assignment, Two assignments (25% for each), 50%. Other, Portfolio, reflection, participation, and oral presentation, 15%. Examination, End-of-semester examination, 35%. For each assessment component, 50% of available marks must be achieved in order to pass the subject. Teams will consist of 3-4 students.

NEA3202 Environmentally Sustainable Design 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: As a result of climate change, there is a definite need for more sustainable approaches to design of buildings. This unit introduces principles of designing ecological buildings; provides examples and ideas for buildings of tomorrow, which may include naturally ventilated buildings, the use of thermal storage, advanced façade design for daylighting and solar energy transmission, design for indoor environmental quality (IEQ) improvement; active measures of renewable energy usage and waste minimisation, and use of rainwater and organic matter. Concepts developed in this unit of study will be further explored in NBD3101 Environmentally Sustainable Design 2.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop a case for the design of sustainable buildings based on the need to address climate change in 21st century; 2. Critically assess interactions between buildings and their surroundings; 3. Appraise government policies at federal, state and local levels and explain the role of government bodies and other organisations in promoting sustainable development; 4. Identify the common tools designers use

to evaluate alternative approaches, as well as their capabilities, and assess the impact of alternative design approaches; 5. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks; and 6. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Notes provided by the lecturer and Class notes on University LMS (VU Collaborate). The textbooks listed below are recommended texts only.Attmann, O., (2010) Green Architecture: Advanced Technologies and Materials McGraw Hill Liedl, P., Hausladen, G. and de Saldanha, M., (2011) Building to Suit the Climate: A Handbook Birkhauser

Assessment: Assignment, Two (2) Assignments (3500-5000 words each - teams of 3-4 students) (30% each), 60%. Other, Two (2) portfolios, personal reflections and oral presentations (10% each), 20%. Examination, Final Examination, 20%. For each assessment component, 50% of available marks must be achieved in order to pass the subject and have adequate skills and knowledge as required by the sequel unit NBD3101. Teams will consist of 3-4 students.

NEA4101 Environmentally Sustainable Design 2

Locations: Footscray Park.

Prerequisites: Nil.

Description: Global warming has reinforced the importance of designing green buildings with lowering the energy consumption of existing buildings. This unit of study focuses on both aspects. In the first stage of the unit, students will become familiar with principles of environmentally sustainable design as well as principles of heat transfer in buildings. Student will design green buildings. The second stage of the unit covers an introduction to building performance analysis tools (software as used by architects and engineers in compliance with energy efficiency provisions of the Building Code of Australia), computer simulation modelling of buildings including thermal and solar performance, natural ventilation, natural and artificial lighting and computational fluid dynamics (CFD). At the end of the second stage students will analyse alternative design scenarios to optimise the thermal and lighting performance of buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Deep insights into a wide range of engineering and technological approaches to the design of green buildings; 2. A critical approach to designing buildings that are energy efficient and in harmony with their surroundings; 3. An ability to model and simulate complex integrated building designs in the area of thermal performance, natural ventilation, air conditioning, solar penetration, thermal comfort, and natural/artificial lighting; and 4. Professional graphical illustration skills with which students can communicate their designs to a wide audience.

Class Contact: Forty-eight (48) hours for one semester comprising a mix of group activities, lectures, computer labs, site work and workshops.

Required Reading: Nil

Assessment: Portfolio, Team portfolio, poster and physical model which represent students' skills in green building design., 40%. Portfolio, Individual portfolio which provides documented evidence demonstrating that the learning outcomes for the subject have been achieved., 40%. Examination, End of semester examination, 20%. Additional information for Point 2 - Portfolio The portfolio will include two major parts: a skills audit and an assignment set which focuses on an existing building (nominally the student's residence). The assignment set includes benchmarking, simulation and exploration of a series of possible renovations.

NEA4201 Building Systems Design & Costing

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study integrates the knowledge gained by students in previous studies of individual building services and building construction. The main emphasis is on understanding and following construction-relevant processes, to ensure coordination of services, integration with building structure, buildability and adequate space provision for both installation and future servicing. The role of Building Information Modelling in achieving these objectives is explained. In addition, the unit introduces methods of measurement and estimating for cost control, as well for life cycle cost estimates.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. From information provided in classes and through interviews with industry practitioners, identify problems involved with coordination and buildability of individual building services and propose procedures resulting in innovative solutions; 2. After a critical review of existing practices, develop a strategy for successful integration of all building services into building structure during the design and construction stages; 3. Create an optimised design of structural and services (primarily HVAC) elements for a typical floor in a multi-storey building and provide full costing for alternatives considered; 4. Assess the use of bills of quantities and unit rates in the tendering process for cost forecasting and control the design and construction phases of capital works projects; 5. Report on and present the principles and methodology for life cycle economic evaluation and management of building-related assets; 6. Demonstrate an ability to work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 7. Demonstrate an ability to present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture3.0 hrs

Required Reading: Marsden, PK 2002 2nd Basic Building Measurement New South Wales University Press, Sydney, Australia Kirk, SJ and Dell'Isolla AJ 1995 2nd Life Cycle Costing for Design Professionals xx Notes provided by the lecturer. Class notes on University LMS.

Assessment: For each assessment component, 50% of available marks must be achieved in order to pass the subject. Assignment, Integrated building design and costing., 55%. Portfolio, Class participation/personal reflection., 15%. Examination, End of semester examination., 30%.

NEA4202 Building Fire Safety Systems

Locations: Footscray Park.

Prerequisites: NEA3103 - Hydraulic Services SystemsNEA3103 OR VAA3042

Description: This unit of study aims to give students an introduction to building fire safety engineering. Includes fire safety and protection provisions in building regulations and building codes, deemed-to-satisfy design, design to standards and performance-based design. The following topics are covered in two parts: Part A - Introduction to Building Fire Safety Engineering: Fire engineering design strategy. Fire behaviour. Pre-flashover fires. Post-flashover fires. Fire modelling with computers. Fire spread. Means of egress. Detection and suppression systems. Mechanical smoke movement. Fire safety system interfaces. Provision for fire service operations. Fire control water supplies. Building fire safety systems and relevant Australian Standards. Fire hydrant systems. Fire hose reels. Automatic fire sprinkler systems. Portable fire extinguishers. Fire safety during construction. Emergency lighting and exit signs. Part B - Fire Safety Systems Design: Hydraulic design of fire hydrant systems, fire hose reels and automatic fire sprinkler systems. Computer-aided

design using HYENA software.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appreciate the fundamentals of fire safety engineering in building design; 2. Specify fire safety features and installations appropriate to various sizes/uses of a range of residential, light industrial and commercial buildings; 3. Formulate fire safety schemes and details, and develop plans for systems maintenance; 4. Assess the involvement of fire safety authorities and the need for specialist fire safety consultants and contractors; 5. Interpret and apply existing fire safety standards and related statutory requirements in an evolving area of the building industry, and appraise the applicability of research and fire safety standards (from overseas) to Australian conditions; and 6. Participate in the fire safety design process using correct fire safety terminology.
Class Contact: Forty-eight (48) hours for one semester comprising lectures, tutorial classes and laboratory work. Includes a mix of individual and small group work.
Required Reading: Buchanan, AH Fire Engineering Design Guide, Centre for Advanced Engineering University of Canterbury Australian Building Codes Board (ABCB), 2014 Volume One NCC 2014 Building Code of Australia ABCB Publications, Canberra Standards Australia, 2005 AS2419 Fire Hydrant Installations Standards Australia Standards Australia, 2005 AS2441 Installation of Fire Hose Reels Standards Australia Standards Australia, 1999 AS2118 Automatic Fire Sprinkler Systems Standards Australia Standards Australia, 2001 AS2444 Portable Fire Extinguishers and Fire Blankets - Selection and Location Standards Australia
Assessment: Tutorial Participation, Continuous assessment, 12%. Assignment, Part A - Team work report, 13%. Assignment, Part B - Individual test/design, 25%. Portfolio, Individual portfolio, 50%. The portfolio is to feature work done in tutorials and team work assignments, including graphical and written designs and specifications detailing creative fire safety solutions appropriate to various property development scenarios, a reflective journal, and self and peer assessment. .

NEC2102 Solid Mechanics

Locations: Footscray Park.
Prerequisites: NEF1101 - Engineering Mathematics 1NEF1102 - Engineering Physics 1NEF1205 - Engineering FundamentalsENF1101 OR NEF1101, ENF1102 or NEF1102, & ENF1205 OR NEF1205
Description: Solid Mechanics is a fundamental subject in engineering and its principles and concepts provide a foundation for further learning in both broad and specialised engineering contexts. Engineers are required to design or analyse a variety of elements, components or structures that are often exposed to different loading conditions. An abstract and practical understanding of the mechanics of materials is therefore required. The abstract concepts of equilibrium and the compatibility of external and internal deformation in particular must be understood by every engineer.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify internal actions in a member including axial force, bending moment and shearing force diagrams; 2. Evaluate centroids, centre of gravity, moment of inertia of simple and composite cross-sections; 3. Determine elastic normal stresses, shearing stresses and shear flow distribution, and calculate torsion and angle of twist in simple structures; 4. List and elaborate on the mechanical properties of engineering materials; 5. Evaluate stresses and strains in two dimensions utilsing the concepts of principle stress and Mohr's circle. 6. Analyse the deflection of simple beams and failure modes of simple compression members; 7. Identify statically indeterminate structures and internal/external forces in simple two dimensional rigid frames; and 8. Formulate and solve problems by undertaking basic engineering analysis and write technical reports.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Hibbeler, R.C. (2013) 4th ed. in SI units Statics and mechanics of Materials Pearson/Prentice Hall, Singapore. Hibbeler, R.C. (2015) 14th ed. in SI units Engineering mechanics: statics Pearson/Prentice Hall, Singapore. Recommended Reading - Texts Hibbeler, R.C. (2016) "Mechanics of materials", 10th ed. in SI Units, Pearson/Prentice, Singapore
Assessment: Assignment, Homework Problems (fortnightly), 15%. Project, Project Report (10 pages,1500 words plus figures/tables), 15%. Test, Mid Semester Test (1.5 hours), 20%. Examination, End of Semester Examination (3 hours), 50%.

NEC2103 Engineering Materials & Construction

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit covers the behaviour, properties, performance and limitations of the most widely used construction materials such as concrete, steel, timber as well as other construction materials such as polymers and composites. In addition, the unit gives an introduction to construction equipment, techniques and OH&S requirements used by the Civil or Building Engineering industry.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the types, properties and applicability of materials; most commonly used in civil and building engineering construction work (i.e. concrete, steel and timber); 2. Demonstrate an appropriate knowledge of other construction and building materials masonry, aluminium, glass, polymers and composites; 3. Select the types and applications of plants, equipment and construction processes for variety of civil and building engineering construction processes; 4. Investigate materials, equipment and construction techniques for a specific project; and 5. Describe the importance of the OH&S and environmental requirements for working in a construction site with specific material, plant or project.
Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial2.0 hrs
Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. There are no required texts for this unit.
Assessment: Report, Group Numerical Type Report (2000 words approx), 25%. Report, Group Technical Report (each 1500 words approx), 25%. Examination, End of Semester Exam (3 hours), 50%.

NEC2104 Engineering Surveying

Locations: Footscray Park.
Prerequisites: NEF1201 - Engineering Mathematics 2ENF1201 OR NEF1201
Description: This unit of study covers the application of a range of surveying instruments and the techniques to be adopted. The following topics would be covered: Surveying reference and basic computations, mapping, vertical measurement and note keeping, angular measurement and note keeping, circular curves, contours and contouring, area computations for polygons, rectangular co-ordinates, computations for earth works, digital terrain models, geographic positioning systems and Victorian land title system.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use a range of surveying instruments; 2. Observe measurements in the field and keep records; 3. Set out circular curves; 4. Produce contour maps of different terrains; 5. Operate with rectangular co-ordinates and compute areas of polygonal shapes; and 6. Formulate and solve specific problems and work both

autonomously and as a member of a team.

Class Contact: Lab 3.0 hrs Lecture 1.0 hr Tutorial 3.0 hrs

Required Reading: Class Notes and additional resources on University LMS (VU Collaborate) site. Ghilani, C D & Wolf, P R. (2011) 13th Ed. Elementary Surveying: An Introduction to Geomatics New York: Pearson Education

Assessment: Practicum, Fieldwork (6 practicals at max two pages each), 30%. Assignment, One assignment (1000 words), 20%. Examination, End of semester exam (2 hour), 50%.

NEC2201 Introduction to Structural Engineering Design

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics NEC2102 or VAC2121

Description: This unit of study aims to provide a basic introduction into the design principles of structural elements. The following topics would be covered: Steel: Load calculation, dead and live loads, design loads rationale, calculation of specific loads. Design of simple structural members in tension, compression, bending and shear. Design of bolted and welded connections in simple shear or tension. Timber: Design of timber beams, columns. Nailed and bolted connections in simple shear. Other materials: Review of fundamental concepts based on Solid Mechanics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design steel elements in tension, compression, bending and shear; 2. Design steel connections consistent with the above outcome; 3. Design timber beams and columns and appropriate connection details; 4. Demonstrate a basic understanding of design fundamentals; and 5. Formulate and solve specific problems, and work both autonomously and as a member of a team.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Class Notes and additional resources on VU Collaborate.

Assessment: Test, Two (2) Class Tests (500 words each), 20%. Assignment, Four (4) Team (PBL) Project reports and oral presentations (500 words each), 50%. Examination, End of Semester Examination (2 hours), 30%. The portfolio provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio may include skills audits, laboratory activities, project reports, reflective journals, self and peer assessment.

NEC2202 Geomechanics

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics NEC2102 OR VAC2121

Description: All engineering structures are founded on or within the earth, so it is important that civil engineering students acquire a good understanding of soil and rock behaviour and their impact on such structures. This unit is designed to provide students with knowledge of basic geology, and the engineering properties and behaviour of different types of soil and rock when subjected to various degrees of weathering, moisture conditions, topographic /stratigraphic conditions, loading patterns and improvement techniques. Students will also be introduced to a range of field investigation and laboratory practices aimed at determining types and properties of soil and rock which might be present on any particular site. Key topics include: Importance of geology in engineering. Earth history, rock formation and basic structural geology. Geological maps and their interpretation. Erosion/transportation/deposition processes and soil formation. Geology and soils of Melbourne and related case studies. Classification, description and engineering properties of soil and rock, soil phase relationships, clay behaviour. In-ground stress due to gravity loads, principle of effective stress. Permeability, seepage of water through soil, flow nets and applications. Shear strength, friction angle and cohesion in various soil types under differing moisture conditions, Mohr-Coulomb strength criterion. Slope failure mechanisms and related stability analyses, methods of slope stabilisation. Earthworks and compaction of soils and crushed rock including methods, specification and field evaluation. Geotechnical site investigation including desk studies, boring/sampling/testing methods, soil/rock profile logging and reporting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Locate, evaluate and analyse basic soil / rock information from sources including websites and texts, geological maps, and laboratory and field investigations; 2. Plan a basic staged and iterative investigation for soil and rock conditions at a particular site, specifying appropriate drilling and sampling equipment, and associated laboratory tests; 3. Classify a limited number of major soil and rock types, and explain their typical applications for engineering uses including structural foundations, roads and dams; 4. Identify a number of key soil parameters, and explain how they are used to qualitatively predict the behaviour of various soil types when subject to a range of specific topographic, stratigraphic, moisture and loading conditions; 5. Solve a range of numerical problems involving the key parameters in (4) above to quantitatively determine soil behaviour when subject to conditions as above; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Smith, I. (2014) 9th ed. Elements of Soil Mechanics Wiley Blackwell A significant number of other texts, supplementary notes and tutorial materials, websites and other resources are recommended for this unit in addition to the text above. These will be indicated in the unit guide provided to students on the VU Collaborate system.

Assessment: In order to be eligible for either a pass or supplementary assessment, students must achieve at least 40% for the end-of-semester examination. Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based field assignment and report, 15%. Assignment, Assignment 2: Team-based problem solving exercise and report, 15%. Examination, End-of-semester exam (3 hours), 60%.

NEC2203 Hydraulics

Locations: Footscray Park.

Prerequisites: NEF2101 - Fluid Mechanics 1 NEF2101 OR ENF2101

Description: This unit builds on Fluids Mechanics that was covered in Semester 1. Fluid mechanics provides the theoretical foundation for hydraulics, which focuses more on the engineering applications of water and other liquids. Hydraulic topics covered in this unit include practical applications in open channel flow, such as hydraulics structures, flow measurement, river channel behaviour, erosion and sedimentation. These topics would be taught using practical hand-on lab experiments, lab demonstrations and a computer based assignment. The site visit is designed to improve the student's ability to link theory (learnt in the classes) with practical real-world situations. Topics include: Pipe flow, boundary layer theory, water hammer; Open channel flow, discharge equations for uniform flow, Specific energy and critical depth, flow transitions and hydraulic jump; Gradually varied flow, classification, water surface profile evaluation; Dimensional analysis, dimensional homogeneity, Rayleigh and Buckingham pi methods, hydraulic model studies; Hydraulic structures, culverts, broad crested and crump weirs; Flow measurements, venturi meter, orifices, sharp crested weir; River hydraulics, river sediment transport and movable bed forms, estimation of sediment loads, reservoir saltation and loss of

capacity, river training and control, bank stabilisation and channel maintenance.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply concepts of hydraulics, complemented with practical laboratory based experiments, site visit and computer labs; 2. Apply concepts of open channel flow to practical engineering related problems; 3. Use dimensional analysis to develop relationships and also for hydraulic model similitude studies; 4. Design hydraulic structures like culverts and weirs; 5. Estimate sediment loads carried by rivers.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Tutorial 1.0 hr Workshop 1.0 hr
Required Reading: Class notes uploaded on University LMS. Hamill, L. (2001) 3rd ed. Understanding Hydraulics MacMillan Press
Assessment: Report, Site visit based report - based on self selected site visit in week 9 (Report, photographs, sketches, max word limit of 1500), 10%. Assignment, Computer lab based assignment, 15%. Practicum, One Lab experiment based test, 15%. Examination, End-of-semester examination, 60%.

NEC2204 Highway Engineering

Locations: Footscray Park.
Prerequisites: NEC2104 - Engineering Surveying NEC2104 OR VAC2171
Description: The field of highway engineering is a vital part of national and international infrastructure development. This unit of study introduces students to the principles of road design and construction which can be applied in various urban and rural contexts. Students learn to perform geometric road design, including route location, super elevation, transition curves, grading and earthwork calculations. They work in small teams on real world projects which require consideration of the natural and existing built environment, OH&S compliance and established reporting protocols. Unit topics include: Earthworks including equipment, determination of quantities and costs; preparation and use of mass haul diagrams. Route location factors, route selection, horizontal alignment including circular curves and transition curves and superelevation, determination of sight distance; vertical alignment including grades and vertical curves. Pavement design methods for both flexible and rigid pavements, determination of number of equivalent standard axles, use of California Bearing Ratio. Road construction equipment capabilities. Introduction to road drainage methods, surface and subsurface drainage. Road maintenance issues and programs.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply appropriate geometric standards to the design of rural roads; 2. Demonstrate understanding of methods to determine efficient earthworks operations; 3. Conceptually map the process for designing road pavements; 4. Identify, formulate and solve emerging problems, and perform requisite design/redesign work; 5. Use a systematic approach to design and evaluate engineering solutions taking into account all relevant technical, environmental, economic and social considerations; 6. Work effectively as a member and/or leader of a team; 7. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Austroads (2010), Guide to Road Design Part 3: Geometric Design Austroads Austroads (2012) Guide to Pavement Technology Part 2: Pavement Structural Design Austroads Parker, A. (20**), VAC2072 Highway Engineering Notes, sem 2, 20** Victoria University (VU; 20** indicates current year addition)
Assessment: Assignment, Assignment 1: site investigations, 10%. Assignment, Assignment 2: geometric standards and super elevation (calculations & drawings), 10%. Assignment, Assignment 3: pavement design (calculation & drawings), 10%. Examination, Final Exam, 70%.

NEC3101 Structural Analysis

Locations: Footscray Park.
Prerequisites: NEC2102 - Solid Mechanics NEC2102 OR VAC2121
Description: Engineers are required to design or analyse a variety of structures that are often exposed to a variety of loading conditions. Therefore an understanding of key analysis methods for statically determinate and indeterminate trusses, beams and frames should be mastered. These include, the method of virtual work for determination of deflections and rotations, the 'stiffness' method of analysis (including the equations of slope deflection and numerical approximation by moment distribution) for beams and rigid frames, the matrix representation of the stiffness method for solution by digital computation and the flexibility method of analysis for statically indeterminate trusses, beams and rigid frames. Experience in approximate analysis of structures and in structural 'modelling' and analysis using commercial linear finite element analysis computer program(s). An introduction to stability analyses of rigid frames and frame buckling.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate structural deflections and rotations for a range of structures (modelled as connected linear elements), which behave in a linear and elastic manner; 2. Evaluate internal axial forces, shearing forces and bending moments for a range of determinate and indeterminate structures (modelled as connected linear elements), which behave in a linear and elastic manner; 3. Create and analyse structure models using a commercial computer program, where structures are modelled as connected linear elements which behave in a linear and elastic manner; 4. Create and analyse structure models using a commercial computer program, where structures are modelled as connected linear elements within which, at ultimate load, compression members may buckle; 5. Compare solutions obtained by analysing structures using commercial computer programs to those obtained by classical (manual) methods of analysis, and to understand the limitations of both approaches to structural analysis; 6. Appraise a range of approximate solutions for common structures; and 7. Solve problems, undertake standard structural Engineering analyses and write technical reports.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Hibbler R.C., 2005 6th edition Structural Analysis Pearson International
Assessment: Assignment, Portfolio of computer analyses (1000 words), 20%. Assignment, Structural model project (1000 words), 15%. Examination, Mid-semester test (1000 words), 30%. Examination, Final Exam (2000 words), 35%. The total combined assessment word equivalence is approximately 4-5000 words.

NEC3102 Geotechnical Engineering

Locations: Footscray Park.
Prerequisites: NEC2202 - Geomechanics NEC2202 OR VAC3061
Description: All engineering structures are founded on or within the earth, and such foundations must be structurally sound, stable (safe), serviceable and cost effective. They must not "break the earth", nor exceed reasonable settlement limits. It is important therefore that civil engineering students develop the key skills necessary to analyse and design different types of foundations and other earth-related structures in a range of different soil and rock types so as to satisfy these criteria. Such foundations and structures include both shallow and deep footings, slabs, embankments, and retaining walls of various types. Students should also understand

a number of key construction issues such as dewatering, excavation stabilization, and soil improvement, and be able to design systems for same. On-going visits made over several weeks to sites where significant foundation construction work is being undertaken form a key part of this unit and are aimed at helping students acquire skills and understanding as indicated above. Key topics include: Introduction to foundation design. Bearing capacity of shallow pad and strip foundations on fine and coarse-grained soils. In-ground stress distribution due to applied loads. Foundations on reactive soils. Pile foundations including types and loading conditions. Load capacity of single driven and bored piles, and of pile groups. Immediate settlement. Consolidation theory and consolidation settlement of foundations on fine-grained soils. Settlement rates and allowable settlement. Lateral stresses in the ground. Active and passive stress states. Analysis and design of gravity and cantilever retaining walls. Introduction to construction issues including ground stabilisation and dewatering. Types and uses of geosynthetic materials.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain key requirements for safe, serviceable and cost effective foundations for several different types of structures in or on a range of soil and rock types; 2. Locate, evaluate and use specific site soil / rock information from websites, geological maps, laboratory / field investigations and reports for design purposes; 3. Analyse requirements and design shallow foundations (including pad and strip footings and slabs) and deeper pile foundations for a range of common structures in different earth / rock profiles; 4. Explain earth pressure theory and design retaining walls and related structures when subjected to a range of backfill soil types and moisture conditions; 5. Explain the principles and carry out basic design work related to dewatering, soil improvement systems and the use of geosynthetic materials; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Lecture3.0 hrsTutorial1.0 hr

Required Reading: Smith, I. (2006) 8th edn, Elements of Soil Mechanics, Blackwell Science Lechte, P. (20**), NEC3102 Geotechnical Engineering - Supplementary Notes and Tutorial Problems, Sem 2, 20** Victoria University (VU; 20** indicates current year edition) A significant number of other texts, websites and other resources are recommended for this unit in addition to the materials above. These will be indicated in the unit guide provided to students.

Assessment: In order to be eligible for either a pass or supplementary assessment, students must achieve at least 40% for the end-of-semester examination. Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based field site visits and report, 15%. Assignment, Assignment 2: Team-based problem solving / design and report (may be split into 2 parts), 15%. Examination, End-of-semester exam (3 hours), 60%. As well as the LO and GC alignments noted, assessment items above are aligned with EA stage 1 competencies as follows: #1:- 1.1 and 1.3 #2:- 1.3, 1.6, 2.2, 3.2, 3.4, 3.5 and 3.6 #3:- 1.3, 2.2, 3.2, 3.4 and 3.6 #4:- 1.1, 1.3 and 2.2.

NEC3103 Hydrology and Water Resources

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC2203 OR VAC2042

Description: This unit is designed to enable students to acquire an understanding of the theoretical principles in engineering hydrology and water resources engineering. This unit will enable students to acquire theoretical knowledge and critical thinking skills and apply these to problems. This unit also provide students an opportunity to enhance their oral and written communication skills as well as other Engineers Australia professional capabilities. Topics include; Hydrologic cycle, rainfall and runoff routing, Urban Drainage design, Floodplain management, Water resources development, Computer software including RORB and SOURCE.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and synthesise a range of numerical problems in urban hydrology, rainfall/runoff routing, flood frequency, urban drainage, flood plain, and water resources management; 2. Conceptually map and design urban drainage networks and recommend and justify computations; 3. Recommend a design flow volume required in an urban subdivision design using computer software RORB 4. Simulate water supply system using computer software SOURCE; 5. Initiate, coordinate and manage team projects in water resources management and to recommend and present the optimum solutions professionally.

Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial2.0 hrsForty-eight (48) hours for one semester comprising, lectures (2hrs X12 weeks), computer labs (2 hrs x 8 weeks), Tutorials (2 hrs x4 weeks), mid-semester test (1 hour during week 6/7 lecture period) and examination (2 hour).

Required Reading: Class notes can be accessed from VU Collaborate.

Assessment: Assignment, SOURCE portfolio, 10%. Assignment, RORB/MiRORB, 15%. Test, Mid-semester test, 25%. Examination, End of Semester Exam, 50%.

NEC3201 Hydraulic Engineering

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC2203 OR VAC2042

Description: Provision of adequate, safe and appealing water supplies for urban and rural communities has long been a key role for civil engineers. Similarly the need for sustainable and increased food supplies to meet the needs of a growing global population is well established, and civil engineers again play a major role in achieving this by designing and constructing irrigation and land drainage systems. Accordingly, this unit of study aims to give students a basic understanding, problem solving and design skills in the areas of water supply and irrigation / drainage engineering. Students are required as part of the unit to undertake a site visit and inspection of relevant infrastructure, and write a report on same. Key topics include: Urban Water Supply Schemes: Demand assessment and management, supply sources, dam types/spillways/outlet works/construction and safety issues, groundwater development works, water quality requirements and various types of treatment to satisfy these, service storage, pumping stations, reticulation system arrangements/layout and manual/computer analysis, pipeline design and construction. Irrigation and drainage: Purpose and principles of irrigation, irrigation water quality, channel design and structures, flood, furrow, sprinkler and trickle irrigation layout and design principles, need for, principles and design of appropriate land drainage systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify typical levels of demand in terms of both quantity and quality for urban water supply and irrigation schemes, and the factors which influence them; 2. Identify, describe, locate information, solve relevant numerical problems, and carry out basic design of key elements for water source development schemes including dams, groundwater bores, pump stations, transfer conduits and service storages; 3. Identify and explain key water quality parameters and supply standards, and describe, solve relevant numerical problems, and carry out design of key elements for basic water treatment plants; 4. Determine appropriate elements and layouts of town water reticulation systems, and design basic systems using manual and computer methods; 5. Identify, describe, solve relevant numerical problems,

determine layouts and carry out basic design of key elements in irrigation and drainage schemes including supply channels, flood, sprinkler and drip systems, and both surface and subsurface drainage systems; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Lechte, P. (20**), NEC3201 Hydraulic Engineering - Course Notes and Tutorial Problems, Sem 2, 20** (VU; 20** indicates current year edition)

Assessment: In order to be eligible for either a pass or supplementary assessment, students must gain at least 40% on the end-of-semester examination Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based problem solving / design exercise and report (may be in 2 parts), 20%. Assignment, Assignment 2: Team-based site visit and report, 10%. Examination, End-of-semester exam (3 hours), 60%.

NEC3202 Civil Engineering Design 1

Locations: Footscray Park.

Prerequisites: NEC2203 - Hydraulics NEC2204 - Highway Engineering NEC2203 OR VAC2042 & NEC2204 OR VAC2072

Description: Along with planning, investigation, construction, and management, design work is a key element of civil engineering. This unit of study aims to give students design practice and skills in a number of areas of civil engineering, and to further develop a range of more generic skills including teamwork and communication. Students will work in small design teams (typically 3-4 students) to carry out two to four (2-4) designs of varying focus and complexity, but drawn mainly from the areas of water and road engineering. Each design will typically involve data gathering, analysis, calculations, preparation of engineering drawings, and a report. To increase student exposure to current real-world practice and requirements, at least one of these designs will often be offered and run by an external civil engineering organisation in collaboration with the unit coordinator. Students will also prepare and deliver an individual oral presentation on one of the designs performed during the semester.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify key issues in a typical civil engineering design problem, formulate the problem, and use a systems approach to solving it; 2. Locate, evaluate and use additional data and information from a variety of sources relevant to a particular design; 3. Carry out preliminary designs for projects in the broad fields of water and road engineering; 4. Evaluate design options against technical and other criteria; 5. Work effectively as a member and/or leader of a small design team; and 6. Demonstrate good communication skills, through team discussion, oral presentation, and design reports.

Class Contact: Lab 1.0 hr Lecture 1.0 hr Tutorial 3.0 hrs

Required Reading: Reading material relevant to particular designs will be discussed with individual supervisors in seminars at the start of each design.

Assessment: Assignment, Two to four team-based design reports, 60%. Presentation, 6-7 minute oral presentation on aspects of a particular design, 10%. Examination, 1.5 hour end-of-semester exam, 30%. (1) The time allocated to individual designs may vary from year to year, depending on the design presenters and level of complexity. Hence 2 larger designs, 3 intermediate or 4 smaller designs may be offered in a particular year. (2) Students must gain at least 40% in the exam to be eligible for a pass or supplementary assessment. .

NEC3203 Structural Engineering Design 1

Locations: Footscray Park.

Prerequisites: NEC2201 - Introduction to Structural Engineering Design NEC3101 - Structural Analysis NEC2201 OR VAC2092; NEC3101 OR VAC3021

Description: Structural Engineering is a key stream in most civil engineering courses. Engineers are required to design a variety of structures under various loading regimes using simplified codes methods or alternatively more accurate techniques. More specifically this unit of study aims to give students a fundamental understanding in the design of reinforced concrete structural elements. The following topics are covered: Design of reinforced concrete simply supported and continuous beams in bending, shear and torsion. Serviceability design of beams including deflection and crack control. Design of one-way and two-way slabs using method of coefficients. Analysis of Flat slabs using simplified strip and equivalent frame methods, including punching shear. Reinforced concrete column and wall design. Introduction to strut and tie method, pre-stressed concrete and footing design.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design reinforced concrete beams in both strength and serviceability states (for bending, shear, torsion, deflection and crack control); 2. Analyse and design reinforced concrete one-way and two-way slabs (including flat plates); 3. Analyse and design members in combined compression and bending (i.e. columns and walls); 4. Demonstrate an in-depth understanding of relevant Australian codes of practice in the design of concrete structures; 5. Exercise critical thinking and judgement in formulating and solving specific concrete design problems; and 6. Work both autonomously in solving problems and as a member of a team in undertaking design tasks.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: The prescribed text 1 is supplemented by resource material placed on the University website (VU Collaborate). Loo, Y.C. and Chowdhury, S.H. (2013) 2nd ed. Reinforced & Prestressed concrete: Analysis and design with emphasis on the application of AS3600-2009 Cambridge Press Standards Australia 2009 AS3600-2009 Concrete structures Standards Australia Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998) Concrete structures Longman, Melbourne Texts 2 and 3 are recommended reading materials.

Assessment: Test, Mid-semester skills audit (1.5 hours equivalent to 1000 words), 20%. Test, Homework Problems (weeks 2 - 8 only), 20%. Project, PBL project (10 pages, 1500 words plus figures/tables), 20%. Examination, End of Semester Examination (3 hours equivalent to 2000 words), 40%.

NEC4082 Environmental Engineering 2

Locations: Footscray Park.

Prerequisites: N/A

Description: This unit is designed to enable students to (i) achieve sound knowledge and understanding of general environmental issues and the ability to develop and implement systems and procedures to ensure compliance with legal environmental requirements, and (ii) appreciate the importance of risk management and sustainable development. Specifically, this unit provides students with specialised skills and expertise in solid and hazardous waste management, air and noise pollution management, and coastal engineering. It also requires students to engage in critical evaluation and debate on broader sustainability and risk management issues. Assignments will help students to practice their skills, and communicate their ideas and results in a clear and concise manner. Students are required as part of the unit to undertake a site visit and inspection of coastal structures in order to develop understanding of complex real world issues in coastal engineering, and to

demonstrate possible solutions for particular related problems. Topics include: Part A: Overview of a range of environmental problems and introduction to Basic Ecology. Solid and Hazardous Waste Management: sources, types/quantity of wastes, hierarchy of management options, collection methods and transfer stations, disposal by landfill and other methods. Air Pollution: types, causes and effects, clean up and control. Noise Pollution: sources and effects, solutions to noise problems. Also, Environmental Management including auditing, risk assessment and sustainable development issues. Part B: Coastal Engineering: coastal forms, wave generation and height prediction, wave phenomena, sediment transport and impact, beach erosion/rehabilitation, marinas and fixed or floating breakwaters, coastal management.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically assess and discuss key issues relating to ecology, energy and general environmental management, solid / hazardous waste management, air and noise pollution management, and coastal engineering; 2. Identify and solve problems related to the areas above based on scientific and engineering principles and taking account of the likely multi-faceted components of such problems 3. Develop and evaluate solutions to a range of such problems, using a systems approach and recognising the integrated nature of engineering responsibilities; 4. Produce high quality written and oral technical reports as part of a small team.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: No required text books, but several recommended in detailed unit guide. Lecture notes and other study materials will be available on VU Collaborate.

Assessment: Test, Class Test covering materials from weeks 1-4 (0.5 hour), 10%. Assignment, All students to participate as team members in a series of formal in-class debates on issues of environmental importance, 15%. Report, Coastal Engineering oral and site visit report- Maximum of eight A4 pages, 15%. Examination, End-of-Semester Examination (3 hours), 60%.

NEC4101 Environmental Engineering 1

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC3201 - Hydraulic EngineeringNEC2203 OR VAC2042 (but prior completion of NEC3201 Hydraulic Engineering is also strongly advised)

Description: Water treatment, wastewater collection, treatment and reuse, water pollution control, and the assessment of project environmental impacts are key elements in maintaining public health and protecting the environment. Civil engineers typically undertake and have responsibility for major projects in each of these areas. This unit of study aims to give students a basic understanding, problem solving and design skills in each of these facets of civil engineering. Students are required as part of the unit to undertake a site visit and inspection of relevant infrastructure, and write a report on same. Key topics include: Reaction kinetics and reactors. Wastewater management overview. Wastewater characteristics and estimation of wastewater flows. Types, design, maintenance and rehabilitation of collection systems. Basic microbiology. Wastewater treatment plant types and applications, unit processes involved and design of components. Advanced wastewater treatment. Introduction to industrial wastewater treatment processes. Land treatment methods and wastewater reuse. On-site wastewater treatment. Water pollution and quality changes in rivers, estuaries and lakes. Point and non-point source water pollution and control. Urban runoff quality and its management. Water quality modelling, overview of available models, and use of SOURCE software. Environmental impact scoping and assessment, community consultation programmes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop basic design plans for key elements of different types of wastewater collection systems, treatment plants and reuse systems; 2. Explicate and solve, manually or via appropriate software packages, a range of water pollution and water sensitive urban design (WSUD) problems; 3. Analyse potential environmental impacts for typical civil engineering projects, and evaluate solution options against technical, environmental, economic and social criteria; and 4. Produce high quality written technical reports as part of a small team.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: No prescribed text books. The study materials will be available on VU Collaborate or as directed by the Lecturer.

Assessment: Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based problem solving/design exercise and report (may be in 2 parts), 20%. Assignment, Assignment 2: Team-based site visit and report (10 pages per group), 10%. Examination, End-of-semester exam (3 hours), 60%.

NEC4102 Structural Engineering Design 2

Locations: Footscray Park.

Prerequisites: NEC2201 - Introduction to Structural Engineering DesignNEC3101 - Structural AnalysisNEC3203 - Structural Engineering Design 1NEC2201 OR VAC2092 & NEC3101 OR VAC3021 & NEC3203 OR VAC3192

Description: This unit introduces the analysis and design of steel and steel-concrete composite structures and the finite element method. Topics dealing with the analysis and design of steel and composite structures include: wind loads, steel webs in shear and bearing, steel members under axial load and bending, steel connections, plastic analysis of steel beams and frames, composite slabs, composite beams, and composite columns. Topics devoted to the finite element method include: truss finite element, beam finite element, triangular finite element, and analysis of 2D and 3D structures using the finite element analysis program Strand7.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Estimate wind loads; 2. Analyse and design steel members under combined actions and steel connections; 3. Analyse steel beams and simple frames using the plastic method; 4. Analyse and design composite slabs, composite beams and composite columns; and 5. Analyse truss, frame and continuum structures using the finite element analysis method and software Strand7.

Class Contact: Forty-eight (48) hours for one semester comprising lectures and tutorials.

Required Reading: Liang, Q. Q. (2014). Analysis and Design of Steel and Composite Structures, London: CRC Press, Taylor and Francis Group. Standards Australia. (2003). Australian Standards for Civil Engineering Students: AS HB2.2 Structural Engineering, Sydney: Standards Australia. Recommended reading: Cook, R. D., Malkus, D. S., Plesha, M. E. and Witt, R. J. (2001). Concepts and Applications of Finite Element Analysis, 4th edition, New York: John Wiley & Sons.

Assessment: Assignment, Assignment 1 (Report maximum 35 A4 pages), 25%. Assignment, Assignment 2 (Report maximum 35 A4 pages), 25%. Examination, Final Exam (3 hour restricted exam), 50%. Important assessment information: 1. Late submission of assignments after the due date without the prior approval of the examiner will incur a penalty of 5% of the total marks for the assignment for each working day. 2. To obtain a passing grade in this unit, a student must obtain at least 50% of the total weighted marks for the unit and 40% of the total marks for each item of assessment in the unit. 3. The final grades for students will be given based on the weighted aggregate of the marks achieved for each of the assessment items in the unit. 4. The final exam is a restricted exam. The only allowable materials that

students may use in the restricted exam for this unit are: the textbook entitled "Analysis and Design of Steel and Composite Structures" by Qing Quan Liang; non programmable calculators. Students are not allowed to take into the exam room any form of notes or information other than the stated allowable materials.

NEC4172 Urban Development and Transportation

Locations: Footscray Park.
Prerequisites: NEC2204 - Highway EngineeringNEC2204 OR VAC2072
Description: This unit covers areas of sustainable urban land development and transportation systems including biophysical and socio-economic data collection and inventories, land capability analysis, planning processes and issues including population density, city infill vs peripheral development, infrastructure and servicing requirements, open space/green city/urban forest concepts, energy and water conservation issues, residential subdivisions and appropriate street designs. It also focuses on demand for transport and the significance of transport and freight movement to the economy; road safety issues; transport planning techniques including trip generation, trip distribution, mode split and trip assignment models; traffic engineering aspects including flow theory, road capacity, headways, gaps and speed analysis; intersection analysis and use of SIDRA program to aid design and analysis of signalised intersections; traffic survey methods and analysis; local area traffic management studies; travel demand management.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Locate, evaluate and analyse a wide range of data relevant to the design and layout of both greenfield and infill urban developments; 2. Develop broad scale plans for such developments incorporating appropriate residential, commercial, industrial, open space / recreational areas and transport networks; 3. Prepare detailed layout plans including service and traffic management arrangements for residential subdivision street schemes; 4. Use a range of transport planning techniques including traffic surveys and analysis, demand assessment and management, modal split and trip assignment modeling, freight needs assessment, and signalized intersection modeling as an aid to design; 5. Evaluate plans and solutions to problems as above against technical, environmental, economic and social criteria; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Evans, G. (20**), NEC4172 Urban Development and Transportation Notes, sem 2, 20**, (VU; 20** indicates current year edition). If these notes are not available, the Lecturer will provide Teaching and Learning material as required.
Assessment: In order to be eligible for either a pass or supplementary assessment, students must gain at least 40% on the end-of-semester examination. Assignment, Team-based field assignment, 20%. Assignment, Team-based design/modelling assignment, 20%. Examination, End-of-semester exam (3 hours), 60%.

NEC4201 Civil Engineering Design 2

Locations: Footscray Park.
Prerequisites: NEC3102 - Geotechnical EngineeringNEC3201 - Hydraulic EngineeringNEC3202 - Civil Engineering Design 1NEC4101 - Environmental Engineering 1NEC3102 OR VAC3062 & NEC3201 OR VAC3042 & NEC3202 OR VAC3031 & NEC4101 OR VAC4081
Description: Graduate Civil Engineers in industry are expected to undertake an increasing range of complex design tasks that require a comprehensive range of skills often with minimal training and assistance. To prepare students for this challenge this unit provides practical experience in design of two to four (2-4) civil engineering projects related to water/wastewater/stormwater treatment, pumping and gravity reticulation systems (hydraulics), hydrology & water resources, roads, geotechnical, and transportation engineering. External Civil Engineering Organisations and Consultants are invited to present authentic and contemporary engineering design project to enhance student learning and confidence. Students will apply engineering fundamentals and project management concepts learnt during the course to complete the design modules. The unit also covers the development of professional engineering skill-attributes such as communication and interpersonal skills, teamwork, Internet research skills, formulating databases and technical report writing. Depending on the project, students will get the opportunity to gain effective use of common engineering software such as AutoCAD, numerical modelling, project planning, budgeting/costing, and scheduling and resource allocating techniques.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate the capacity to conduct real-world civil engineering design problems or projects; 2. Identify design problems, propose solutions and complete associated design work in a number of civil engineering disciplines; 3. Research and locate relevant design information and data to inform resolution of design problems; 4. Conceptually map and adopt a system approach to design and evaluate the feasibility of solutions taking into account technical, environmental, economic and social criteria; 5. Work effectively as a member and/or leader of a design team; 6. Demonstrate sound communication skills in preparing requisite technical reports, contributing to team discussions and making oral presentations.
Class Contact: Forty-eight (48) for one semester comprising design workshops / seminars and student team design work.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.
Assessment: Assignment, Two parallel design projects (contact time 12 hours each) – Reports with individual peer review reflective statements – (2000 words each), 25%. Assignment, Design project (contact time 24 hours each) – Reports with individual peer review reflective statements – (2000 words each), 25%. Presentation, Oral presentation/s – 6-8 minutes (based on design assignments 1, 2 or 3) – Individually assessed, 10%. Examination, Final Examination (two (2) hours), 40%. Students will work in teams of 3-4 students on four designs with a group project report worth10% each . Students will deliver one oral presentation (6 minutes) on one of the designs which is worth 10%. The portfolio will normally include skills audit results and design reports including technical calculations, but may also include a reflective journal, workbook(s), and self and peer assessment with a maximum of 4 pages. Further details on portfolio components will be issued to students during the first week of classes. Two hour final exam covering all four designs worth 40%. .

NEE2101 Electrical Circuits

Locations: Footscray Park.
Prerequisites: NEF1101 - Engineering Mathematics 1NEF1205 - Engineering FundamentalsNEF1102 OR ENF1102 & NEF1205 OR ENF1205
Description: This unit focuses mainly on Alternating-Current (AC) circuit analysis. A revision on DC circuit analysis will be given in the beginning of the semester. Definitions of instantaneous power, the load convention, active electrical circuit elements (sources) and passive electrical circuit elements (sinks) will then be introduced. Time domain voltage-current relationships of ideal capacitors and ideal inductors are explored. These will lead to the calculation of energy storage in a

capacitor and an inductor. Analysis of simple RC and RL circuits in time domain will then be covered. Steady-state sinusoidal analysis of series RL, RC, and RLC circuits will be performed with phasors and complex numbers. The concepts of impedances, admittance, average power, RMS values, and crest and form factors will also be covered. The Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, Norton's theorem, and equivalent circuits will be emphasised. For applications in the power engineering area, students will learn to calculate real power, reactive power, complex power, and power factor along with power factor correction for single phase and balanced three-phase circuits. For applications in the electronic engineering area, circuits involving Transformer Rectifier Units will be treated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Provide Comprehensive analysis of RC and RL circuits; 2. Demonstrate knowledge and competency in the analysis of simple AC circuits by Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, and Norton's theorem; 3. Differentiate the concepts of frequency, impedance and admittance as they relate to AC circuits; 4. Demonstrate knowledge and competency in the analysis of balanced three-phase AC circuits; 5. Distinguish a range of circuits with operational amplifiers such as inverting amplifiers, non-inverting amplifiers, comparators, buffer and summing amplifier circuits; and 6. Demonstrate knowledge and competency in the analysis of transformer rectifier units.

Class Contact: Lecture1.0 hrTutorial1.0 hrForty Eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: Alexander, C.K. and M.N.O. Sadiku., (2013) 5th ed. Fundamentals of Electric Circuits, McGraw-Hill

Assessment: Test, Mid-semester test, 20%. Laboratory Work, Laboratory reports, 20%. Examination, End of semester exam, 60%.

NEE2102 Computer Systems

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to computer programming using a high level language (C). The unit describes the overview of a typical microcomputer system including the program creation process (for an embedded microcontroller). The unit focus is on creating computer programs that interact with the outside world using microcontroller PORTS and simple sensor/actuator interfacing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the architecture and program creation process for a small embedded microcontroller; 2. Describe the relationship between a high level programming language (C), assembler language and low level machine code; 3. Convert numbers between bases (decimal, binary and hexadecimal forms), perform binary and hexadecimal arithmetic and determine the permissible range of a number (signed and unsigned) given a word length; 4. Write programs in the C language to solve problems that include use of selection and repetition structures, create arrays, store and manipulate data, employ library and user created function calls, create and manage pointers and simple data structures; 5. Write C programs for a microcontroller that respond to external and internal interrupts and maintain a simple "real-time" flow and interface to common actuator and display devices including 7-sement displays, LCDs, DC, stepper and servo motors and common sensors including:- temperature, pressure/force, light intensity and motion; and 6. Embedded C programs onto a small micro-controller and connect to external sensors and actuators.

Class Contact: Lab2.0 hrsLecture1.0 hrTutorial1.0 hr

Required Reading: Kochan, S.G. (2014) 4th ed. Programming in C Addison-Wesley

Assessment: Laboratory Work, Six (6) Laboratory Based Problem Solving Sessions, 20%. Test, Mid-semester Test, 20%. Examination, End of Semester Examination, 60%.

NEE2103 Linear Analysis for Electrical Engineers

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2NEF1201 OR ENF1201

Description: This unit explores in details linear analysis in time domain and frequency domain that are important for electrical and electronic engineers. The topics to be covered include integration of simple functions of two real variables (excluding advanced topics like line integrals, contour integrals, Divergence theorem and Stokes' theorem), vector and function spaces and their applications in the analysis of electrical and electronic systems. Trigonometric Fourier series will be presented as the least-square optimal solution of an approximation problem. The orthogonal property of its basis functions and the corresponding practical implications are to be emphasized. Fourier series in exponential form will also be covered. Fourier transform will be treated as the aperiodic generalization of Fourier series in exponential form. Signal analysis for energy signal and power signal will be introduced and applied to the computation of energy spectrum and power spectrum for simple signals. Laplace transform of exponential order signals will be treated as the generalization of Fourier transform. Conditions under which Fourier transform can be obtained from Laplace transform will be stated and explained. Inverse Laplace transform will be obtained through the use of partial fractions and a Table of Laplace transforms. Solution of initial-value problems for second-order linear ordinary differential equations with constant coefficients will then be covered. The problem of solving a system of linear algebraic equations with m equations and n unknowns will be addressed via Gaussian elimination method. After introducing the matrix-vector representation of a system of m linear algebraic equations with n unknowns, row reduction and transformation with elementary matrices will be treated together with elementary matrix operations. The concepts of a linearly independent set of vectors, vector space and subspaces, spanning set of vectors, basis vectors and the dimension of a vector space will then be introduced. This will allow the concepts of row space, column (or range) space, rank and nullity of a matrix to be introduced naturally. The conditions under which no solution exists, a unique solution exists, and an infinite set of solutions exists will be stated and explained. The advantage of adopting a set of orthonormal basis vectors in practical problems will be emphasized. Determinant and its applications will be outlined but will not be emphasized. Finally, eigenvectors will be introduced as directional-invariant vectors with respect to a linear transformation. Examples of matrices with repeated eigenvalues and complex-conjugate eigenvalues will be given but only matrices with simple real eigenvalues will be emphasized. Facts related to eigenvalues of Hermitian matrix and eigenvectors corresponding to distinct eigenvalues will be stated and illustrated with examples, The method of determining eigenvalues and eigenvectors will be employed to solve a system of first-order linear ordinary differential equations with constant coefficients, The geometrical structure of the solution will be illustrated on phase space for second-order systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Illustrate knowledge and technical competency in the analysis of systems of m linear algebraic equations with n unknowns; 2. Justify theory and practice based understanding of the process of signal decomposition and synthesis through calculations related to Fourier series and Fourier transforms; 3. Apply and adapt knowledge and technical competency in calculations related to Laplace transform and

inverse Laplace transform to solve initial-value problems; 4. Apply and adapt knowledge and technical competency in calculations related to Laplace transform and inverse Laplace transform to solve systems of first-order linear ordinary differential equations with constant coefficients.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Dyke, P. (2014) 2nd ed. An Introduction to Laplace Transforms and Fourier Series Springer-Verlag Strang, G. (2009) 4th ed. Introduction to Linear Algebra Wellesley-Cambridge Press
Assessment: Test, Semester Test 1, 10%. Test, Semester Test 2, 15%. Test, Semester Test 3, 15%. Examination, End-of-Semester Examination, 60%.

NEE2104 Sports Technology Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit uses a fun and exciting design problem to introduce students to systematic engineering design methods for solutions in sports technology. The first part of the unit will cover the fundamental phases of engineering design, human factor considerations and CAD software required for physical design of the solution. Design considerations from materials, cost, technology, ethics and culture will be covered with the design problem as an example. In the second part, students will be introduced to fundamental aspects of electronics, sensors and embedded programming while working in groups to design the prototype solution. Examples of these concepts applied to other sports technology will be provided throughout the unit. Students will be required to deliver a working prototype as part of an engineering team.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Assess and articulate the ergonomics and human factors as applied to physical considerations in system design; 2. Apply basic knowledge in electronics, sensors and microcontrollers for measurement system design; 3. Systematically apply design methodology, incorporating engineering design phases and solution requirements; 4. Work individually and collaboratively, as both a team member and leader, to complete tasks and evaluate own and others' performance using prescribed methods; 5. Communicate effectively with others orally and in writing;
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: Pahl, Gerhard, and Wolfgang Beitz. (2013) 1st ed. Engineering design: a systematic approach Springer Science & Business Media
Assessment: Laboratory Work, Six (6) Labs (2 hours each), 30%. Presentation, Oral presentation (20 minutes per group) and demonstration of design project, 10%. Report, Three (3) group reports (3000 words max. each), 60%.

NEE2105 Introduction to Data Analytics

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces students to the fundamentals of data analytics, data collection and current analytics software used in industry. Application focus will be given to data obtained from sports such as game statistics, player stats, team stats and historical sports data. The unit will cover fundamental concepts on data analytics, big data, data discovery, data preparation, model planning and model building. The importance of ethical data collection and data privacy will be emphasized with respect to human subject data. Basic statistical analysis tools such as moments of a distribution, power, sample sizes and differences of means will be covered with respect to analysis of example data sets using popular software.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the fundamental concepts in data analytics including data preparation, model planning and model building; 2. Interpret basic statistical descriptions of data and cite the underlying assumptions; 3. Calculate statistical descriptors using data analytics software; 4. Articulate the importance of data privacy and the ethics behind human data collection.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: Runkler, Thomas A., 2016 2nd Data Analytics: Models and Algorithms for Intelligent Data Analysis Springer-Verlag
Assessment: Laboratory Work, Six (6) Laboratory (Computer and Practical) (2 hours each), 30%. Test, Mid Semester (1 hour), 20%. Examination, Final Exam (3 hours), 50%.

NEE2110 Engineering Design and Practice 2A

Locations: Footscray Park.
Prerequisites: Nil.
Description: This is a PBL unit in which students work in teams to formulate responses to given problems specifically designed to integrate the learning and content from ENE2103 and ENE2102. Student teams will be coached and mentored by an Electrical Engineering staff member whilst resolving these problems. Staff from the ENE2103 and ENE2102 units will advise students with technical aspects of the problems. A language and communication staff member will assist with the development of communications skills. Staff members from other Colleges will provide workshops to assist students with the development of generic skills. This unit provides students with the opportunity to collaboratively apply the wide-ranging technical, creative and conceptual skills developed throughout the year with creativity, initiative and personal responsibility.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contextualise science and engineering fundamentals through problem solving and by utilising a systems approach; 2. Demonstrate specialised knowledge and technical competence in finding creative, sustainable and ethical solutions to allocated problems; 3. Collaborate effectively as an individual in diverse teams, with accountability for personal and team accomplishments; 4. Integrate Occupational Health and Safety (OHS) and professional responsibilities of engineers in problem solving; 5. Locate, evaluate, and use information effectively in the solution of allocated problems; and 6. Communicate solutions clearly (orally and in writing) to professional and non-professional audiences.
Class Contact: Lab 1.0 hr Lecture 1.0 hr Tutorial 1.0 hr
Required Reading: Nil text required.
Assessment: Presentation, Two (2) Oral Presentations, 20%. Project, Project Demonstration, 10%. Report, Two (2) Reports, 20%. Examination, End of Semester Examination, 50%.

NEE2201 Linear Systems with Matlab Applications

Locations: Footscray Park.
Prerequisites: NEF1201 - Engineering Mathematics 2NEE2101 - Electrical CircuitsNEF1201 OR ENF1201 & NEE2101 OR ENE2103
Description: This unit treats both transient and steady-state analysis of linear time-invariant systems by using Fourier and Laplace transform methods. In addition to periodic signals, signals represented by singularity function will also be included as forcing functions. The application of system concepts, which include transfer functions, poles and zeros, frequency response functions, and state variables, will be emphasised.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Comprehensive theory and practice based understanding of Fourier series, Fourier transforms, and Laplace transforms to the analysis of signals and linear time-invariant systems; 2. Demonstrate the ability to apply the Fourier series and Fourier transforms to the frequency-domain analysis of linear time-invariant systems; 3. Competently apply the Laplace transforms to the time-domain analysis of linear time-invariant systems described by linear differential equations; 4. Competently utilise the Laplace transforms in the time-domain analysis of linear time-invariant systems described by state variables; and 5. Fluently employ MatLab commands and Simulink to analyse and evaluate linear time-invariant systems using Fourier series, Fourier transforms, and Laplace transforms.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Alexander, C.K. and M.N.O. Sadiku, 2013, 5th edition, Fundamentals of Electric Circuits, McGraw-Hill Strum, R.D. and D.E. Kirk, 2000 Contemporary Linear Systems using MatLab Brooks/Cole

Assessment: Test, Semester tests, 20%. Report, Laboratory reports, 20%. Examination, End-of-semester examination, 60%.

NEE2202 Electronic Systems

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical Circuits

Description: The digital electronics section of the unit includes an examination of simple logic gates and applications including the description of circuit operation in truth table form, the derivation and manipulation of Boolean equations along with the Karnaugh Map reduction technique. Circuit implementation techniques using simple logic gates and universal gate sets are examined along with simple asynchronous (ripple) counting circuits. Student designs are tested in logic simulation software and implemented on Field Programmable Logic Arrays (FPGA). The analog electronics section of the unit involves the study of PN and Zener diodes and their electrical characteristics and applications. The small signal equivalent circuits of Bipolar and MOSFET are introduced along with applications including the analysis and design of single stage BJT and CMOSFET amplifier circuits and linear and switching power supplies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Construct truth tables, formulate logic expressions, minimize logic expressions using Boolean Algebra and Karnaugh maps; 2. Design and construct simple combinational logic circuits in Sum of Products (SOP) and Product of Sums (POS) forms using simple logic gates; 3. Design and construct sequential (ripple) logic digital circuits using D and T flip-flops and simple logic gates; 4. Implement logic circuits through the use of a Computer Aided Design package and Field Programmable Logic Arrays (FPGA); 5. Describe the characteristics of semiconductor devices (Diodes, Bipolar and Metal Oxide Transistors); 6. Analyse and design a single-stage BJT and CMOS FET amplifier; and 7. Analyse and design a simple rectifier based linear and switched modes power supply.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr

Required Reading: Sedra, A. and Smith, K, 2009 6th edition Microelectronic Circuits Oxford University Press

Assessment: Laboratory Work, Six (6) Laboratory Based Problem Solving Sessions, 10%. Assignment, Semester Written Assignment (1500 Words), 10%. Test, Semester Tests, 20%. Examination, End of Semester Examination, 60%.

NEE2203 Experimental Data Analysis

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2N EF1201 OR ENF1201

Description: This unit focuses on the applications of probability and statistical principles in data analysis. The unit introduces probability theory and explores the basic principle of statistics. The unit is designed so that the probability and statistical principles covered will be applied to experimental data analysis. The topics to be included are: Statistical treatment of experiment data. Systematic errors and random errors. Combining errors, linear situations, products and the general case. Combining results of different experiments, mean and variance. Least squares fitting. Weighted sum of squares. Estimation of parameters. Application of parameter testing and distribution testing to experimental data.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse simple random experiments by applying elementary probability theory. 2. Understand and address error propagation in data analysis procedures. 3. Apply statistical principles in basic parameter estimation and hypothesis testing problems. 4. Use the method of least squares for curve fitting.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Taylor, John R. 2nd edition An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements Sausalito, CA 1996

Assessment: Test, Semester Test 1, 10%. Test, Semester Test 2, 15%. Test, Semester Test 3, 15%. Examination, End-of-Semester Examination, 60%.

NEE2210 Engineering Design and Practice 2B

Locations: Footscray Park.

Prerequisites: NEE2110 - Engineering Design and Practice 2A NEE2110 OR ENE2100

Description: This is a practical, PBL mode subject in which students work in teams to formulate responses of given problems specifically designed to integrate with the learning and content from ENE2201 and ENE2202. Teams of students will have an Electrical Engineering staff member as a 'coach or mentor' whilst working on these problems. 'Specialist' staff from the ENE2201 and ENE2202 subjects will be available to assist students with technical aspects of the problems. Staff members from the School of Communication, Culture and Languages will be available on a weekly basis to assist with the development of communications skills. Staff members from other Faculties will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals in order to identify complex problems and formulate solutions; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Apply In-depth technical competence in at least one engineering discipline; 4. Adapt a systems approach to design and operational performance and integrate the principles of sustainable design and development; 5. Collaborate effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 6. Exhibit commitment to the social, cultural, global, environmental and ethical responsibilities of the professional engineer, and the need for sustainable development; and 7. Display the capacity to undertake lifelong learning by locating, evaluating, managing and using information effectively.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr

Required Reading: Nil texts required.

Assessment: Other, Attendance and Participation, 10%. Project, Project

Demonstrations, 10%. Presentation, Oral Presentations, 20%. Test, Based on Project, 20%. Report, Written Technical Report, 20%. Portfolio, Demonstrate the Attainment of Learning Outcomes, 20%.

NEE3101 Telecommunications

Locations: Footscray Park.
Prerequisites: NEE2201 - Linear Systems with Matlab ApplicationsNEE2201 OR ENE2201
Description: This unit is designed to enable students to acquire specialised skills and expertise in the telecommunications field, specifically wireless and fixed network engineering. The unit will enable students to acquire theoretical knowledge, practical and critical analysis skills and apply these to research and complex technological problem solving scenarios. The unit will also enhance students' communication skills and other professional capabilities. The unit aims to alleviate and support employment demand in the telecommunications industry within Australia and overseas. Particular emphasis will be on telecommunication technologies and infrastructure for broadband wireless and optically connected broadband networks. The unit takes into account the current growth drivers of the global telecommunications industry.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate the theoretical concepts of a communication channel and the principles of digital communication systems in collaboratively planning and designing complex communication systems with accountability for personal and team outcomes; 2. Determine optimum signal link paths using Maxwell's equations including taking into account propagation mechanisms; 3. Prescribe antenna solutions to specified requirements and contexts with initiative and judgement; 4. Develop and modify propagation models for wireless communication links as well as design terrestrial and satellite links for a range of situations; 5. Conceptually map cellular network designs with creativity and technical skill; 6. Employ MatLab commands and Simulink to analyse and interpret communication systems; and 7. Interpret and use data generated by communication network elements to optimise performance.
Class Contact: Lab1.0 hrLecture1.0 hrTutorial1.0 hr
Required Reading: There are a number of other textbooks that can be used in concert with the required texts below. Some of these texts are available online by subscription. Students please check with the Main library.Rodger Zimmer & William Tranter (2009) 6th Principles of Communications Wiley Many other sources of important information are available online.www.ieee.org/explore
Assessment: Laboratory Work, Continuous assessment in laboratory work, 10%. Test, Mid-semester written test, 15%. Examination, End-of-semester examination, 50%. Project, Full semester project, 25%. To pass the unit a student must pass the project by scoring no less than 50%.

NEE3102 Electronic Systems 2

Locations: Footscray Park.
Prerequisites: NEE2202 - Electronic SystemsNEE2202 OR ENE2202
Description: The digital electronics section of this unit introduces students to synchronous state machine design including Moore and Mealy models with system implementation using logic gates/flip-flops and description in VHDL. System level design is examined using the Algorithmic State Machine Design/Register Transfer Language methods along with VHDL description and FPGA implementation of controller and data-processor elements. The analog electronics section of the unit examines the frequency response of amplifiers and introduces wide-band and high frequency amplifier design. The unit also includes an examination of differential amplifiers including modes of operation and design for specific performance characteristics. Feedback classification and the effect on circuit performance is also included along with an introduction to switched mode power conversion and analog filter analysis and design.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe common datapath elements and their applications; 2. Apply a system level approach to digital design using the Algorithmic State Machine (ASM) or the Register Transfer Language (RTL) design paradigm; 3. Synthesize ASM/RTL controllers and datapath elements using traditional methods and using VHDL with implementation on FPGA; 4. Analyse a range of analogue circuit types and assess the circuit performance; 5. Apply negative feedback on electronic circuits to achieve specific performance and stability requirements; 6. Design analogue circuits to meet performance criteria and select suitable components for circuit realisation.
Class Contact: Lab2.0 hrsLecture1.0 hrTutorial1.0 hr
Required Reading: Sedra, A. and Smith, K., 2009 6th edition Microelectronic Circuits Oxford University Press
Assessment: Laboratory Work, Laboratory Based Problem Solving Sessions - Six (6), two hours each, 10%. Assignment, Written Assignment (1500 words), 10%. Test, Semester Tests - Two (2), one hour each, 20%. Examination, End of Semester Examination (3 hours), 60%.

NEE3103 Electrical Machines

Locations: Footscray Park.
Prerequisites: NEF1205 - Engineering FundamentalsNEE2101 - Electrical CircuitsNEF1205 OR ENF1205 & NEE2101 OR ENE2103
Description: This unit introduces students to Magnetic circuit theory, Faraday's and Lenz's laws. Students will be required to undertake calculation of forces on moving charges, and analyse various magnetic circuits. DC machines, as motors and generators, will be discussed including the development and application of equivalent circuits in the performance analysis of DC machines. Transformer fundamentals, applications of transformers in power systems and their performance analysis using equivalent circuits will further be covered. Single phase and three phase Induction machines will be investigated including the application of equivalent circuits in the performance analysis of induction machines. The starting methods of induction motors will be explored. Other topics that are critically reviewed in this unit are: synchronous machines, generator operations and analysis, motor operations and analysis, synchronous generator performance on infinite bus, synchronous condensor, power factor calculations and corrections.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamentals of mechanical and electromagnetic energy conversion in diverse contexts; 2. Demonstrate knowledge of the structure of DC and AC electrical machines and the purpose of the various components; 3. Apply relevant equivalent circuit models of various electrical machines and analyse their operational performance under wide ranging conditions; 4. Analyse simple power systems containing transformers and synchronous generators to solve fundamental problems; 5. Critically analyse various starting techniques of motors; 6. Construct test platforms for testing purposes and set up complex electrical connections of electrical machines; and 7. Review and evaluate appropriate applications of A.C. machines in industries.
Class Contact: Lab2.0 hrsLecture1.0 hrTutorial1.0 hr
Required Reading: Bhag S. Guru, Huseyin R. Hiziroglu, 2001 3rd edition Electric

Machinery and Transformers Oxford University Press
Assessment: Laboratory Work, Laboratory assessment, 20%. Test, Mid-semester test, 20%. Examination, End-of-semester examination, 60%.

NEE3201 Introduction to Control Systems

Locations: Footscray Park.
Prerequisites: NEE2201 - Linear Systems with Matlab ApplicationsNEE2201 OR ENE2201
Description: This unit introduces feedback problems and their solutions. These are low sensitivity design, dynamic characteristics and closed-loop stability, Routh-Hurwitz stability tests, on closed-loop transfer functions, Root locus, frequency response and their interpretations in terms of relative stability and dynamic performance will be treated. Proportional (P), Proportional and Integral (PI), Proportional, Integral and Derivative (PID) controllers, lead, lag and lag-lead compensators will be introduced. Time domain and frequency domain design of lead, lag and lag-lead compensators will be emphasized. The unit also covers state-space models and state-space and transfer function models conversion. Linear state-variable (including estimated state) feedback controllers will also be introduced.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Competently state and differentiate the purposes and requirements of open-loop and closed-loop control systems; 2. Correctly calculate an overall transfer function by the use of both Mason's Gain Formula and Block Diagram Reduction as well as competently perform Routh-Hurwitz test on closed-loop control systems; 3. Demonstrate the ability to perform elementary time-domain and frequency-domain analyses of simple control systems; 4. Competently use Root-locus technique and Bode diagram to analyse the relative stability and performance of LTI SISO systems; 5. Proficiently design P, PI, PID controllers, lead, lag, lag-lead compensators and linear state-variable (including estimated state) feedback controllers to meet time-domain and frequency-domain specifications of LTI SISO closed-loop systems.
Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial1.0 hr
Required Reading: R.C. Dorf & R.H. Bishop, (2017) 13th edition Modern Control Systems Upper Saddle River, N.J. Prentice Hall
Assessment: Laboratory Work, Laboratory Assessment, 20%. Test, Semester Test 1, 10%. Test, Semester Test 2, 10%. Examination, End-of-Semester Examination, 60%.

NEE3202 Power System Supply Chain Management

Locations: Footscray Park.
Prerequisites: NEE3103 - Electrical MachinesNEE3103 OR ENE3105
Description: The unit explores two key areas - supply chain and transmission. PART A: SUPPLY CHAIN Historical developments and power industry deregulation; Loads and utility ancillary services; Electricity supply basics; Thermal power plants; Other power plants; Alternative energy generation; Distributed generation and energy storage; Rotating machine basics; Transformer fundamentals; Overhead lines and underground cables; Power distribution networks and substation layouts; Auxiliary networks, protection equipment and SCADA PART B: TRANSMISSION Since transmission lines are the key link between the power plant and customer, it is often considered the most important component of the entire power grid. Consequently, the specialised knowledge in this area is provided from the perspective of operation and planning engineers. Detailed mathematical analysis and performance of transmission line is exemplified and contextualised with the power circle diagram. Reactive power compensation through traditional and more advanced power electronic devices is also explored. along with steady-state analysis of transmission line, travelling wave phenomenon better assess performance of transmission lines. Economic and environmental aspects of transmission lines are also briefly debated in this unit. OBJECTIVES Main contents will be: Modelling of Transmission Lines Power Transfer through Transmission Lines Transmission Line Parameters and Ferranti Effect Transmission Line Travelling Waves and Transient Conditions Insulation System Selection Fault Levels and Busbar Configurations
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discriminate between the elements of the supply chain and how they function in order to map and interrogate the roles of (a) transmission - Transformers, overhead lines and cables, (b) distribution - Transformers and substations, insulation equipment and (c) auxiliary networks - Protection equipment, energy management system, supervisory control and data acquisition system; 2. Contextualise alternative generation such as hydro generation, wind and solar generation and other energy generation systems to known and unknown situations; 3. Apply principles in the modelling of transmission lines of various lengths with ABCD constants with initiative and judgement; 4. Analyse transmission lines under steady state conditions and power transfers through transmission lines including -reactive compensation of transmission lines; 5. Illustrate and map transmission line travelling waves and transient conditions in relation to Lattice diagrams; 6. Assess the use of AC and DC voltages and selection of voltage levels for transmission in wide ranging settings; and 7. Justify and explain insulation system selection, fault levels, and busbar configurations.
Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial1.0 hrForty eight (48) hours or equivalent for one semester comprising of lectures, laboratory and tutorials
Required Reading: Glover J.D., Sarma, M.S. and Overbye T.J. 5th Power System Analysis and Design Cengage Learning Recommended Reading: 1. Hadi Saadat: Power System Analysis (Second edition), 2002, 0-07-284796-4, McGraw Hill 2. Kothari, D.P. and Nagrath, I.J., Power System Engineering, 2nd Edition, 2008, Tata McGraw Hill. 3. Grainger J. J. and Stevenson W.D. Power System Analysis, 1994, McGraw Hill Stephen J. 4. Chapman, "Electric Machinery and Power System Fundamentals", McGraw Hill, 2002.
Assessment: Test, Mid-semester, 20%. Laboratory Work, Three (3) Lab excercises, 20%. Examination, End of semester examination (3 hours), 60%.

NEE3203 Embedded Systems

Locations: Footscray Park.
Prerequisites: NEE2102 - Computer SystemsNEE2102 OR ENE2202
Description: This unit extends the study of Embedded Computing from Year 2 of the course and introduces the principles of operation of networked computer systems. The unit includes system design involving real-time constraints and interfacing to external devices including: pulse width modulation for actuator control, sensor interfacing using direct digital sensors and time critical analogue to digital conversion. The unit also examines inter-device communication using industry standard methods including: USART, SPI, I2C, CAN interfaces and embedded web services.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate a broad understanding of the principles and techniques used in computer data communication; 2. Critically review the principles involved in computer networking; 3. Implement a real-time, embedded industrial control system using an embedded microcontroller with associated interface and communication devices; 4. Implement an embedded networked connected microcontroller application.
Class Contact: Lecture2.0 hrsTutorial1.0 hrForty-eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and group practical activities.

Required Reading: Mazidi, McKinlay and Causey, 2008 PIC Microcontroller and Embedded Systems using Assembly Language and C for PIC18 Pearson/Prentice-Hall Forouzan. B., Fagan. S. C., 2006 Data Communication and Networking McGraw Hill
Assessment: Laboratory Work, Six (6) Laboratory Based Problem Solving Sessions, 10%. Assignment, Written Assignment (1500 Words), 10%. Test, Semester Tests, 20%. Examination, End of Semester Examination, 60%.

NEE3204 Sensors and Actuators in Sports

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit focuses on the study of sensors and actuators with special emphasis on those used in sports. The first part of the unit will introduce sensors that measure physical quantities such as temperature, force, pressure and acceleration. Sensor characteristics such as sensitivity, resolution, accuracy and bandwidth will be illustrated with respect to the aforementioned sensor modalities. Fundamental interface electronics for these sensors such as the voltage divider and bridge circuits will be covered. The second part of the unit covers the use of DC motors, belt drives, gears and their variants as examples of mechanical actuators. A review of forces will be done leading to actuator design calculations based on mechanical loading requirements. Case study applications will be employed to illustrate the design considerations and safety for their use.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the merits and limitations of sensors and interface electronics; 2. Apply the fundamental principles of actuators and mechanical loading to real-world problems; 3. Interpret, predict and apply the technical characteristics of sensors and actuators to the design of basic measurement and actuation systems; 4. Integrate and articulate professional ethics and responsibilities for safety criteria in sensor and actuator design.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: J. Edward Carryer, R. Matthew Ohline, Thomas William Kenny, (2011) 1st ed. Introduction to Mechatronic Design Prentice Hall
Assessment: Test, Mid Semester Test (1 hour), 20%. Laboratory Work, Six (6) Labs (2 hours each), 30%. Examination, Final Exam (3 hours), 50%.

NEE3205 Signal Processing Techniques

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces the student to the fundamentals of digital signal processing with a focus on frequency domain analysis. Students will learn about digital filtering techniques and basic signal transforms. Common digital filter types in both categories of finite impulse response (FIR) and infinite impulse response (IIR) filters will be covered. Topics on digital filter techniques, filter responses and the filter effects on time domain will be discussed. The use of signal transforms such as the discrete fourier transform will be discussed as a tool for investigating signal content from a frequency domain perspective. An overview of advanced signal transforms such as the wavelet transform will also be given. Popular signal processing software (e.g. Matlab), will be used to demonstrate these concepts.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the application need for digital filters and specify their parameters; 2. Elaborate the advantages and limitations of digital filters; 3. Apply signal transforms such as the Discrete Fourier Transform to investigate signal characteristics in the frequency domain; 4. Apply digital filters and signal transforms to data to remove noise and to extract important signal information; 5. Apply these filtering and transform techniques on real data using common engineering software.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs
Required Reading: Richard G. Lyons., (2010) 3rd ed. Understanding Digital Signal Processing Pearson Education
Assessment: Laboratory Work, Four (4) Labs (3 hours each), 40%. Test, Mid Semester Test (1 hour), 20%. Examination, Final Exam (3 hours), 40%.

NEE4100 Wearable Technology Design

Locations: Footscray Park.
Prerequisites: NEE2104 - Sports Technology Design
Description: This unit will introduce design concepts behind wearable electronics technology, combining previous knowledge of electronics, sensors and embedded systems with the engineering concepts required for wearable design. Topics on human factors, ergonomics and mechanical load-capacity design, theories of static and dynamic failure (following on from material in NEE2104 Sports Technology Design) will be covered in the first part. This will be followed by electronics design optimization, electronic textiles, and flexible electronics and flexible circuits technology. Students will apply knowledge gained by completing a mini project on the design of a wearable prototype to perform a specific measurement task.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the human factors involved in the design of wearables; 2. Apply the concepts of static and dynamic actions to wearable electronic design; 3. Implement concepts in the selection of electronics for a minimalist electronics design; 4. Demonstrate the ability to work both autonomously and as a member of a design team;
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Tutorial 1.0 hr Workshop 1.0 hr
Required Reading: McCann, Jane, and David Bryson, eds. (2009) 1st Smart clothes and wearable technology Elsevier
Assessment: Laboratory Work, Six (6) Labs (2 hours each), 20%. Presentation, Oral presentation (20 minutes per group) and prototype demonstration, 20%. Project, Three (3) Group Project Reports (3000 words max), 60%.

NEE4101 Sports Data Analytics 1

Locations: Footscray Park.
Prerequisites: NEE2105 - Introduction to Data Analytics
Description: This unit builds on NEE2105 Introduction to Data Analytics and covers further concepts of statistical analysis with an emphasis on common statistical distributions, hypothesis testing, and variance analysis methods e.g., ANOVA. Model metrics such as receiver operating characteristics (ROC) and coefficient of variation will be discussed. The concept of feature extraction as a dimension reduction technique will be introduced and basic feature extraction techniques on time domain waveforms will be discussed. These include waveform morphological parameters, signal energy, moving averages and linear discriminant analysis. Applications of the statistical methods described will be explored through a project focused on biomechanical and physiological examples commonly found in sports.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the application need for statistical modelling and feature extraction; 2. Perform basic feature extraction on time domain waveforms; 3. Apply statistical analysis to extracted features using software; 4. Analyse results and present them professionally.

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs
Required Reading: Runkler, Thomas A., (2016) 2nd ed. Data Analytics: Models and Algorithms for Intelligent Data Analysis Springer-Verlag
Assessment: Laboratory Work, Four (4) Labs (3 hours each), 40%. Test, Mid Semester Test (1 hour), 20%. Project, Final Report (5000 words max), 40%.

NEE4102 Signal Processing

Locations: Footscray Park.
Prerequisites: NEE2201 - Linear Systems with Matlab ApplicationsNEE3102 - Electronic Systems 2NEE2201 OR ENE2201 & NEE3102 OR ENE3104
Description: The analogue electronic section of this unit introduces the students to multistage amplifiers, analogue filters, oscillators and power amplifiers. The topics to be covered include analysis and design of multistage amplifiers, specifications of analogue filters, analysis, design and realization of analogue filters with standard circuits, analysis and design of RC, LC and crystal oscillators, classification and operation of power amplifiers, efficiency analysis of power amplifiers, design of power amplifiers using power transistors and integrated circuits. The digital signal processing section of this unit introduces the students to the fundamentals of deterministic digital signal processing. The topics to be covered include analogue to digital signal conversion, mathematical representation of discrete-time signals and systems, the frequency response function and its properties, analysis of discrete-time signal processing systems using transform techniques, design and realization of finite impulse response (FIR) filters and infinite impulse response (IIR) filters.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform analysis and design calculations for multistage amplifiers; 2. Design analogue filter circuits to meet performance criteria of specific application. This includes the selection of suitable components for circuit realisation; 3. Analyse oscillator circuits and design oscillator circuits to achieve specific characteristics and performance; 4. Analyse power amplifiers and design power amplifiers to meet performance criteria. This includes the selection of suitable components for circuit realisation; 5. Perform signal to noise ratio analysis of analogue to digital signal conversion processes; 6. Produce mathematical representations of discrete-time signals and systems; 7. Analyse discrete-time signal processing systems; and 8. Design and implement finite impulse response (FIR) filters and infinite impulse response (IIR) filters.
Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work
Required Reading: Oppenheim A. V. and Schafer R. W., 2009. 3rd edn Discrete-Time Signal Processing. Prentice-Hall Sedra A & Smith K., 2010. 6th edn Microelectronic Circuits. Oxford University Press
Assessment: Test, Class test, 20%. Laboratory Work, Laboratory work throughout semester, 30%. Examination, End-of-semester examination, 50%.

NEE4110 Electrical Power Systems, Analysis and Operation

Locations: Footscray Park.
Prerequisites: NEE3103 - Electrical MachinesNEE3202 - Power System Supply Chain ManagementNEE3103 OR ENE3105 & NEE3202 OR ENE3205
Description: An outline of the electricity distribution in the deregulated Australian power industry will be given. Network calculations and the bus-admittance matrix will be covered. The concept of load flow analysis will be studied. The Gauss-Siedel, Newton-Raphson, and Fast Decoupled load flow analysis methods and their application to the solution of complex networks will be introduced. Economic operation of power systems is to be covered. The planning, design and operation of electrical energy transmission and distribution networks will be examined. The subject aims to cover the electrical insulation properties and characteristics, insulator selection, insulation co-ordination in electric energy networks. Specifically sources of overvoltages, lightning impact on transmission and distribution networks, surge propagation theory, circuit interruption theory and circuit breaker operation are also covered in great length. The course also considers breakdown in gases, liquids and solids.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply techniques of load flow solutions including calculations of voltage, angles, losses, generated reactive power, slack power, etc.; 2. Model accurately a multi-bus system and carry out load flow studies; 3. Identify solutions to power system problems; 4. Display an understanding of circuit breaker operation; 5. Analyse electrical insulation properties and characteristics, insulator selection, insulation co-ordination in electric energy networks; 6. Study impact of overvoltages, lightning impact on transmission and distribution networks, surge propagation theory, circuit interruption theory and circuit breaker operation are also covered in great length; and 7. Conduct experiments on breakdown in gases, liquids and solids.
Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work
Required Reading: Glover J.D., Sarma, M.S. and Overbye T.J./2012 5th ed. Power System Analysis and Design Cengage Learning
Assessment: Laboratory Work, Laboratory Reports (4 labs with 4 pages of report on each lab), 20%. Test, 2 Mid-semester tests (1 hour duration each), 20%. Examination, Final (3 hours closed book exam), 60%.

NEE4120 Analog and Digital Transmission

Locations: Footscray Park.
Prerequisites: NEE3101 - TelecommunicationsIt is also recommended that the student will have successfully passed all second year electrical engineering units.
Description: This unit is designed to provide the theoretical basis for the understanding of the engineering aspects of analogue and digital transmission which leads to the design, construction, and operation of existing and emerging communication systems. It is expected that the unit will provide the support for students requiring basic knowledge of analog and digital transmission in order to handle concurrently studied Engineering Design projects that involve various aspects of analog and digital transmission in communication systems. Consequently the syllabus is to be presented as a collection of specialised lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. Optical systems as well as optical transmission infrastructure will be introduced. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine signals and their characteristics as depicted in time and frequency domains; 2. Translate the information bearing nature of signals and the bandwidth considerations; 3. Implement the principles behind frequency translation and its depiction as various types of modulation; 4. Exploit the signal transition in linear and non-linear systems, and the recognition of such systems in terms of filters and other components; 5. Determine the types of noise present in telecommunication systems and the characterisation of thermal noise; 6. Perform the statistical analysis of random signals and the characterization of such signals in terms of correlation and power spectral density functions; 7. Employ the concept of signal to noise ratio and its influence in faithful reception of analog and digital

signals; and 8. Outline the assessment of performance in digital communication systems in terms of bit error probability.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: The prescribed textbooks are suplemented by many other textbooks most of which avail electronic copies on websites such as www.wiley.com.K.Daniel Wong (2012) Fundamentals of comunication engineering technologies Wiley Simon Haykin & Michael Moher (2009) 5th Communication systems Wiley N.Benvenuto et al (2007) Communication systems Wiley Students are encouraged to be imaginative and also explore other publishers that have a different approach to what is prescribed above.

Assessment: For group lab reports staff will take into account individual contribution when awarding marks. A student must pass each assessment item in order to pass the unit. Laboratory Work, Continuous assessment in laboratory work, 20%. Test, Mid-semester written test, 30%. Examination, End-of-semester examination, 50%.

NEE4130 Operating Systems and Network Programming

Locations: Footscray Park.

Prerequisites: NEE2202 - Electronic Systems

Description: This unit provides students with a good understanding of computer networking protocols, the management of computer networks, computer operating systems (OS) and the facilities within an OS that support network operations. The OS components : Process, File systems and memory management will be examined from the users and programmers' perspective. In the networking section, emphasis will be on TCP/IP protocols and socket programming.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the principle and practice of computer networking protocols; 2. Design, configure and manage a computer network; 3. Describe the structure and operations of a modern computer system; 4. Create application programs that access the OS facilities by means of a high level language (C/C++, etc); 5. Create multithreaded application programs for a modern OS (Unix, etc); and 6. Use BSD sockets in client-server applications.

Class Contact: Forty-eight (48) hours or equivalent for one semester comprising lectures, tutorials and group practical activities.

Required Reading: Silberschatz. A., 2012 9th Edition Operating Concepts Wiley Tanenbaum, A., 2010 5th Edition Computer Networks Prentice Hall

Assessment: Laboratory Work, Weekly laboratory work, 10%. Assignment, Semester assignment, 20%. Test, Mid-semester test, 20%. Examination, Final examination, 50%.

NEE4200 Biomechatronics

Locations: Footscray Park.

Prerequisites: NEE2104 - Sports Technology DesignNEE3204 - Sensors and Actuators in Sports

Description: This unit introduces the concept of biomechatronics as a new of field of mechatronics applied to humans. This unit builds on earlier units in sensors and actuators and engineering design. Students will cover concepts of biosignals and biosignal conditioning circuits, kinematic sensing, and movement actuators as additional core hardware components of a biomechatronic system. The second part of the unit explores the engineering performance of designs using suitable Finite Element Analysis software tools supported by the fundamental theory of finite element analysis. Selected case studies in prostheses, exoskeletons and haptics will be covered. Design guidelines will be emphasized where required.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Research the state of the art in bio mechatronics; 2. Select sensors suitable for human motion monitoring and human bio sensing; 3. Analyse and design actuators to aid in artificial human movement; 4. Analyse the limitations of these designs using finite element analysis software; 5. Demonstrate the ability to work collaboratively with colleagues and produce tangible results

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: Graham Brooker, 2012 1st Introduction to Biomechatronics (Materials, Circuits and Devices) SciTech Publishing

Assessment: Test, Mid Semester Test (1 hour), 20%. Laboratory Work, Six (6) Labs (2 hours each), 30%. Examination, Final Exam (3 hours), 50%.

NEE4202 Sports Data Analytics 2

Locations: Footscray Park.

Prerequisites: NEE2105 - Introduction to Data Analytics

Description: This unit continues the data analytics concepts discussed in NEE2105 Introduction to Data Analytics, with a focus on classification and function estimation. Students will cover basic classification techniques such as clustering to more advanced pattern recognition techniques based around artificial neural networks. These will then be extended to the more general idea of regression as a technique for function estimation. Emphasis will be placed on the use of computational software which now implements the popular classification and regression algorithms. The role of feature extraction, model testing and validation will also be covered with respect to the algorithms discussed. Application data samples will be derived from sports and healthcare problems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the application needs for classification and regression; 2. Explicate and apply the methodology behind basic classification and regression algorithms; 3. Implement classification and regression on data analysis using common engineering software; 4. Interpret classification and regression results and provide fundamental interpretations; 5. Work in groups to problem solve and present solutions in a professional and ethical manner.

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: Runkler, Thomas A., (2016) 2nd ed. Data Analytics: Models and Algorithms for Intelligent Data Analysis Springer-Verlag

Assessment: Laboratory Work, Four (4) Labs (3 hours each), 40%. Test, Mid Semester Test (1 hour), 20%. Project, Final Report (5000 words max), 40%.

NEE4204 Computer and Fuzzy Logic Control Systems

Locations: Footscray Park.

Prerequisites: NEE3201 - Introduction to Control Systems

Description: The unit introduces pulse transfer functions and covers conversion of a continuous-time transfer function model into a zero-order hold equivalent pulse transfer function model. Conversion between pulse transfer function models and difference equation models are also treated. Analysis and design of discrete-time control systems with the Root Locus method and Bode diagrams in conjunction with the Bilinear transformation are emphasised. Performance trade-off in control design problems is discussed. The unit also introduces fuzzy sets theory in terms of fuzzy set definitions, properties of fuzzy sets, and operations on fuzzy sets. Concepts of fuzzy relations are also covered. Natural language formalisation and approximate reasoning using linguistic variables, fuzzy propositions, fuzzy if - then statements, and inference rules are emphasised. This will be followed by the introduction of

theoretical design, analysis, and practical implementation of fuzzy controller design in the form of the structure of a fuzzy controller, the rule base, the data base, the inference engine, the choice of fuzzification and defuzzification methods.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Correctly explain the basis of use of pulse transfer functions in the description and analysis of computer controller systems; 2. Competently convert a continuous-time transfer function model into a zero-order hold equivalent pulse transfer function model and convert between pulse transfer function models and difference equation models; 3. Competently perform analysis and design of discrete-time control systems with the Root Locus method; 4. Demonstrate knowledge and competency in the analysis and design of discrete-time control systems with the use of Bode diagrams in conjunction with the Bilinear transformation; 5. Correctly explain the need of performance trade-off in control design problems; 6. Correctly define the basic mathematical concepts of fuzzy sets and describe the structure of fuzzy logic controller; 7. Competently design and implement fuzzy logic controller; and 8. Competently use MatLab/Simulink to analyse, design, and implement discrete-time and fuzzy logic control systems.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: Ogata, K., 1995 Discrete-Time Control Systems, Prentice-Hall K.M. Passino and S. Yurkovich, 1998 Fuzzy Control Addison-Wesley,

Assessment: Laboratory Work, Laboratory Work, 30%. Test, Mid-semester, 20%. Examination, Final, 50%.

NEE4207 Alternative Energy Systems and Power System Communication

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide applied and creative knowledge and skills in the two broad areas of alternative energy systems and power system communication. The unit is delivered in two parts: Part A - Alternative Energy Systems: Part A reflects on the concept of sustainability in the electrical energy generation sector in order to provide the basis for the consideration of alternative energy systems. Part A will revise conventional energy systems and the emissions associated with these systems. Then, the students will be introduced to unconventional energy sources such as solar, wind, biomass and fuel cells as well as energy storage technologies. Technical properties, environmental and economic advantages of these technologies will be discussed and learning activities will focus on mathematical modelling, and analysis of these alternative generation technologies. Finally, Part A will focus on the design of hybrid systems and their integration to existing distribution and transmission systems. Part B - Power System Communication: Part B provides an introduction to the power system automation, control, and communication concepts and technologies, which are integral elements of a state of the art power system network, i.e. a smart grid. Power system automation, protection and control concepts will be studied with examples from real world applications such as SCADA technologies. Part B will also review the communication technologies, network topologies, and standardization efforts in the power systems communication arena, and discuss the relevant standards, communication architectures, and protocols developed for use in these networks. Security concerns in power system communication networks will be outlined and the importance of developing and maintaining a secure network against cyber-attacks will be further elaborated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse current applications of alternative energy sources and systems and their availability across Australia; 2. Innovate and design alternative energy generation systems for diverse contexts justifying economic and environmental impacts of the alternative energy systems; 3. Adapt communication in the design and development power system networks creatively and appropriately for contemporary engineering settings; 4. Design for the use of communication media and architectures in power systems; 5. Interrogate system automation, control, and integration concepts in diverse contexts; 6. Critically review the communication standards, protocols and architectures most commonly employed in power system protection and distribution networks; and 7. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: Masters, G. 2004, 1st edn, Renewable and Efficient Electric Power Systems, John Wiley & Sons, Hoboken, NJ. Ozansoy, C. 2010, 1st edn, Modelling and Object Oriented Implementation of IEC 61850, Lambert Academic Publishing, Saarbrucken, Germany. Boyle, G. 2004, 2nd edn, Renewable Energy: Power for a Sustainable Future, Oxford University Press, Oxford. Kalam, A and Kothari, D. P. 2009, 1st edn, Power System Protection and Communications, New Age International (P) Ltd.

Assessment: Laboratory Work, Two (2) Laboratory Group Reports (Team of two, 2000 words each), 20%. Test, Mid-Semester Test (1 hour), 10%. Project, Team Project Report (Team of two, 4000 Words), 20%. Examination, Final Examination (3 hours), 50%.

NEE4210 Electric Energy Systems Protection and Power Electronics

Locations: Footscray Park.

Prerequisites: Nil.

Description: Protection: This unit covers the planning, design and operation of electrical protection systems for the generation, transmission and distribution systems of electric energy: planning, design standards and performance requirements; principles and types of protection systems (over-current, impedance, differential, backup, fuses); application of protection to generators, motors, transmission lines, transformers, busbars, and distribution; sources of overvoltage, lightning impact on transmission and distribution networks, surge propagation theory, circuit interruption theory; instrument transformers steady state and transient behaviour; electrical studies for planning and design of protection systems; power system communications for protection application. Power Electronics: Introduction to the theory, design and analysis of conversion of electric power by means of power electronics, including AC to DC and DC to DC power converters. The fundamental knowledge of electronic speed control techniques for DC motor drives for different applications. AC-DC single-phase and three-phase power converters: Diode and SCR bridge rectifiers. DC-DC Switching Mode Power Converters, buck converters and boost converters, Buck-boost converters. Unipolar and bipolar voltage switching method. Flyback converters, push pull converters. First quadrant, two quadrant and four quadrant drive. Different electronic speed control techniques for DC motor drives.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and apply different protection schemes applicable to generation, transmission and distribution systems; 2. Design protection systems including relay settings and protection coordination; 3. Evaluate and assess recent innovations on power system communications; IEC61850 protocols 4. Define the basics and operations of power semiconductor switches; 5. Describe the building

blocks of power electronics conversion; 6. Analyse AC/DC and DC/DC power converters; and design different types of switching power supplies

Class Contact: Lecture1.5 hrsTutorial1.5 hrsWorkshop1.0 hr

Required Reading: Lecture notes hand outs. Kalam, A. and Kothari, D.P., (2010) 1st ed. System Protection and Communications, New Age International (P) Ltd, N. Mohan, T. M. Undeland & W. P. Robbins, (2003) 1st ed. Power Electronics - Converters, Applications, and Design, John Wiley & Sons.

Assessment: Test, Mid-semester (2 test of 1 hour duration), 20%. Laboratory Work, Laboratory exercise (4 labs with 4 pages of report on each lab), 20%. Examination, Final (3 hours closed book), 60%.

NEE4220 Wireless and Broadband Communications

Locations: Footscray Park.

Prerequisites: NEE3101 - TelecommunicationsIt is also recommended that the student will have successfully passed all second year electrical engineering units.

Description: This unit offers an overview of digital modulation with emphasis on wireless applications. It is expected that the following commonly used modulation schemes such as QPSK, MSK, GMSK and QAM will be studied. Students will be taught Vector space representation of digital signals, Correlation receiver, Matched filter receiver, Signal-space representation of noise, Maximum likelihood sequence estimation (MLSE) detector and performance in AWGN channels. Network Access schemes such as CDMA and OFDM and their application to wireless LAN and Cellular Systems will be introduced. A Layered structure of computer communication protocols such as ISO OSI 7 layer model and TCP/IP protocol suit will be covered. Network connecting devices such as repeaters, hubs, bridges, routers, and gateways will be covered in addition to IP and IP addressing. This will be followed by Sub-netting, super-netting, Routing protocols, ARP and RARP, ICMP and IGMP plus Transport layer protocols; UDP and TCP will be covered. These topics will be enhanced by Flow control, error control, and congestion control in TCP. Routing protocols, RIP, OSPF, and BGP will be introduced. We hope to cover modern optical Networks and the application of Dense Wavelength Division Multiplexing (DWDM) in short and long haul communication.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain digital communications and modulation as used in weird and wireless transmission; 2. Explain receiver techniques for digital modulation links; 3. Introduce key wireless systems. GSM, WCDMA and WLAN; 4. Discuss the basic principles involved in data communication systems; 5. Explain the data network architecture, operation, and performance analysis; 6. Evaluate the protocols employed in data networks; 7. Explain the particular aspects of local area and wide area networks; and 8. Discuss wireless networks, their operation, and interfacing with network backbone.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: Forouzan, B.A., 2003 'TCP/IP Protocol Suite' McGraw Hill Haykin, S. 2001 4th Edition Communication Systems John Wiley & Sons.

Assessment: Awarding Lab of marks will take into account each individual student's contribution. Each assessment item must be passed in order to pass the Unit. Laboratory Work, Continuous assessment in laboratory work., 20%. Test, Mid-semester, 30%. Examination, Final, 50%.

NEE4230 Real Time ASIC Based Systems

Locations: Footscray Park.

Prerequisites: NEE3102 - Electronic Systems 2NEE3203 - Embedded Systems

Description: This unit of integrates the hardware and software knowledge from earlier years of study into the production of Application Specific Integrated Circuits (ASICs). The aim of the unit is for the students to learn how to bring together one (or more) microprocessors, memory blocks (containing a C/C++ real time program), I/O blocks and student designed special purpose devices onto a single VLSI device. Managing the design of complex systems and the commercial considerations in using Intellectual Propriety (IP) soft-core building blocks is examined. The unit then extends into the use of a Real Time Operating System (RTOS) for task management including task scheduling, inter-task communication and performance profiling.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and implement a single chip digital system (FPGA) containing single or multiple customised soft-core microprocessors; 2. Use VHDL or symbolic library components to create customised hardware single chip designs; 3. Create embedded software for single chip systems using high level programming (C) and operating under the control of an RTOS; 4. Describe the problems associated with creating designs that include over 1 million logic gate equivalents; and 5. Describe the process for and the commercial implications of employing soft-core IP modules and RTOS kernels in manufactured devices.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: Labrosse, J. J., 2002 2nd edition MicroC/OS II The Real Time Kernel CMP

Assessment: Laboratory Work, Laboratory Project + Report, 40%. Assignment, Semester Written Assignment, 10%. Examination, Final examination, 50%.

NEF1101 Engineering Mathematics 1

Locations: Footscray Park.

Prerequisites: NFM0112 MATHEMATICS FOUNDATIONS or a unit of study score of 20 in either Mathematical Methods CAS or Specialist Mathematics; or 35 in Further Mathematics; or with approval from the Course Coordinator

Description: This unit of study aims to provide a basic understanding of integral and differential calculus and engineering applications of statistics. Students are encouraged to work in groups in tutorial classes where they can apply their lecture material to the solution of mathematical exercises and basic engineering problems. The unit begins with a consolidation of the student's knowledge of basic algebra including the solution of linear, polynomial, exponential and logarithmic equations. Calculus topics include differentiation, integration, definite integral, fundamental theorem of integral calculus and Integration methods. Statistics topics include distributions, measures of variability and confidence limits, probability, mutually exclusive and independent events, permutations and combinations, binomial and Poisson probability.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Solve a variety of mathematical functions; 2. Perform basic differentiation and integration; and 3. Apply calculus and statistical techniques to engineering-related problems.

Class Contact: Lecture2.0 hrsTutorial1.0 hrSixty (60) hours for one semester comprising lectures and tutorials.

Required Reading: Hughes-Hallett et al., (2013) 6th ed. Calculus: Single & Multivariable, Wiley

Assessment: Test, Short answer or multiple choice online tests, approximately weekly, 20%. Test, 1.5 hour in class test, 30%. Examination, End-of-semester examination (2 hours), 50%.

NEF1102 Engineering Physics 1

Locations: Werribee, Footscray Park.

Prerequisites: NFP0102 PHYSICS FOUNDATIONS; or a unit of study score of 20 in either VCE Physics or Specialist Mathematics; or 25 in Mathematical Methods CAS; or 35 in Further Mathematics; or with approval from the Course Coordinator.

Description: This unit of study aims to provide a basic understanding of Motion, Vectors, Newton's laws and Wave behaviour. In tutorial classes, students are encouraged to work in groups where they can apply their lecture material to the solution of physics and basic engineering problems. The unit begins with a general introduction to measurements and their uncertainties. The equations for one dimensional motion are then developed and extended to two and three dimensional motion. The concept of a force is introduced leading to Newton's laws including frictional forces. The study of simple harmonic motion, damping forces and resonance is followed by the topics of sound and light waves.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use kinematics to calculate displacement, velocity and acceleration; 2. Use Newton's laws to calculate forces and acceleration; 3. Apply the rules of conservation of energy and momentum to engineering-related problems; 4. Apply the principles of SHM and waves to engineering-related problems; and 5. Perform calculations on sound intensity levels and the Doppler effect in engineering-related problems.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Halliday and Resnick, (2013) 10th ed. Fundamentals of Physics Wiley

Assessment: Laboratory Work, Laboratory report/ assignment, 20%. Test, In-semester assessments, 30%. Examination, End-of-semester examination, 50%.

NEF1103 Engineering and the Community

Locations: Footscray Park.

Prerequisites: Nil

Description: In this unit, students will explore the role and importance of engineering in society, at both the national and international level. This will include identifying issues facing engineers such as sustainability; existing trends and practices; and innovations to meet future challenges. Students will examine the development of Engineering as a profession and look at the varying disciplines within the profession. This will enable students to establish their own learning and career goals and develop strategies to achieve those goals. Students will also examine the activities that constitute the engineering method, a problem-solving process, and apply the method to an identified problem. Case studies will be presented to students introducing them to descriptions of real situations that provide a context for engineers to explore decision-making in the face of socio-technical issues, such as environmental, political, and ethical issues. Students will work on a number of deliverables that will require them to work both individually and collaboratively, and communicate their work and findings in oral and written forms.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key roles of engineering in the local and global communities, and understand the key features of the different disciplines of engineering practice; 2. Develop their own learning and career goals, and use self-management skills to plan and manage their work; 3. Recognise the professional responsibilities of engineers as well as ethical and sustainability issues in engineering practice; 4. Identify and interpret strategies for practising sustainable engineering and evaluate a solution in terms of environmental, social and economic costs and benefits; 5. Describe the engineering method as well as the activities that constitute this problem-solving process and apply the method to an identified problem; 6. Communicate effectively with others orally and in writing on a range of engineering-related topics using appropriate language; and 7. Work individually and with others, as both a team member and leader in both formal and informal teams, to complete tasks.

Class Contact: Lecture 2.0 hrs Workshop 3.0 hrs

Required Reading: Dowling, D, Carew, A, Hadgraft, R., (2013) 2nd ed. Engineering Your Future: an Australasian Guide John Wiley and Sons Australia, Milton, Queensland

Assessment: Essay, Individual Reflection Essay (1000 words), 25%. Case Study, Individual Case Study Report (1500 words), 30%. Presentation, Team Oral Presentation (15 minutes), 10%. Project, A Team Project Report (5000 words), 35%. Total combined assessment word equivalence is approximately 7500 words. For any team assessment, a percentage of student's mark is based on observations of their contribution to the overall task, as such; attendance is mandatory in the workshops, field trips and presentations.

NEF1104 Problem Solving for Engineers

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is based on a series of problems designed to both introduce students to systematic problem solving methods and to build on and apply knowledge introduced in other first year semester 1 units. The problems will focus on a range of issues related to engineering practice and sustainability. Students will be required to undertake data analysis and manipulation using various computing tools, including spreadsheet software and fundamental programming techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental knowledge of mathematics and science to solving engineering problems; 2. Plan and adapt systematic approaches to solving engineering problems; 3. Undertake data analysis and manipulation using various computing tools, including spreadsheet software and fundamental programming techniques in solving problems; 4. Identify, propose and initiate solutions to broad sustainability issues related to engineering problems; 5. Work individually and collaboratively, as both a team member and leader, to complete tasks and evaluate own and others' performance; and 6. Exemplify safe laboratory practices and an ability to identify potential safety hazards.

Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs Sim (Simulation) 2.0 hrs Workshop 2.0 hrs Sixty (60) hours for one semester comprising lectures, tutorials and laboratory work.

Required Reading: VU 2009, School of Engineering and Science, 2nd edn., PBL in Engineering Manual, Victoria University, Melbourne, Australia. VU 2013, College of Arts, 10th edn., Handbook of Communication Skills for First Year Students in the College of Engineering and Science, Victoria University, Melbourne, Australia.

Assessment: Presentation, Team Oral Presentation (15 Minutes/team), 10%. Report, Four (4) Team Project Reports (1000 words each), 40%. Test, Four (4) Class Tests, 50%. For any team assessment, a percentage of student's mark is based on observations of their contribution to the overall task, as such; attendance is mandatory in the workshops.

NEF1201 Engineering Mathematics 2

Locations: Footscray Park.

Prerequisites: NEF1101 - Engineering Mathematics 1

Description: This unit of study aims to provide a basic understanding of matrix

methods, first order differential equations, complex numbers and infinite series and their application to engineering problems. Students are encouraged to work in groups in tutorial classes where they can apply their lecture material to the solution of mathematical exercises and basic engineering problems. Calculus topics include partial derivatives, first order linear differential equations (DE's), separable DE's, integrating factor, first and second order linear DE's in engineering applications. Simple, double and complex roots of auxiliary equations will also be covered.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use matrices to solve simultaneous linear equations; 2. Apply first order and second order differential equations to engineering-related problems; 3. Perform simple complex number calculations; 4. Test series for convergence and use MacLaurin method to generate power series; and 5. Apply partial differentiation to engineering problems.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs Workshop 2.0 hrs Sixty (60) hours for one semester comprising of lectures, tutorials and laboratory work.

Required Reading: Hughes-Hallett et al. 2013, 6th edn, Calculus: Single & Multivariable, Wiley.

Assessment: Test, Short answer or multiple choice online tests, approximately weekly, 20%. Test, 1.5 hour in class test, 30%. Examination, End-of-semester examination (2 hours), 50%.

NEF1202 Engineering Physics 2

Locations: Werribee, Footscray Park.

Prerequisites: NEF1102 - Engineering Physics 1

Description: This unit continues with the concept of forces studied in Physics 1, beginning with a consolidation of the student's knowledge of the gravitational force and the idea of "action at a distance". These principles are then applied to Electrostatic Forces and the Magnetic Force produced by moving charges as well as electromagnetic induction. The unit concludes with the topic of thermodynamics including temperature, thermal expansion, heat capacity, specific and latent heat, ideal gases, work and heat in the thermal process, first law of thermodynamics and an introduction to heat engines.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply principles of electric and magnetic fields to engineering-related problems; 2. Calculate the forces acting on charged particles in electric and magnetic fields; and 3. Apply principles of heat and temperature to engineering-related problems.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr Sixty (60) hours for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Halliday and Resnick, 2013, 10th edn., Fundamentals of Physics, Wiley.

Assessment: Laboratory Work, Laboratory report/assignment, 20%. Test, In-semester tests, 30%. Examination, End-of-semester examination, 50%.

NEF1204 Introduction to Engineering Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is based on a series of problems designed to both introduce students to the design process and to apply knowledge introduced in other Year 1 units of study. The problems will therefore emphasise creative thinking in design, generating and evaluating alternatives against a range of technical, environmental, social and economic criteria, and making the final design decisions. The unit also incorporates a module on professional drawing practice including projections and views, dimensioning, different drawing types and using computer-aided design (CAD) software.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply a systematic approach to engineering design; 2. Find, organise and evaluate information on a range of topics related to problems in engineering design; 3. Identify and evaluate technical, environmental, social and economic factors impacting on the solution of engineering design problems; 4. Use computer-aided design (CAD) software to develop and present design solutions; 5. Communicate effectively with others orally, in writing and by means of engineering drawings; 6. Demonstrate an ability to learn individually and collaboratively in a team environment; 7. Use a personal reflective journal and demonstrate improvements in their effectiveness as learners; and 8. Respond to diverse learning situations in a socially and culturally responsible manner.

Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs Workshop 2.0 hrs Forty-eight (48) hours for one semester comprising of team workshops, including supporting lectures and labs.

Required Reading: Vallero, D.A, and Brasier, C., (2008) Sustainable Design: The Science of Sustainability and Green Engineering Richmond: Wiley VU, School of Engineering and Science, (2009) 2nd ed. PBL in Engineering Manual Melbourne: Victoria University VU, Faculty of Arts, (2009) 9th ed. Communication Skills Handbook for First Year Students in the Faculty of Health, Engineering and Science Melbourne: Victoria University

Assessment: Test, Two (2) Short individual tests on design in class, 10%. Report, Teamwork including technical reports (4000-5000 words as a cumulative total for a team of four (4) students per semester), 45%. Portfolio, Individual portfolio (additional 1000 words which excludes the copies of the reports which are part of the portfolio), 25%. Presentation, Team Oral Presentation (5 minutes per student), 5%. Test, CAD Skill, 15%.

NEF1205 Engineering Fundamentals

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide a basic understanding in the two broad areas of statics and electrical fundamentals. The following topics are covered in two parts: Part A - Statics: Part A introduces the concept of force, resultants and components, levers and moments. Free body diagrams, 2D and 3D statical equilibrium concepts are covered. Part A further explores the analysis of pin jointed trusses, statically determinate beams/shafts including loads, reactions and internal forces. Part B - Electrical Fundamentals: Part B begins with an introduction on Ohm's and Kirchhoff's laws. Series and parallel resistor circuits are analysed and their equivalent resistive circuits are developed. DC sources are studied. Part B examines the analysis of single and multiple loop circuits as well as voltage dividers. The Nodal Voltage method, the Principle of Superposition, Thevenin's Theorem, Norton's Theorem, and equivalent circuits will be emphasised. Part B concludes with a discussion on diodes and voltage amplification in electrical networks.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate states of statical equilibrium for objects subjected to forces/couples in two/three dimensions, including external 'freebody' force/couple diagrams; 2. Assess internal forces in simple pin-jointed trusses, beams and frames including axial force; 3. Apply Ohm's law and Kirchhoff's laws in single and multiple loop circuits; 4. Analyse DC circuits by Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, and Norton's theorem; 5. Calculate voltage amplification in electrical circuits; and 6. Collaborate with team members to solve problems,

undertake basic Engineering analysis and design, and write technical lab reports.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr
Required Reading: For Part A: R. C. Hibbeler, 2014 4th edn in SI units Statics Mechanics of Materials Singapore, Pearson/ Prentice Hall
Assessment: Laboratory Work, Laboratory Reports, 20%. Test, In Semester Test (1 hour), 20%. Examination, End of Semester Examination (3 hours), 60%.

NEF2101 Fluid Mechanics 1

Locations: Footscray Park.
Prerequisites: NEF1101 - Engineering Mathematics 1
Description: Fluid Mechanics deals with the study of the properties and movement of liquids. Fluids are found and used in every facet of our lives, ranging from the water we are so much dependent on to complex hydraulic machines. The history of fluid mechanics is as old as civilisation itself, as water has been used for centuries for irrigation, power, navigation, and so on. This unit of study aims to provide students with a strong understanding of the basic concepts of fluid mechanics, which is essential for most engineering disciplines. It would introduce and teach students numerous concepts in static fluids as well as fluids in motion. Most of these concepts would be taught using practical examples found in day-to-day life (eg. objects immersed in water, water flowing in garden hoses and pipes, pumps, etc). Practical lab experiments would be undertaken to explain these concepts using hands-on experiments and demonstrations. Topics include: Hydrostatics, pressure, force on immersed surfaces; Pressure measurement, piezometers and U-tube manometers; Stability of floating bodies, Archimedes principle and metacentric height; Hydrodynamics, classification of flows, continuity, momentum and energy equations and their applications; Flow in pipes, pipe friction equations and Moody's diagram, Flow measurement in pipes (venturi meter and orifice meter); Pumps, types of pumps, performance equations, affinity laws, pumps in series and parallel, cavitation and surge.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts of Fluid Mechanics (hydrostatics as well as hydrodynamics), complemented with practical laboratory based experiments; 2. Calculate hydrostatic force on submerged bodies; 3. Evaluate the factors that control the stability of floating bodies; 4. Use continuity, momentum and energy equations to solve problems related to pipes and inter-reservoir pipe flow; and 5. Identify types of pumps and select suitable pumps for a variety of situations.
Class Contact: Lecture 2.0 hrs Forty Eight (48) hours for one semester comprising a mixture of lectures, tutorials and group based practical laboratory experiments.
Required Reading: Class Notes and additional resources on WebCT. Hamill, Les. (2011) Third Edition Understanding Hydraulics MacMillan Press
Assessment: Practicum, Two lab experiment based assessments with group report for one assessment, 20%. Test, One mid-semester test, 15%. Examination, End of Semester Examination (3 hours), 65%. Simulated environment reports assessed by lecturer.

NEF2251 Fundamentals of Electrical and Electronic Engineering

Locations: Footscray Park.
Prerequisites: NEF1205 - Engineering Fundamentals ENF1205 - Engineering Fundamentals NEF1205 - ENGINEERING FUNDAMENTALS or ENF1205 - ENGINEERING FUNDAMENTALS
Description: The unit aims to provide students with a sound knowledge of electrical circuits, circuit analysis techniques, transformers, motors, generators as well as digital electronic circuits. The unit covers fundamentals of Electrical and Electronic Engineering for non-electrical engineering students from Mechanical, Architectural and Building Engineering courses. Part A - Electrical Circuits. Part A begins with a revision of basic fundamentals including Direct-Current (DC) circuits. The concept of nodal-analysis (node-voltage method) for the analysis of DC circuits is introduced. The principle of Superposition, derivation of Thevenin and Norton equivalent circuits are discussed in detail as well as the maximum power transfer theorem. Alternating-Current (AC) circuits are explored and the analysis of these circuits using complex numbers is covered. Three-phase AC systems are studied and the concept of power factor correction is introduced. An overview of electrical transformers is given. Finally, DC and AC motors are examined as well as synchronous generators. Part B - Digital Electronics. Part B begins with a discussion of number systems including the binary system and hexadecimal numbers. Arithmetic operations and Boolean expressions and their reduction techniques are explored. The design of combinational digital circuits using NAND/NOR design techniques/gates, latches, and flip-flops is introduced and studied in detail. These are done through Karnaugh Maps and Boolean Algebra. Special emphasis is given to the study of sequential digital circuits and their design techniques. Finally, asynchronous and synchronous counter circuits, analogue to digital conversion and microprocessor interface devices are introduced.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and solve DC, AC circuits and balanced three-phase systems using a range of techniques; 2. Appraise the significance of transformers in electric circuits and how they operate, and perform transformer operational and performance calculations; 3. Investigate the operational principles of motors and generators, and use their equivalent circuits to estimate their operating and performance characteristics; 4. Distinguish a range of number systems including the binary system, octal and hexadecimal systems and convert between these different number systems; 5. Identify different Logic Gates, truth tables and examine their use in given contexts; 6. Develop and simplify Boolean expressions using Boolean laws and in sum of products and/or product of sums expressions from logic truth tables; 7. Design and optimise combinational and sequential digital circuits using NAND/NOR design techniques as well as asynchronous counters for a given count sequence; 8. Assess the significance of analogue to digital conversion in electronic circuits; and 9. Collaborate effectively with responsibility for personal and group outputs.
Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr
Required Reading: Glover, J.D. (2012) 5th edition Power Systems: Analysis and Design Cengage Learning Tocci, R.J. & Widmer, W.D. (2010) 11th edition Digital Systems: Principles and Applications. Prentice-Hall Rizzoni, G. (2006) 5th edition Principles and Applications of Electrical Engineering. McGraw Hill
Assessment: Test, Two (2) Class Tests (one (1) hour), 20%. Laboratory Work, Two (2) Laboratory Group Reports (1000 words each), 20%. Examination, Final Examination (3 hours), 60%.

NEF3101 Project Management

Locations: Footscray Park.
Prerequisites: Completion of at least 96 CP
Description: Prospective employers in the Industry seek Graduates with strong project management skills to ensure that projects deliver specified outcomes and are both sustainable and profitable. This Project Management unit introduces students to a project management framework - the Project Management Body of Knowledge (PMBoK). Students will learn network planning with Gantt charts, resource allocation and scheduling techniques for executing engineering projects. The unit also addresses topics such as feasibility studies and project evaluation, contract administration and tendering processes and conducting financial feasibility studies for projects.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map and apply a project management framework (PMBoK) to selected engineering projects; 2. Conduct technical and financial feasibility studies; formulate a detailed project management plan, design network logic diagrams, determine critical paths and optimise project resources; 3. Administrate contracts and preparation of tender documents; 4. Create project plans/schedules and conduct critical path analysis; apply commercially available software, such as Microsoft Project to support budget, resource and time management within an engineering project; 5. Develop project cash flows and budgets with respect to project control at various stages of projects.

Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hr

Required Reading: Lecture Materials and associated Notes;Jack R. Meredith, Samuel J. Mantel, Jr. Meredith, Jack R. Hoboken, (2014) 9th ed. Project management: a managerial approach NJ : John Wiley There are a number of other textbooks that can be used in conjunction with the required texts. Some of these texts are available online by subscription. For example, Project management [electronic resource] : a systems approach to planning, scheduling, and controlling / Harold Kerzner, Harold Hoboken, N.J. : Wiley, c2013 11th edition.

Assessment: Report, Develop a Due Diligence Report (first six weeks) and a Project Management Plan (PMP) - second six weeks; Group Reports (2500 words each), 20%. Presentation, Two group Oral Presentations (1) at the completion of Due Diligence report and (2) at the completion of the PMP report (5 mins/ student/presentation), 10%. Report, MS Project Computer Lab Report - Group (based on a Case Study - 1500 words each) - 1 to 12 weeks, 20%. Examination, End-of-Semester Examination (3 hours), 50%.

NEF3201 Engineering Management

Locations: Footscray Park.

Prerequisites: Completion of at least 96 CP

Description: Prospective employers in contemporary engineering disciplines seek graduate engineers with strong management knowledge and skills. This unit is designed to teach specialised engineering management concepts graduates need to perform their duties industry. Topics covered include principles of engineering management, project tendering process, principles of life cycle engineering, financial modelling of engineering systems and planning techniques for repetitive engineering processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the time value of money concepts for the economic evaluation of engineering systems or projects; 2. Implement general management principles for the successful delivery and management of engineering projects; 3. Exhibit the ability to apply techniques for repetitive construction or production; evaluate project performance 4. Articulate and apply basic principles of project life cycle costing, including reporting, planning and evaluation of systems; 5. Examine from an economic and functional viewpoint the feasibility of alternative design solutions; and 6. Demonstrate the ability to apply financial modelling to a project, including conduct of sensitivity analyses and application of techniques to account for uncertainty in the project evaluation process.

Class Contact: Lab1.0 hrLecture1.0 hrTutorial2.0 hrs

Required Reading: There are a number of other textbooks that can be used in concert with the required texts below. Some of these texts are available online by subscription. Students please check with the Main library.

Assessment: Test, Mid Semester Test - in sixth week (50 minutes), 20%. Report, Develop a Financial Model using MS Excel and submit a report - Group Assignment (1 -12 weeks), 30%. Examination, Semester Examination (3 hours), 50%. Total word equivalence of the above assessment tasks is 4,000 words. To pass the unit, students must pass the final exam, i.e. score 50%. This unit focuses to develop very important Engineering Management principles which would useful for applying in the industry. Therefore, students must show their understanding and learning of these management fundamentals through the final examination.

NEF4102 Capstone Project 1

Locations: Footscray Park.

Prerequisites: NEF3101 - Project ManagementNEF3101 PROJECT MANAGEMENT AND have completed 288 credit points from the Course

Description: The capstone project is the culminating experience of the student's engineering program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial engineering project or research project, related to the student's discipline area. Students will take the responsibility to organise, plan and carry-out the various tasks required for successful completion of the project. Students will be taught research methods to support this activity. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. This unit focuses on the research, scoping, designing and planning of the project. Project proposals will be presented as a report as well as end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Capstone Projects B where the project outcomes will be created and delivered.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse the problem; 2. Use Engineering research methods to evaluate the feasibility of a range of solutions taking into account such factors as cost, technical requirements, business requirements, environmental and sustainability issues; 3. Synthesise, prototype, critically analyse and/or test project designs or research hypotheses ensuring that design outcomes meet client specifications; 4. Effectively plan a project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors.

Required Reading: None required.

Assessment: Presentation, Oral Presentation, 10%. Report, Project Proposal (See detail below), 60%. Project, Project Management Plan (See detail below), 30%. In the project proposal, students will apply their skills and knowledge to critically analyse a complex engineering problem or research question, conduct a detailed literature review and investigation and propose a detailed solution or hypothesis to be tested. In the Project Management Plan students will document the complete design of their engineering solution or research investigation as well as a detailed plan on how the engineering solution will be created or how the research investigation will be conducted. This will include a detailed work break-down

structure, identification and allocation of resources, risk analysis and records of meetings and communications with the supervisor and other parties involved with the project. In the oral presentation, students will present their proposal in a clear, effective and professional manner. The student is required to satisfactorily complete and pass the project proposal before attempting the project management plan.

NEF4105 Professional Engineering Practice

Locations: Footscray Park.
Prerequisites: NEF3101 - Project ManagementNEF3201 - Engineering Management
Description: This unit is designed to prepare engineering students for professional life. One component involves students in career planning, preparing a resume and portfolio, and undertaking a mock interview process. Another component focuses on the Codes of Ethics of Engineers Australia and similar bodies, professional conduct of engineers and their social, economic, legal and environmental responsibilities. Students are also oriented to the interface between engineering, business and labour: the nature of engineering and business organisations; their administrative, marketing and financial activities; issues around intellectual property rights; business start-up and sources of business finance; industrial hazards and safety; and union activities. The importance of lifelong learning, and community engagement, participation and contribution are also addressed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop a set of career goals and identify enabling pathways and tools (resume, interview skills); 2. Critically review the role of a professional engineer, codes of ethics and standards of professional engineering bodies and speculate on their application in specific contexts; 3. Justify the importance of community participation and professional development by engineers and reflect on the nature of their potential contribution to lifelong learning; 4. Appraise workplace hazards and safety and make recommendations accordingly; 5. Assess the role of unions and collective bargaining in an organisation and predict areas of contest and possible resolution; 6. Investigate and analyse intellectual property matters affecting the engineering profession; 7. Compare business types, appraise regulatory requirements of starting a business and create a business plan with emphasis on securing funding.
Class Contact: Lecture1.0 hrOnline1.0 hrSeminar1.0 hrTutorial1.0 hr
Required Reading: No required text for this unit. Reading materials will be supplied or given reference of, as and when necessary.
Assessment: Assignment, Individual Assignment - Portfolio preparation and mock interview, 1500 words., 30%. Assignment, Individual Assignment - A report on professional conduct and ethics, and professional organisations, and/or lifelong learning, 1000 words., 15%. Assignment, Individual Assignment - An analytical essay on inquiry into a case of workplace safety, intellectual property, and/or union activities, 1500 words., 20%. Assignment, Team Assignment - A plan of an engineering business, including an oral presentation, 2000 words per team member., 35%.

NEF4202 Capstone Project 2

Locations: Footscray Park.
Prerequisites: NEF4102 - Capstone Project 1
Description: The capstone project is the culminating experience of the student's engineering program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial engineering project related to the student's discipline area. Students will take the responsibility to organise, plan and carry-out the various tasks required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. This unit continues the work done by students in the prerequisite unit Capstone Project 1. In this unit, the project outcomes will be created and delivered to the satisfaction of the client. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering knowledge to create, test and validate project designs or research activities to deliver on outcomes that meet client specifications; 2. Effectively manage a complex design or research project; 3. Produce a range of high quality professional and technical documents including project reports; and PowerPoint presentations; and 4. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.
Class Contact: One (1) hour per week and (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors.
Required Reading: None required. Notes from lectures will be provided to students.
Assessment: One assessment record is needed to satisfy mandatory requirements for this unit, please check with your College for internal procedures Project, Project Assessment, 50%. Report, Project Report (See details below), 40%. Presentation, Oral Presentation, 10%. The project outcome is assessed against the project proposal and required deliverable from semester 1. Project assessment is required to be completed with a minimum satisfactory pass to complete the unit. The project report documents the creation of project deliverable or research outcomes with detailed analysis and evaluation of the project. The outcomes of the project are also presented orally in the final oral presentation.

NEM2101 Mechanical Engineering Design

Locations: Footscray Park.
Prerequisites: NEF1204 - Introduction to Engineering DesignNEF1205 - Engineering Fundamentals
Description: During this unit students will work individually and collaboratively to develop broad skills in designing a range of machine elements using both mathematical and computer based methods. The first half of the unit will focus on the design of mechanical components for static conditions. It will also follow on from stress analysis theory with a more specific emphasis on failures resulting from static loading and its influence on mechanical engineering design. The second half of the unit will focus on design optimisation techniques which will include graphical optimisation, linear programming and will also introduce students to computer based topology optimisation. Throughout the unit computer aided drawing (CAD) software will also be used to design and generate solid models of mechanical elements. The computation methods presented in the unit follow on from those introduced in NEF1204 - INTRODUCTION TO ENGINEERING DESIGN and are included to provide students with skills in using design software which is often used in engineering practice.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental mechanics and scientific skills to the design and selection of mechanical elements 2. Identify, formulate and solve engineering design problems in a systematic way 3. Create innovative solutions to complex

engineering problems using relevant computer software 4. Select and justify the use of mathematical methods to optimise mechanical engineering designs 5. Collaborate effectively as a member and/or leader of a team and to time manage multiple tasks 6. Adapt mechanical engineering design skills to solve authentic, 'real-world' problems taking into consideration relevant variables

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: K. Nisbett & R. Budynas (2014) 10th ed. Shigley's Mechanical engineering design. McGraw Hill

Assessment: Portfolio, Part 1: Individual drawing portfolio (before wk 6) Part 2: Mathematical Optimisation Solutions (after wk 6), 20%. Assignment, Group design & analysis task, 15%. Assignment, Group CAD challenge, 15%. Examination, Final Examination (Hurdle), 50%.

NEM2102 Introduction to Engineering Materials

Locations: Footscray Park.

Prerequisites: Nil.

Description: Atomic structure and bonding and its effect on mechanical and physical properties of solids. Introduction to microstructures of polymers, metals and ceramics. Fundamentals of cement and concrete microstructure- property relationships; classification of cementitous materials for engineering design. Deformation mechanisms in crystalline solid. Mechanism of strengthening of metals; phases in alloys. Introduction to phase diagrams and their application to ferrous alloys. Phase transformations through time-temperature- transformations and their applications to heat treatment of plain carbon steels and cast irons. Structure-property relationship in alloy and stainless steels.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop an understanding of microstructure- property relationship of solid materials; 2. Develop appreciation of limitations of basic materials in engineering design; 3. Develop cognitive skills in decision-making process for areas of optimum engineering design; 4. Cognisance of the role materials play in maintaining a sustainable environment; and 5. Produce written technical reports individually and as a part of a team.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Rojter, J (2014) Introduction to Engineering Materials, Lecture Notes Victoria University Callister, D.W. Jr (2013) Materials Science and Engineering - An Introduction John Wiley & Sons Budinski, G.K. & Budinski, K.M. (1999) Engineering Materials - Properties and Selection Prentice-Hall Askeland, R.D., & Fulay, P.P. (2008) Essentials of Materials Science and Engineering, Cengage Learning Stamford CT, USA

Assessment: Students will work in groups but present individual components in the team reports. The reports will be used for formative assessment. Laboratory Work, Require demonstration of laboratory skills, analysis of data, library research to contextualize knowledge acquired in the course of experimentation, 12%. Assignment, Student will as a team submit a major report based on open-ended current technical issues. The report will also include individual reflective journals, 18%. Test, Mid-semester, covering introductory lectures, 20%. Examination, Covering large part of the course including laboratory and assignment work, 50%. Total combined assessment word equivalence is approximately 5000 words. Additional conditions: Attendance in all laboratory sessions is compulsory.

NEM2201 Thermodynamics 1

Locations: Footscray Park.

Prerequisites: NEF1202 - Engineering Physics 2

Description: This unit builds on NEF1202 - ENGINEERING PHYSICS 2, as the first Thermodynamics subject for Mechanical Engineering students. It will lead to a thorough understanding of and the fluent skills of applying the Fist Law of Thermodynamics. Students will apply the First Law of Thermodynamics to various simplified engineering problems. The subject then introduces the Second Law of Thermodynamics and its relevance in setting the directions of the engineering processes. The unit elaborates on the upper limits and for some ideal processes. It then quantifies the Second Law of Thermodynamics using entropy, introduce the entropy increase principles and calculate the irreversibility changes during various engineering processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the thermodynamics properties of pure substance and apply the ideal gas law to a range of engineering situations; 2. Apply systematic engineering synthesis with initiative and judgement to distinguish the various closed and open systems from engineering applications; 3. Analyse simple engineering systems involving energy balance by applying the First Law of Thermodynamics; 4. Appraise the various thermodynamical systems so that these systems perform within the limits set by the Second Law of Thermodynamics; 5. Calculate the entropy changes of a system and determine the entropy generation of various engineering processes; and 6. Apply the energy and mass conservation laws to determine the performance of ideal and actual refrigeration systems used at home and industries.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Comprehensive class, laboratory and activity notes. On-Line material.Cengel, Y.A. and Boles, M.A. 2014 8th Edition Thermodynamics - An Engineering Approach McGraw Hill

Assessment: Additional Information: 1. Test - Students will be assessed on their in-depth understanding of thermodynamics properties of pure substance, the use of steam tables, and applications of the first law of Thermodynamics to solve the energy balance in closed and open systems of engineering applications. 2. Test - Students will be tested on their understanding of the second law of Thermodynamics, the Carnot cycle and the application of first and second laws of Thermodynamics to ideal refrigeration systems. 3. Laboratory Work - Students will perform an experiment in groups on a refrigeration system and write individual reports of professional standard to demonstrate their understanding of working principles of the refrigeration system, their ability of analysis of the experimental data, and discuss their experimental results to learn the difference between the idealization of the refrigeration system studied in class and an actual refrigeration system. Test, Class test; calculations, sketches max. 1000 words, 10%. Test, Class test; calculations, sketches max. 1000 words, 10%. Laboratory Work, Laboratory on Refrigeration; calculations, sketches max. 1000 words, 10%. Examination, Final, 70%. 4. Examination - This final examination will exam all the content covered during the semester and will assess the competence of the students in applying the first and second laws of Thermodynamics to analysis the energy balance for many systems from engineering applications. Students will also be assessed in-depth understanding by the application of Thermodynamics principles to refrigeration systems and fluent application of these principles to determine the performance of actual refrigeration systems.

NEM2202 Dynamics

Locations: Footscray Park.

Prerequisites: NEF1202 - Engineering Physics 2

Description: This unit of study aims to give students an understanding of principles of engineering dynamics including particle dynamics and rigid body dynamics

(kinematics and kinetics) in two and three dimensional space, as well as to develop problem solving, computing skills in the areas of mechanism design. It covers the following topics. Introduction to dynamics, Kinematics of particles - rectilinear and plane curvilinear motion co-ordinates systems, 3-D curvilinear motion and relative motion. Plane kinematics of rigid bodies - rectilinear and plane curvilinear motion, relative velocity, instantaneous centre of zero velocity, relative acceleration, space curvilinear motion. Kinetics of particles - Newton's law, work and energy, impulse and momentum. Plane kinetics of rigid bodies - moments and products of inertia, Newton's law, work and energy, impulse and momentum. Three-dimensional dynamics of rigid bodies - kinematics, kinetics, gyroscopic motion.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental knowledge to solve problems related to particle dynamics and rigid body dynamics in two and three-dimensional space; 2. Solve a wide range of problems using kinematics of particles, plane kinematics of rigid bodies, kinetics of particles, plane kinetics of rigid bodies and three-dimensional kinematics and kinetics of rigid bodies; 3. Communicate effectively (both written and oral) and work as effective members of a team; and 4. Apply experimental techniques to real world engineering problems.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Meriam J.L., & Kraige L.G. (2013) (7th SI ed.). Engineering mechanics: Dynamics John Wiley and Sons

Assessment: Assignment, Part 1: Preliminary laboratory submission (approx. 1000 words). Part 2: Final report (approx. 2000 words). Group submissions (Hurdle), 20%. Portfolio, Short answer mathematical problems (weekly). Includes oral presentation of a solution, 10%. Test, Prerequisite knowledge test (before wk 6), 10%. Examination, End-of-semester examination (3 hours), 60%.

NEM3101 Engineering Analysis and Modelling

Locations: Footscray Park.

Prerequisites: NEM2202 - Dynamics

Description: This Unit of Study introduces students to the application of fundamental laws of physics, mathematical concepts and computer programming tools in the process of systematic analysis and predicting behaviour of engineering systems. It exposes students to generic analytical skills and methods relevant to contemporary engineering practice and illustrates their practical application to various generic engineering systems for the purpose of their evaluation, and numerical modelling and simulation of their behaviour, such as performance of internal combustion engine, shock and vibration or sound. After an introduction to the analysis of engineering systems and to formulation of simple numerical predictive models of mechanical systems involving differential equations in the time domain, the need for the analysis of mechanical systems in the frequency domain is explored. Students are introduced to the concept of a signal and become familiar with the relationship between the frequency and the time domains and practice the implementation of Fast Fourier Transform. Graphical presentation of multidimensional sets of data, such as time-frequency is practiced. A simple model of a mechanical second order system is used to introduce the concept of the transfer function and its use for prediction of response. Students explore a modern environment for numerical simulations involving Ordinary Differential Equations and transfer functions. Students are introduced to the use of transducers, instrumentation and computer data acquisition systems to validate the results of simulations and discuss discrepancies. The UoS will culminate in students giving end-of-semester oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify suitable approach to the engineering system analysis in either the time or the frequency domain; 2. Formulate models of simple engineering systems with Ordinary Differential Equations and transfer functions and then numerically simulate and predict the behaviour of these systems; 3. Acquire and process large sets of experimental data and derive dependent parameters through computer programming; 4. Compute and scale frequency spectra of signals representing the response of a mechanical system using Fast Fourier Transform and use them to interpret the behaviour of the system; 5. Produce computation automation scripts (computer programs); 6. Produce written technical reports individually and as part of a team; and 7. Prepare and present an oral technical presentation relating to a project.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Palm W.J., 2013 Introduction to MATLAB® for Engineers McGraw-Hill Chapman S.J., 2013 MATLAB® Programming with Applications for Engineers Cengage Learning

Assessment: Students will work in groups of two but present individual reports. The reports will be used for formative assessment. Each project report will be graded as either 0 (unsatisfactory) or 1 (satisfactory). As these are designed to assist the learning process, unsatisfactory reports may be re-submitted after feedback has been obtained from the facilitator. Other, Weekly Quiz (20 mins revision to access progressive acquisition of learning outcomes and work outside contact hours), 10%. Report, Project- Formative feedback (no more than 600 words per week of a project), 0%. Presentation, Oral (10 min oral presentation of a project), 10%. Examination, Final Exam (3 hours), 80%. Additional conditions: - Final examination result will be multiplied by the average grade for formative reports, e.g. by 1 if all reports are deemed S (satisfactory). - Formative feedback on reports 600 words will be marked as either S or U - Attendance in all laboratory sessions is compulsory. .

NEM3102 Design of Mechanical Systems

Locations: Footscray Park.

Prerequisites: NEM2101 - Mechanical Engineering Design

Description: In this unit students will develop the design and judgement skills required to resolve complex problems in Mechanical Engineering Design. They will work individually and collaboratively to design a range of machine elements in mechanical engineering systems. The unit builds on the prerequisite knowledge developed in NEM2101 Mechanical Engineering Design and has a major focus on the design of components subject to fatigue conditions. Computer aided drawing (CAD) software will be used to design and generate solid models of mechanical elements. Students' learning is consolidated through a real world project specifically designed to enhance their classroom-based learning providing a rich and authentic context for learning.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adapt fundamental mechanics and scientific skills to the design and selection of mechanical elements; 2. Diagnose engineering design problems and formulate appropriate design solutions; 3. Analyse existing mechanical engineering designs and develop creative alternatives using computing methods.; 4. Collaborate effectively with other members of their design team to apply knowledge and skills in diverse contexts; and 5. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: K. Nisbett & R. Budynas (2010) 9th metric Shigley's Mechanical engineering design. McGraw Hill.

Assessment: Assignment, Design report and presentation (approx. 2500 words). Group submission., 20%. Assignment, Design report and Oral presentation (approx.

2500 words). Group submission., 20%. Examination, End of semester examination (3 hours) - Hurdle, 60%. Team assignments will be in pairs or groups of three. Although all assessment includes learning outcomes 1 and 2, only the final examination assesses the students individual skills associated with these learning outcomes. Furthermore, the knowledge assessed in the exam is considered critical to the degree. Therefore the final examination must be a hurdle requirement.

NEM3103 Thermodynamics 2

Locations: Footscray Park.
Prerequisites: NEM2201 - Thermodynamics 1
Description: This unit is the continuation of from the Thermodynamics 1 and is specifically for Mechanical Engineering students. The Thermodynamics 2 will focus on the applications of the principles learnt from Thermodynamics. This includes the learning to analysis the air-conditioning system, various engines, power plants and simple combustion process. It is expected that the students can analysis real engineering problems involving thermal energy after studying this subject.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine the various thermodynamic properties of mixtures; 2. Describe basic concepts of air-conditioning, and determine the energy and mass balance in air-conditioning systems; 3. Define the various cycles related to petrol engines, diesel engines, gas turbine, and jet engines and determine their performance; 4. Define the various cycles related to steam power cycles and determine their performance in large power stations; 5. Describe the basic concepts of combustion; determine the air to fuel ratio and flame temperature.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Comprehensive class, laboratory and activity notes. On-Line material. Cengel, Y. A. and Boles, M. A. (2014) 8th ed. Thermodynamics - An Engineering Approach McGraw Hill
Assessment: Test, Class Test 1; calculations, sketches (max. 1000 words), 15%. Test, Class Test 2; calculations, sketches (max. 1000 words), 15%. Laboratory Work, Laboratory on Air Conditioning; calculations, sketches (max. 1000 words), 15%. Examination, Final Examination (3 hours), 55%.

NEM3201 Manufacturing Materials

Locations: Footscray Park.
Prerequisites: NEM2102 - Introduction to Engineering Materials
Description: This subject will aim to extend the knowledge of materials science in alloy steels, leading edge non-ferrous alloys, polymers, ceramics and glasses and composites and integrate it into issues of sustainable engineering product design and manufacturing technologies. This subject gives students an understanding of the engineering practice through an introduction to problem solving methodology and knowledge of the responsibilities of the professional engineer. The content will include merit matrices for material selection for economic and sustainable design and manufacture; diffusion in solids and the application of mathematical diffusion models to surface treatments of alloys; thermo- mechanical strengthening treatments of metal alloys; structure and properties of aluminium, magnesium, zinc, nickel, copper and titanium alloys, and their applications in engineering design; structure, properties and heat treatment of ceramics and glasses; introduction and structure to polymers, elastomers, foams and polymer composites; casting processes metals and polymers; introduction to surface physics and its application to powder metallurgy and joining processes; the application of introductory plasticity theory to solid forming processes; and joining processes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. To attain an understanding of processes and key issues relating to engineering science in manufacturing and environment; 2. Solve a range of numerical and engineering problems found in engineering practice and design; and 3. Identify and apply formulation and solution, effective communication, system approach to design and undertake life-long learning.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Rojter, J., 2014 Manufacturing Materials Victoria University. Class Notes Kalpakjian, S., 2010 Manufacturing Engineering and Technology Addison-Wesley Rojter, J (2014) Introduction to Engineering Materials, Lecture notes Victoria University Callister, D.W. Jr (2013) Materials Science and Engineering - An Introduction John Wiley & Sons Budinski, G.K & Budinski, K.M. (1999) Engineering Materials - Propoerties and Selection Prentice-Hall Askeland, R.D., & Fulay, P.P. (2011) Essentials of Materials Science Stamford CT, USA
Assessment: Students will work in groups but present individual components in the team reports. The reports will be used for formative assessment. Laboratory Work, Required to demonstrate: laboratory skills, analysis of data, library research to contextualize knowledge acquire in the course of experimentation, 12%. Assignment, Student will, as a team, submit a major report based on open-ended current technical issues. The report to include individual reflective journals, 18%. Test, Mid-semester - covering introductory lectures, 20%. Examination, 3 hours - covering large part of the course including laboratory and assignment work, 50%. Total combined assessment word equivalence is approximately 5000 words. Additional conditions: - Attendance in all laboratory sessions is compulsory.

NEM3202 Fluid Mechanics 2

Locations: Footscray Park.
Prerequisites: NEF2101 - Fluid Mechanics 1
Description: This unit builds on Fluid Mechanics 1 and is a more advanced subject. This subject will give an in-depth coverage of the conservation laws in integral and differential forms (Navier-Stokes equations). Some exact solutions for simple laminar flows will be given. It will explain the dimensional analysis and similarity, their applications in extrapolating experimental data based on prototype to full scale engineering devices. The subject will then study the various flows include boundary layers, flow around bluff bodies to determine the drags and lift forces which are important to many engineering applications. Finally, the subject will cover turbo-machinery which includes pumps and turbines. The behaviour of the flows inside these turbo-machinery devices and their effect on the performance of these devices will be studied.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the conservation laws of integral and differential forms in wide ranging contexts to determine the forces on engineering devices from fluid flows; 2. In-depth understanding of dimensional analysis and similarity to Interpret experimental data from prototype to the full scale device; 3. Compressive understanding of flows in turbulent boundary layers and in flow around bluff bodies to determine the drags and lifting forces from the flows; 4. Detail study of the flow characteristics in the commonly used turbo-machinery devices such as centrifugal pumps and turbines; 5. Integrate the principles and theoretical concepts of fluid mechanics and collaboratively plan and design creative, sustainable solutions to complex engineering problems with accountability for personal and team outcomes; and 6. Communicate solutions orally and in writing to small specialist groups.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: White, F.M. (2008) 6th ed. Fluid Mechanics McGraw Hill

Assessment: Test #1; Application of conservation laws of integral and differential forms to calculate forces on engineering devices from fluid flows and application of knowledge of dimensional analysis and similarity to analysis experimental data. Test #2: Application of knowledge on turbulent boundary layer and flow around bluff bodies to determine the total drags and lifting forces for flow around devices which are important to engineering applications. Laboratory Work: Forces due to flow around a cylinder in a wind tunnel. Students will conduct experiments in groups. Using a wind tunnel to measure the drags of flow around a cylinder at various wind speed. Reports Professional standard from each student will be expected to contain the analysis of the drags and Drag coefficients vs Reynolds numbers, the contribution of the drags due to pressure difference and That due to surface friction, and to extrapolate the experimental results from to a drag around a large circular building. Test, Class test; calculations, sketches max. 1000 words, 10%. Test, Class test; calculations, sketches max. 1000 words, 10%. Report, Laboratory on drags on a cylinder; calculations, sketches max. 1000 words, 10%. Examination, Final Semester Examination (3 hours), 70%. Final Exam: This final examination will exam all the content covered during the semester and will assess the competence of the students in applying the conservation laws of integral and differential forms to analysis the forces on engineering devices from fluid flows, fluent application of dimensional analysis principles to interpolate experimental data and competence in determining the forces and performances of the turbo-machinery devices such as centrifugal pumps and turbines.

NEM3203 Stress Analysis

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics

Description: Three-dimensional stress analysis: stress vector, Cartesian stress components, equation of equilibrium, principal stresses and principal stress directions. Three-dimensional strain analysis: displacement vector, Cartesian strain components, similarity between stress and strain matrix, equation of compatibility. Experimental stress analysis: strain gauges and photoelasticity. Introduction in linear elasticity: stress strain relationship, Lame's equations and Hooke's law, various formulation of boundary value problems, plane stress and plane strain problem, orthotropic materials, composite materials.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and solve general three dimensional problems of stress-strain analysis especially fundamental problems of elasticity in mechanical engineering; 2. Apply experimental techniques of stress analysis, especially photoelasticity and strain gauges; and 3. Apply the principles of stress analysis to advanced problems involving composite materials and inelasticity.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Nil required texts. Reading material and lecture notes will be provided by the lecturer.

Assessment: Report, Laboratory 1: three hour on Strain Gauge, report 2000-3000 words,, 10%. Report, Laboratory 2: three hour Photoelasticity, report 2000-3000 words,, 10%. Test, Test 1: based on Week 1-4, open book, one hour., 10%. Test, Test 2: based on Week 6-8, open book, one hour., 10%. Examination, Examination: three hour (open book),, 60%.

NEM4101 Mechanical Vibrations

Locations: Werribee, Footscray Park.

Prerequisites: NEM3101 - Engineering Analysis and ModellingVAM2131 - Engineering AnalysisEither NEM3101 Engineering Analysis and Modelling OR VAM2131 Engineering Analysis.

Description: Mechanical vibration is an important consideration for the performance, functionality and integrity of many structures and machines. This unit of study critically reviews theoretical concepts related to mechanical vibrations. It is designed to promote the requisite knowledge, skills and competencies to analyse and resolve vibration issues across a broad range of applications. Students' learning is consolidated through real world projects specifically designed to enhance their classroom and laboratory based learning. Student progress is monitored and evaluated through reports, weekly quizzes and a final examination. The unit incorporates the following topics: Fundamental vibration theory; various types of damping; response due to initial conditions (free vibrations); harmonic and complex forcing functions; Fourier analysis and the Fourier spectrum; Shock Response Spectrum; single, two and multi degree-of-freedom systems; mode shapes; vibration measurement and instrumentation; random vibration analysis; and vibration absorbers and vibration control.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Map and articulate the fundamental concepts of mechanical vibrations and justify their application in a variety of engineering design contexts; 2. Measure and analyse the salient vibration characteristics of vibratory systems such as structures, machines and vehicles; 3. Develop numerical models of vibratory systems such that they can be used to predict and enhance performance; 4. Use vibration theory to calculate and predict the vibration behaviour of complex systems (including two and multi degree-of-freedom); 5. Analyse the vibration behaviour of structures and machines taking into account economic, industrial, human and environmental considerations; and 6. Produce accurate, clear and coherent technical reports on the vibratory behaviour of structures and mechanical systems for a variety of audiences.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Rao S.S. (1995) Third Ed. Mechanical Vibrations Addison-Wesley Publishing Company Inman D.J. (2001) Second Ed. Engineering Vibration Prentice Hall Class Notes

Assessment: Formative assessment in the form of group reports (four reports) are hurdle assessment tasks and will be assessed as 0 (unsatisfactory) or 1 (satisfactory) and every team member receives the same mark. As these are designed to assist the learning process, unsatisfactory reports may be re-submitted repeatedly after feedback has been obtained from the facilitator. The mid-semester and final examinations are largely based on the work undertaken for the reports. Test, Weekly Quiz. The quizzes, to be undertaken individually, will be based on the lecture material and specific reading material., 10%. Examination, Mid-semester examination (open book), 40%. Examination, Final examination (open book), 50%. Report, Project-based reports. Formative assessment undertaken in groups (hurdle assessment), 0%. The formative assessment components of the unit will be used to give students structured feedback about their capability development of GC1 as applied to real-life vibration problems and challenges. Lectures and workshops will develop GC2 and GC3 by studying real-life systems, structures, machines and installations.

NEM4202 Advanced Engineering Analysis

Locations: Footscray Park.

Prerequisites: NEM3101 - Engineering Analysis and Modelling

Description: Advanced Engineering Analysis introduces students to advanced methods of signal and system analysis in the frequency and the time domain based on experimental data. Enhanced signal analysis techniques in both domains, such as synchronous averaging, digital filtering, spectral averaging, Power Spectral Density

are studied. Various spectral estimates, such as Auto- and Cross Spectrum are used to determine the causal relationship between response and excitation of systems in the form of Frequency Response Function (FRF) and its time domain equivalent, the Impulse Response Function. Students apply these techniques to experimental signals for the purpose of machine condition monitoring, validation of modelling and simulation results and for vibration modal analysis of mechanical or civil engineering structures. The concept of Transfer Function is then extended to the study of dynamics of systems - an underlying theory behind modern automatic control systems. Practical aspects of design of stable controllers in various automatic control systems are studied as well as systematic analysis of behaviour of engineering systems, including their automatic control. Students work collaboratively in a project exposing them to generic analytical skills and methods relevant to contemporary engineering practice engaging them in authentic practical applications in the analysis of various generic engineering systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and perform digital signal processes relevant to mechanical and structural engineering; 2. Identify and participate in measurement of Frequency Response Function, other aspects of dual channel analysis techniques of systems and their applications; 3. Describe fundamentals of control theory; 4. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 5. Produce technical reports and participate effectively in discussions and debates.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Randall R.B. (1987), Frequency Analysis. Bruel & Kjaer, Demnark. Dorf R.C. and Bishop R.H, (2004) 10th ed., Modern Control Systems, Prentice Hall

Assessment: Formative assessment in the form of group reports. These will be assessed as satisfactory (0) or unsatisfactory (1). Other, Progress quizzes and diary, 10%. Examination, Final. Weighted by the average score for group reports., 90%.

NEM4420 Mechanical Design Project

Locations: Footscray Park.

Prerequisites: NEM3102 - Design of Mechanical Systems

Description: This unit is the capstone design project for the course that requires students to undertake a major design task based on a real engineering project. Students will work individually and collaboratively to resolve a complex engineering problem. Students will implement design and project management process, drawing on principles and theoretical knowledge developed in the prerequisite units. Regular written and oral progress reports will be a feature of the unit, and the major assessments will comprise a reflective design journal, language skills exercises, one interim and one final design report. The final report will document the complete design process, the analysis of the design and comparison with the original project specifications. Students will be required to work with intellectual independence acting responsibly and accountably as professionals.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Diagnose problems and formulate solutions with intellectual independence in wide ranging 21st century engineering contexts; 2. Implement a systematic approach to the design problem demonstrating initiative and professional judgement; 3. Innovate and propose creative mechanical designs, using engineering drawings and solid modelling, to meet the agreed specifications; 4. Plan, manage and execute a project by, designing to specification and meeting the client's requirements and reporting timelines; 5. Collaborate effectively with other designers working on related project tasks as well as stakeholders who may be influenced by the project and negotiate project outcomes; and 6. Communicate effectively orally as well as in writing and present a clear and coherent exposition of knowledge and ideas to a variety of audiences including professional audiences and external parties.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Design brief and specifications document

Assessment: Portfolio, Comprises an informed design journal that contains regular reporting (witten and oral) of the design process and demonstration of the skills developed, 40%. Report, Interim design report (no greater than 6,000 words equivalent) – team assessment, 10%. Report, Final design report (no greater than 16,000 words equivalent) – team assessment (Hurdle), 50%.

NEN8900 Engineering (Full-Time)

Locations: Werribee, Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes and procedures outlined as part of the university's Higher Degrees by Research Policy.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to design, develop and implement a research project/s to systematically investigate a research problem; to develop, adapt and implement research methodologies to extend and redefine existing knowledge; and to manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals; 6. Intellectual independence, initiative and creativity in new situations and/or for further learning; 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Class Contact: Regular meetings with supervisor and participation in agreed research professional development activities.

Required Reading: To be determined in consultation with the supervisors.

Assessment: Thesis, Research Thesis, Pass/Fail. The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be internally assessed by the supervisory team, the College and University through 6- or 12-monthly progress reports. On completion, the thesis will be

assessed through independent examination by at least two external expert examiners of international standing.

NEN8901 Engineering (Part-Time)

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes and procedures outlined as part of the university's Higher Degrees by Research Policy.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to design, develop and implement a research project/s to systematically investigate a research problem; to develop, adapt and implement research methodologies to extend and redefine existing knowledge; and to manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals; 6. Intellectual independence, initiative and creativity in new situations and/or for further learning 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.
Class Contact: Regular meetings with supervisor and participation in agreed research professional development activities.
Required Reading: To be determined in consultation with the supervisors.
Assessment: Thesis, Research Thesis, Pass/Fail. The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be internally assessed by the supervisory team, the College and University through 6- or 12-monthly progress reports. On completion, the thesis will be assessed through independent examination by at least two external expert examiners of international standing.

NFM0112 Mathematics Foundations

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit aims to provide students with fundamental understanding of basic mathematical concepts and prepares students in the following areas of Mathematics - basic numeracy, arithmetic and mathematical operations (+,-,×,÷); basic algebra using various expressions; graph sketching of linear, quadratic and trigonometric functions; and basic calculus, including limits, differentiation and anti-differentiation/integration.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform mathematical calculations; 2. Manipulate and solve algebraic expressions; 3. Graph some polynomial and trigonometric type functions; 4. Understand the concepts and mathematics of change through calculus; and 5. Problem solve in mathematics.
Class Contact: Lecture2.0 hrsTutorial1.0 hrSixty (60) hours for one semester comprising of lectures and tutorials.
Required Reading: Learning materials will be provided by the lecturer.
Assessment: Test, Three (3) Class tests (10% each), 30%. Examination, Final Examination (3 hours), 70%.

NFP0102 Physics Foundations

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit aims to provide students with fundamental understanding of basic physics concepts. This unit emphasises on building a strong foundation of understanding in the key concepts that are explored in further mathematical detail in Engineering Physics 1. NFP0102 Physics Foundations, will cover numbering systems and standards of measurements, introduction to kinematics with one and two dimensional motion, forces and friction, work, energy and power, momentum and impulse, rotational mechanics.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse motion in one and two dimensions and apply kinematic equations to calculate displacement, velocity and acceleration; 2. Evaluate the interaction of forces, both conservative and non-conservative, on an object; 3. Analyse the conversion of mechanical energy and work; and 4. Apply the concepts of conservation of energy and conservation of momentum to describe interactions between two bodies or objects.
Class Contact: Lab1.0 hrLecture2.0 hrsTutorial2.0 hrs
Required Reading: Learning materials will be provided by the lecturer.
Assessment: Test, Three (3) in class tests., 15%. Examination, End of semester examination (2 hours), 50%. Assignment, Problem and Project Based assignments, 35%.

NHE5100 Honours Research Project

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: In the Honours program students will undertake a full time research project. Initially students will have access to the honours handbook listing potential projects offered by the various supervisors. The student and the supervisor will then collaboratively agree on the specific research project for the honours program. Various guided workshops will be run in a collaborative mode for peer to peer learning and to create a vibrant research environment. The workshops will cover a range of topics, including writing a risk assessment, research proposal, performing a literature review, giving oral presentations, preparing a research thesis, and understanding intellectual property. The literature review will provide the scientific background and rationale for the research project. Students will also be

engaged in collaborative, hands on practical activities in the laboratory which test theoretical concepts discussed with their supervisor. The research thesis is the culmination of the knowledge, skills and their application over the course of honours studies.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit advanced theoretical and technical knowledge in the discipline area by critically reviewing and evaluating relevant scientific literature; 2. Design, implement, troubleshoot and manage a research project to successful completion; 3. Analyse, evaluate and interpret data within the context of key literature; 4. Communicate professionally with a range of people including direct supervisor, peers, researchers, and industry representatives; 5. Produce a scholarly honours thesis based on their research project which complies with requisite academic conventions; 6. Critically reflect on own learning and progress of professional goals.

Class Contact: No formal contact hours, although a normal fulltime load is considered a minimum of twenty (20) hours per week. Regular meetings will be scheduled with the BSc (Hons) supervisor.

Required Reading: To be advised by the supervisor.

Assessment: Assignment, Project Proposal (3000 words), 10%. Presentation, First Oral - Introduction of Proposed Research Project (20 minutes), 5%. Literature Review, Review of Literature Relevant to Research Project (5000 words), 15%. Presentation, Final Oral - Presentation of Results and Conclusions from research project (20 minutes), 10%. Thesis, Research Thesis (15,000 words), 60%. At the commencement of the academic year, each student is assigned two examiners from within the College with appropriate discipline knowledge. In some instances an external examiner may be appointed. These two examiners, along with the Research supervisor, assess and provide feedback on the Project Proposal, literature review and the Research Thesis. The assessment is across the entire course. The two oral presentations are presented to a gathering of the College Science staff, research students and all of the Honours students. All attendees, except the Honours students, assess the oral presentations against a rubric. Prior to the final mark for the thesis being determined, the student is given an opportunity to meet with the examiners and answer questions the examiners may have in regard to the material presented in the thesis. .

NHE5101 Honours Research Project

Locations: Werribee, Footscray Park.

Prerequisites: Nil.

Description: In the Honours program students will undertake a full time research project. Initially students will have access to the honours handbook listing potential projects offered by the various supervisors. The student and the supervisor will then collaboratively agree on the specific research project for the honours program. Various guided workshops will be run in a collaborative mode for peer to peer learning and to create a vibrant research environment. The workshops will cover a range of topics, including writing a risk assessment, research proposal, performing a literature review, giving oral presentations, preparing a research thesis, and understanding intellectual property. The literature review will provide the scientific background and rationale for the research project. Students will also be engaged in collaborative, hands on practical activities in the laboratory which test theoretical concepts discussed with their supervisor. The research thesis is the culmination of the knowledge, skills and their application over the course of honours studies.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit advanced theoretical and technical knowledge in the discipline area by critically reviewing and evaluating relevant scientific literature; 2. Design, implement, troubleshoot and manage a research project to successful completion; 3. Analyse, evaluate and interpret data within the context of key literature; 4. Communicate professionally with a range of people including direct supervisor, peers, researchers, and industry representatives; 5. Produce a scholarly honours thesis based on their research project which complies with requisite academic conventions; 6. Critically reflect on own learning and progress of professional goals.

Class Contact: No formal contact hours, although a normal part time load is considered a minimum of ten (10) hours per week. Regular meetings will be scheduled with the BSc (Hons) supervisor.

Required Reading: To be advised by the supervisor.

Assessment: Assignment, Project Proposal (3000 words), 10%. Presentation, First Oral - Introduction of Proposed Research Project (20 minutes), 5%. Literature Review, Review of Literature Relevant to Research Project (5000 words), 15%. Presentation, Final Oral - Presentation of Results and Conclusions from Research Project (20 minutes), 10%. Thesis, Research Thesis (15,000 words), 60%. At the commencement of the academic year, each student is assigned two examiners from within the College with appropriate discipline knowledge. In some instances an external examiner may be appointed. These two examiners, along with the Research supervisor, assess and provide feedback on the Project Proposal, literature review and the Research Thesis. The assessment is across the entire course. The two oral presentations are presented to a gathering of the College Science staff, research students and all of the Honours students. All attendees, except the Honours students, assess the oral presentations against a rubric. Prior to the final mark for the thesis being determined, the student is given an opportunity to meet with the examiners and answer questions the examiners may have in regard to the material presented in the thesis. .

NIM8900 Information and Mathematical Sciences (Full-Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes and procedures outlined as part of the university's Higher Degrees by Research Policy.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to design, develop and implement a research project/s to systematically investigate a research problem; to develop, adapt and implement research methodologies to extend and redefine existing knowledge; and to manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Expert communication skills to explain and critique

theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals; 6. Intellectual independence, initiative and creativity in new situations and/or for further learning; 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Class Contact: Regular meetings with supervisor and participation in agreed research professional development activities.

Required Reading: To be determined in consultation with the supervisors.

Assessment: Thesis, Research Thesis, Pass/Fail. The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be internally assessed by the supervisory team, the College and University through 6- or 12-monthly progress reports. On completion, the thesis will be assessed through independent examination by at least two external expert examiners of international standing.

NIM8901 Information and Mathematical Sciences (Part-Time)

Locations: Footscray Park.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes and procedures outlined as part of the university's Higher Degrees by Research Policy.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to design, develop and implement a research project/s to systematically investigate a research problem; to develop, adapt and implement research methodologies to extend and redefine existing knowledge; and to manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Epert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals; 6. Intellectual independence, initiative and creativity in new situations and/or for further learning; 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Class Contact: Regular meetings with supervisor and participation in agreed research professional development activities.

Required Reading: To be determined in consultation with the supervisors.

Assessment: Thesis, Research Thesis, Pass/Fail. The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be internally assessed by the supervisory team, the College and University through 6- or 12-monthly progress reports. On completion, the thesis will be assessed through independent examination by at least two external expert examiners of international standing.

NIT1101 Web Development and CMS

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit provides an introduction to coding web sites and the use of Content Management Systems (CMS) in the provision of web sites. Coding of sites involves Extensible Hyper Text Markup Language (XHTML) and Cascading Style Sheets (CSS). CMS involves design, creation and management of web sites using specialist CMS tools. The unit is delivered using Problem-based Learning (PBL). Lectures and laboratories will support the PBL approach with the use of scaffolding. Contents include: XHTML and CSS for coding web sites; use of a CMS to design, set up, deploy and maintain web sites.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop web sites using XHTML coding; 2. Apply CSS to web sites for formatting and presentation of content; 3. Apply a CMS in the design, development and deployment of a web site; and 4. Apply Web design principles in the effective design of Web sites.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Gosselin, D. (2011) 1st Ed. Principles of HTML, XHTML, and DHTML Course Technology

Assessment: Test, Test 1 (20 minutes), 10%. Laboratory Work, Assessable Lab 1 (1.5 hours), 30%. Laboratory Work, Assessable Lab 2 (1.5 hours), 30%. Test, Test 2 (1.5 hours), 30%.

NIT1102 Introduction to Programming

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to modern computer programming language, problem solving and algorithm development. Students will be exposed to multiple design strategies, including top-down design and recursive design with functions, object-based programming, and object-oriented design. Content includes: Data Types and Expressions, Control Statements, Strings and Text Files, Design with Functions, Design with Classes, Graphical User Interfaces, Simple Graphics and Image Processing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate skills in using a programming language; 2. Apply suitable design strategies to develop a solution; 3. Develop algorithms using basic programming language; and 4. Apply basic object-oriented software principles in problem solving.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Kenneth A. Lambert /2012 1st Fundamentals of Python: First Programs Cengage Learning
Assessment: Laboratory Work, Weekly Practical tasks, 30%. Test, Two Written Tests (20% each), 40%. Test, Final Practical Test, 30%.

NIT1103 Communication and Information Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit aims to develop a set of skills associated with oral, written, technical and online communication. Students locate and assembling reliable sources of information for collation and presentation. Information is stored and managed electronically for effective storage and communication. Content includes an overview of the Internet, characteristics and functions of browsers, resources on the Internet, using search engines effectively, and application of IT technology to information gathering, storage and reporting. The unit also addresses formal and academic written communication.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct basic research and locate relevant Web-based and other resources; 2. Assess and evaluate resources and make judgements and decisions on their reliability and validity; 3. Access, collate and synthesise information from a variety of sources; 4. Plan and apply a variety of approaches to design and present researched information to given problem; and 5. Collaborate with others using effective interpersonal skills to design and develop online material, with responsibility for own output.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Material provided (referred to) in unit.
Assessment: Test, Test 1 (40 minutes in-class Knowledge Test), 25%. Test, Test 2 (40 minutes in-class Knowledge Test), 25%. Assignment, Final Assignment: Apply information or communication concepts, 50%.

NIT1104 Computer Networks

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides an introduction to data communication fundamentals, network transmission technologies and network protocols. It introduces students to basic design and communicational issues related to local area networks, wide area networks and the Internet. Content includes: History and fundamentals of data communications and networks; standards; communication media types; data communications principles and protocols; network architectures and protocols, standard interfaces and transmission techniques; data integrity and security; Local Area Networks (LAN); data link control; IP Addressing and Subnetworking; Routing protocols like RIP; Switching technologies and Virtual LANs; Design and implementation of enterprise networks using industry standard equipment like CISCO routers and switches.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of modern business and personal applications of data communication systems; 2. Apply various technologies to solving data communication and networking problems; 3. Design IP networks with proper subnetworks; 4. Design switching networks; and 5. Implement moderately complex networks with industry standard technologies like CISCO routers and switches.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Kurose, J. F. , Ross, K. W. (2010) 5th Ed. Computer Networking Boston: Pearson Addison-Wesley Bennett, S. (2009) 2nd Ed. 31 Days Before Your CCNA Exam: A Day-by-Day Quick Reference Study Guide Indianapolis: Cisco Press
Assessment: Test, Test 1 (60 minutes in Lab Class), 25%. Test, Test 2 (60 minutes in Lab Class), 30%. Assignment, Final Assignment, 45%.

NIT1201 Introduction to Database Systems

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces fundamental concepts and principles of database and explains its role and purpose in information system design and analysis. Students gain mastery of standard techniques to identify system requirements and design a simple database system. Content includes: systems concepts; role of the analyst; Systems Development Life Cycle (SDLC), process modelling, Entity-Relationship (ER) modelling; relational database design using ER and Extended ER modelling, SQL (Structured Query Language), normalisation; and database management systems (DBMS).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the benefits and functions of databases and their applications; 2. Design a database using key relational database model concepts; 3. Develop and apply ER and EER diagrams; 4. Implement a relational database with multiple tables using a relational DBMS; 5. Apply query languages and manage a database using SQL; and 6. Normalise relations in a relational database system.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Elmasri, R. and Navathe, S. (2014) Pearson New International Edition, 6th Ed. Fundamentals of Database Systems Pearson Education
Assessment: Assignment, Assignment, 30%. Test, Test, 20%. Examination, Final Written Examination (2 hours), 50%.

NIT1202 Operating Systems

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces students to modern computer operating systems, their major components and roles. Students will be exposed to at least two popular operating systems including a mobile OS. Content includes: Operating System (OS) concepts, OS architectures; threads and processes; concurrency, daemons and services; memory management, devices and device drivers; file systems, security; basic scripting.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of the basic OS architectures, functions and roles; 2. Cite the history and identify social impacts of different operating systems, including mobile OS; 3. Describe OS components for processes, devices, files and memory management; 4. Research and report information on operating system types; and 5. Understand the basis of Unix shell scripting.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: McIver-McHoes A. & Flynn, I. (2008) 6th Ed. Understanding Operating Systems Cengage Learning
Assessment: Assignment, Assignment (1000-1500 words), 30%. Test, Test (90 min), 30%. Examination, Final Written Examination (2 hours), 40%.

NIT1203 Introduction to Project Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit investigates aspects of professional practice and specific tasks that need to be undertaken in order to initiate and implement an IT project. Content includes many aspects of project management, definition of a project; characteristics of IT projects; project life cycle; project team; project management aspects; scope, time, cost, quality, human resource; communications, risk, procurement, and integration management; project planning and scheduling; Critical Path Method (CPM); project execution and monitoring; project closure; project management software.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Define a project, and identify the special characteristics of IT projects; 2. Describe the key elements of a project plan, including cost and time schedules; 3. Undertake project planning and documentation, considering all project requirements, constraints and risks; 4. Manage project execution activities, monitor and control project scope changes, risks, issues and the delivery of project team work activities; and 5. Coordinate project closure, consider IT support plans and obtain final project sign-off.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Schwalbe, K. (2013) 7th Ed. Information Technology Project Management Thomson Course Technology
Assessment: Test, Two tests (10% each), 20%. Project, Group Project Implementation (2000 words), 30%. Examination, Final Exam (3 hours), 50%.

NIT1204 Web Application and Server Management

Locations: Footscray Park.
Prerequisites: NIT1101 - Web Development and CMSECB1222 - Web Design and Programming
Description: This unit instructs students in rapid development of web-based, interactive applications using an Integrated Development Environment (IDE). It then continues with addressing the set up and management of web servers that host such applications. The unit is delivered using Problem-based Learning (PBL). Lectures and laboratories will support the PBL approach with the use of scaffolding. Content includes: application of an IDE in web application design and development; use of controls in web page development; server-side scripting using object-oriented programming; web server set up, deployment and management using relevant technologies/tools.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply an IDE to design and develop web applications for real-world clients; 2. Use relevant markup/controls in developing web pages; 3. Apply object-oriented programming in the design and development of web applications; and 4. Apply concepts related to server management in managing a server in a real-world situation.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Joel Murach and Ray Harris (2014) 2nd ed. Murach's PHP and MySQL USA/Mike Murach & Associates, Inc.
Assessment: Assignment, Web development task, 25%. Assignment, Web development task, 25%. Examination, Final Examination (2 hours), 50%.

NIT2101 Computer and Internet Security

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer NetworksNIT1104
Description: This unit investigates processes of security at local and network levels, including security policies and practices, software, hardware and human issues. Content includes: physical and system security; cryptosystems; authentication and authorization; Access Control List (ACL); firewalls and port security; secure and insecure web protocols (e.g. telnet, ssh); secure email protocols (e.g. PGP and S/MIME); intrusion detection and system hardening; security in Virtual Private Networks (VPN), cloud computing, and databases.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Audit a system for security vulnerabilities; 2. Manage and use system security and logging tool; 3. Identify strengths and weaknesses in security products; 4. Apply security tools to strengthen a networked system; 5. Analyse a system for deploying the most appropriate security solution; 6. Design and implement a security solution given a set of constraints.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Jie Wang, Zachary A. Kissel (2015) 2nd Introduction to Network Security: Theory and Practice Wiley
Assessment: Laboratory Work, Practical Knowledge Test, 20%. Report, Project report (2500 - 3000 words), 30%. Examination, Final Written Examination (3 hours), 50%.

NIT2112 Object Oriented Programming

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides in-depth understanding of a modern object oriented language. The unit develops skills in software development, through an algorithmic approach and the application of principles of objected oriented programming. Content includes: introduction to programming; basic constructs of a programming language; sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries; one dimensional arrays; graphical user Interface.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss and apply fundamental aspects of computer program development; 2. Describe and conduct software development activities; 3. Develop algorithms using basic programming constructs; 4. Manipulate primitive data types and structured data types; and 5. Apply object-oriented software principles in problem solving.
Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs Tutorial 1.0 hr
Required Reading: Lewis J., DePasquale P., & Chase J. (2014) 3rd ed. Java Foundations: Introduction to program design and data structures, Pearson International Edition.
Assessment: Test, Test (60 min), 25%. Assignment, Assignment (programming tasks), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2113 Cloud Application Development

Locations: Footscray Park.
Prerequisites: NIT1102 - Introduction to ProgrammingECB1121 - Programming PrinciplesNIT1102 or ECB1121
Description: This unit introduces the basic concept and fundamental principles of cloud computing and popular cloud development platforms. Students will learn programming skills in cloud and practise the design and development process of cloud applications in various platforms. Cloud computing undergoes constant evolution, and there are several competing platforms, such as Amazon. This unit

includes important topics in cloud computing, e.g., virtualization, storage, infrastructure/platform/software as a service, reliability, security, MapReduce programming, etc. The knowledge will be applied to design, develop and deploy cloud based applications in Amazon web services platform.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design cloud applications architecture in major cloud platforms; 2. Develop cloud applications by using cloud services in different level, e.g. IaaS, PaaS, SaaS; 3. Apply the current cloud technologies, framework architecture and principles in cloud application development; and 4. Analyse the usage of cloud computing in different sectors and the impact of cloud on society.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: George Reese/2009 1 Cloud Application Architectures: Building Applications and Infrastructure in the Cloud O'Reilly Media

Assessment: Assignment, Cloud application design (1000-1500 words), 25%. Project, Cloud application development (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2122 Server Administration and Management

Locations: Footscray Park.

Prerequisites: NIT1104 - Computer NetworksNIT1202 - Operating SystemsECB1213 - Computer Operating Systems(NIT1104 AND NIT1202) OR ECB1213

Description: This unit provides students with the knowledge of server administration, including database and operating system administration. Content includes: database (DB) administration; operating system (OS) administration; system administration: network connection, data backup, software administration; TCP/IP (Transmission Control Protocol/Internet Protocol) configuration; creating DNS (Domain Name Servers), wireless communication systems administration; firewalls, IPSec protocols.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain fundamentals of database, operating systems, and server administration; 2. Develop server administration and maintenance skills; and 3. Configure real-life network infrastructures, including wireless systems.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Ross Mistry, Shirmattie Seenarine (2012) 2nd Microsoft SQL Server 2012 Management and Administration Sams Publishing

Assessment: Laboratory Work, Practical Knowledge Test, 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2124 Network Management

Locations: Footscray Park.

Prerequisites: NIT1104 - Computer NetworksECB1131 - Computer Network ConceptsNIT1104 or ECB1131

Description: This unit explores the fundamentals and practice of network management methodologies. This includes the study of standard network management models such as the FCAPS model that includes fault management, configuration management, accounting management, performance management, and security management. Management models like FCAPS will be used to justify and assess the applicability of various network management tools like the Simple Network Management Protocol. Content includes: FCAPS (Fault, Configuration, Accounting, Performance, and Security) model, Simple Network Management Protocol (SNMP); network management tools and systems, such as CiscoWorks LAN Management Solution (LMS).

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principles of network management; 2. Develop the skills required to manage networks; 3. Understand the applicability of the available tools; 4. Perform network management tasks.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Alexander Clemm (2006) 1st ed. Network Management Fundamentals Cisco Press

Assessment: Assignment, Two (2) Reports (4-5 technical questions), 25%. Test, Two (2) Practical Knowledge Tests, 25%. Examination, Final Written Examination (2 hours), 50%.

NIT2171 Introduction to ICT Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit will equip students with broad and coherent knowledge and skills for both business and information system management. It aims to meet the demands for professionals with advanced technologies to serve management and staff across various teams. Students will explore the development, use and management of an organization's information system, and propose a service agreement to establish the collaboration between IT experts and the other teams in the organization.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review and evaluate the current ICT management techniques and skills in business; 2. Identify and resolve ICT related management issues and problems in an organisation; and 3. Propose an ICT service agreement for collaboration with other service teams.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Text will be provided by the lecturer.

Assessment: Workshop, Weekly workshops, 25%. Assignment, Group assignment (2000-2500 words), 25%. Assignment, Individual assignment (1000-1500 words), 50%.

NIT2201 IT Profession and Ethics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit articulates the role of the IT profession within the local and global communities. The unit examines a wide range of ethical and privacy issues and concepts in the ICT field. The unit develops student critical thinking skills by introducing topical and controversial issues related to computing ethics and privacy problems. Content includes: the role of a computing professional; understanding how computers impact on society; information privacy concepts as applied to the management of information systems; different industry policies; mechanisms for implementing these policies; Australian Computer Society (ACS) code of ethics; social issues of privacy, intellectual property, and the digital divide.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key roles of computing in the local and global communities; 2. Demonstrate an understanding of the different principles underlying ethical decision making; 3. Critically discuss social and ethical issues in Information and Communication Technology (ICT) domains; 4. Identify and relate appropriate privacy measures and their management for computing environments; 5. Identify specific ethical and privacy issues in networked computing environments; and 6.

Communicate effectively on a range of IT-related topics using appropriate language.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation. Quinn, M.J. /2012 5th Ed. Ethics for the Information Age Pearson International
Assessment: Assignment, Assignment-1 (1000-1500 words), 25%. Assignment, Assignment-2 (1000-1500 words), 25%. Examination, Final Written Examination (2 hours), 50%.

NIT2212 Database 2

Locations: Footscray Park.
Prerequisites: NIT1201 - Introduction to Database Systems ECB1223 - Introduction to Systems Analysis and Databases NIT1201 or ECB1223
Description: This unit provides students with an in-depth understanding of the design and implementation of modern multi-user database systems. Content includes: design and implementation of robust and scalable database applications; issues pertaining to multi-user database environments, such as transaction management and performance; in-depth study of Structured Query Language (SQL); database application development tools; database performance optimisation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain design principles underlying multi-user database management systems; 2. Apply database theories to real-life database applications; 3. Demonstrate knowledge of the technologies that underpin multi-user database systems; 4. Analyse a real-life problem, and design and implement a system using a commercial database management system; and 5. Evaluate the robustness and scalability of database systems.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Connolly, T.M., and Begg, C.E. (2010) 5th Ed. Database Systems: A Practical Approach to Design, Implementation and Management Pearson International
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final 3 hours written examination, 50%.

NIT2213 Software Engineering

Locations: Footscray Park.
Prerequisites: NIT1102 - Introduction to Programming ECB1121 - Programming Principles NIT1102 or ECB1121
Description: Description: This unit introduces students to the design of software systems. It covers modelling of systems using Unified Modelling Language (UML) and relevant visual models in this design. Content: Introduction to UML; use of a UML-based modelling tool; analysis and design; use cases; objects and classes; class diagrams; interaction diagrams.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design software systems using UML; 2. Apply a UML-based modelling tool in the design of software systems 3. Apply the different types of models of UML to design of software systems; and 4. Correctly construct and lay out all types of diagrams.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Bernd Bruegge & Allen Dutoit (2014) 3rd ed. Object-Oriented Software Engineering Using UML, Patterns, and Java Pearson Education Limited
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Assignment (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2222 Networking Technologies

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer Networks
Description: This unit enhances and deepens the knowledge on internetworking technologies and protocols. Content includes: Routing algorithms and protocols including EIGRP and OSPF, Network Address Translation (NAT), IP V6, Wide Area Networks (WANs), Transmission Control Protocol, and network design and implementation with industry standard equipment like Cisco routers and switches.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the mechanisms and algorithms of major switching and routing technologies; 2. Design networks with appropriate network structures, addresses and routing protocols; and 3. Design and implement networks with industry standard technologies for LANs, WANs and the Internet (e.g. with Cisco Routers and WAN Switches).
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Kurose, J. F. , Ross, K. W. (2010) 5th Ed. Computer Networking Pearson Addison-Wesley
Assessment: Assignment, Assignment 1, 20%. Assignment, Assignment 2, 30%. Examination, Final Written Examination (3 hours), 50%. Assignments are design tasks based around IP Addressing, Sub-netting and Dynamic Routing.

NIT2223 Mobile & Wireless Networks

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer Networks ECB1131 - Computer Network Concepts NIT1104 or ECB1131
Description: This unit provides students with an in-depth awareness of the fundamentals of Cisco WLAN and an overview of current technologies, together with an understanding of some scientific aspects of wireless communications and the necessary techniques to implement a WLAN. Content includes: wireless regulatory bodies; Wireless Local Area Networks (WLAN) fundamentals, such as Bluetooth, WiMAX, ZigBee; cordless phone technologies; wireless standards such as 802.11; authentication and encryption methods; wireless systems architectures, such as Cisco Unified Wireless Network Architecture.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of WLAN fundamentals; 2. Install and configure WLAN and clients; 3. Implement and design WLAN; and 4. Conduct WLAN troubleshooting and maintenance.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Henry Chou and Michael Kang, 2010 CCNA Cisco Certified Network Associate Wireless study guide McGraw Hill
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Assignment (Wireless LAN Deployment Project), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2271 ICT Change Management

Locations: Footscray Park.
Prerequisites: NIT2171 - Introduction to ICT Management
Description: ICT is the most dynamic sector in the 21st century. ICT change management is a challenge to modern organisations. This unit provide students with knowledge and skills in effectively management changes and mitigate risks. The content includes ICT change management process, ICT change plan, ICT change recording and documentation, ICT change automation, risk mitigation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse key factors involved in ICT change management; 2. Develop ICT change management strategy; 3. Plan and deploy change management; and 4. Identify risk and develop risk mitigation plans for ICT change management.

Class Contact: Forty-eight (48) hours for one semester comprising lectures and laboratory sessions.

Required Reading: Text will be provided by the lecturer.

Assessment: Test, Practical Knowledge Test, 25%. Assignment, Assignment (equivalent to 1,000 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3101 IT Project 1

Locations: Footscray Park.

Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringNIT2122 - Server Administration and ManagementNIT2222 - Networking TechnologiesECB2123 - Programming for NetworksECB2124 - Web-Based Systems DevelopmentECB2253 - IT Project Management(NIT2112 AND NIT2213) OR (NIT2122 AND NIT2222) OR (ECB2123 AND ECB2124 AND ECB2253)

Description: This unit centres on an industry sponsored group project. In a team students develop an IT solution to solve a real-world problem for their client. Student activities include: business case analysis, requirements modelling, data and process modelling, and project management. This unit brings together the knowledge and skills acquired by students in earlier units and apply them to a real-world system development project.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Gain knowledge for working on a real-world software development project; 2. Apply software engineering and database methodologies in business case analysis, requirement analysis and business process modelling; 3. Demonstrate IT project management skills, such as liaising with clients, working in a team; and 4. Create and produce project documentation.

Class Contact: PC Lab4.0 hrs

Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.

Assessment: Presentation, Oral presentation-1 on project progress (5-10 minutes), 15%. Presentation, Oral presentation-2 on project update (5-10 minutes), 15%. Other, Peer and client assessments, 20%. Project, Group project documentation (4000-5000 Words), 50%.

NIT3104 Computer Architecture

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study explores the design of a computer system at the architectural level. Topics covered computer hardware, computer software, data and communications, which makes up the architecture of a computer system. In addition to concepts of computer systems, the unit will discuss modern computer systems' applications such as Google applications, Cloud computing and Mobile applications. Although computer technology is developed very quickly, the basic architecture of computer systems has changed surprisingly little. This understanding is at the foundation of being a competent and successful system analyst, system architect, system administrator or programmer.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Rationalise key processor components; 2. Review and analyse computer organisation; 3. Use simulator programs to model computer system components; and 4. Design and construct application specific solutions in the field of computer architecture.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.Randal E. Bryant and David R. O'Hallaron/2015 3rd Edition Computer Systems: A Programmer's Perspective Pearson John L. Hennessy/2011 5th Edition Computer Architecture: A Quantitative Approach Morgan Kaufmann

Assessment: Test, Practical Knowledge Test, 25%. Assignment, Computer simulation, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3112 Advance Web Application Development

Locations: Footscray Park.

Prerequisites: NIT1101 - Web Development and CMSNIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringECB1222 - Web Design and ProgrammingNIT1101 or NIT2112 or NIT2213 or ECB1222

Description: This unit provides students with knowledge and practice of designing and developing large complex web applications, e.g., large enterprise software systems in web-based environment. Students will learn of advanced software frameworks for web development and apply them in practice. A number of techniques will be introduced which include Web Service and Services, MVC (Model-View-Controller) framework, etc.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse requirements of large and complex web applications for a real-world business case; 2. Apply advance web application frameworks in designing large and complex web application; and 3. Create and develop and prototype large web applications with current popular technologies, e.g., Web services.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Imar Spaanjaars (2013) 1st ed. Beginning ASP.NET 4.5 in C# and VB USA/John Wiley & Sons, Inc.

Assessment: Assignment, Large web system design, 25%. Project, Large web system prototyping and development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3113 Advanced Programming

Locations: Footscray Park.

Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringECB2124 - Web-Based Systems DevelopmentNIT2112 or NIT2213 or ECB2124

Description: This unit explores the methodologies and approaches used in programming for computer networks through using appropriate features and the application programming interface of a modern programming language. Content includes: In-depth study of classes and objects, polymorphism; advanced graphical user interfaces (GUI), programming for Transmission Control Protocol (TCP) and Universal Datagram Protocol (UDP); file input and output; object streams and exception handling.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit specific network programming ability; 2. Demonstrate an understanding of networking with URLs (Uniform Resource Locators), sockets and datagrams; 3. Establish a simple server using TCP/IP protocol; 4. Implement a network client;

5. Program basic client-server communications; and 6. Compose advanced object-oriented solutions for problem solving using Model-View-Controller framework.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Deitel & Deitel (2015) 10th Ed. Java How to Program (Early Objects) Pearson Education
Assessment: Test, Test (60 min), 25%. Assignment, Assignment (programming tasks), 25%. Examination, Final written examination (3 hours), 50%.

NIT3114 Online Business System Development

Locations: Footscray Park.
Prerequisites: NIT2112 - Object Oriented Programming NIT2213 - Software Engineering ECB2124 - Web-Based Systems Development NIT2112 or NIT2213 or ECB2124
Description: The Building Online Business Systems unit introduces broad fundamental concepts of business information systems, online systems and e-commerce, information management in organisations and current enterprise system development technologies. The unit will focus on introducing problem-solving techniques and critical thinking for designing and developing online business systems along with other topics including information strategies, E-business, Web 2.0, Cloud computing, Enterprise systems, information security and risk management. Current online business system trends and likely future developments and applications of information systems will also be discussed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse business requirements and design the online business system including architecture, components and interfaces; 2. Develop prototypes of online business systems for specific domains; 3. Apply the current technologies and frameworks for building online business systems; and 4. Analyse the importance and impact of online business systems on e-business, business process management and enterprise management.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Brian Lehaney/2011 1 Business Information Systems and Technology: A Primer Routledge
Assessment: Assignment, Online business system design and analysis, 25%. Project, Online business system prototype development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3122 Enterprise Network Management

Locations: Footscray Park.
Prerequisites: NIT2122 - Server Administration and Management NIT2222 - Networking Technologies ECB1131 - Computer Network Concepts ECB1213 - Computer Operating Systems NIT2122 or NIT2222 or ECB1131 or ECB1213
Description: The Enterprise Network Management unit aims to provide students with an understanding of issues relevant to enterprise networks and related technologies, as well practical skill and techniques to manage the enterprise network. Topics studied include Enterprise Network Infrastructure, Domain Name Systems, Network Group Policy Design and Implementation, Security Planning and Administration, System Maintenance and Trouble Shooting and their related technologies.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop solutions for enterprise network architecture; 2. Build and configure small-scale enterprise network; 3. Analyze and identify potential issues in managing enterprise network; and 4. Manage and maintain enterprise network infrastructure.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Shannon McFarland/2011 1 IPv6 for Enterprise Networks (Networking Technology) Cisco Press
Assessment: Laboratory Work, Practical Tasks (4 to 6 labs), 20%. Assignment, Enterprise network Design and Implementation, 30%. Examination, Final Written Examination (3 hours), 50%.

NIT3123 Advanced Networking Technologies

Locations: Footscray Park.
Prerequisites: NIT2122 - Server Administration and Management NIT2222 - Networking Technologies ECB2234 - Network Security ECB2241 - Wireless Networks NIT2122 or NIT2222 or ECB2234 or ECB2241
Description: This unit will introduce students to the latest networking technologies and their ability to handle advanced communications applications. Students will work with an industry or community organisation to design an advanced network for their current and/or future networking and data communication needs. Content includes: advanced networking technologies, such as Ad-hoc Networks, ubiquitous networks, and sensor networks; an industry standard framework for network design and evaluation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe important features of advanced networking technologies; 2. Assess the networking needs of an industry or community organisation; 3. Apply network design principles to develop a model of the required network; 4. Evaluate a number of network technologies to meet the design requirements; 5. Design a network to meet the organisation needs; and 6. Apply good design and project management principles.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Anthony Bruno and Steve Jordan (2011) Cisco Network Design Associate CISCO Press
Assessment: Test, Practical Knowledge Test, 25%. Project, Group project design, documentation and presentation (2000-3000 words), 25%. Examination, Final Written Examination (2 hours), 50%.

NIT3171 ICT Business Analytics and Data Visualisation

Locations: Footscray Park.
Prerequisites: NIT2171 - Introduction to ICT Management
Description: As the use of big data become increasingly important to businesses, it is essential to analyse the data and provide meaningful view and knowledge to support judgment and action plans. This unit provides students with advanced analytical methodologies and data mining models for ICT business analytics, as well as contemporary techniques to visualise the data for decision support. The content includes data preparation, association rule analysis, classification, clustering, regression, anomaly detection, building analytic models using SQL and data visualisation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review the current algorithms, methodologies and modelling for ICT business analytics; 2. Evaluate various ICT business analytic tools and techniques; and 3. Propose a business analytics report to solve practical problems identified in an ICT business project.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Lecturer may supply additional/alternative material. Brendan Tierney/2014 1 PREDICTIVE ANALYTICS USING ORACLE DATA MINER McGraw-Hill

Assessment: Test, Knowledge Test, 25%. Project, Group project on BA solution development, 25%. Assignment, Individual assignment reviewing business analytics, 50%.

NIT3201 IT Project 2

Locations: Footscray Park.
Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2122 - Server Administration and ManagementNIT2213 - Software EngineeringNIT2222 - Networking TechnologiesECB2123 - Programming for NetworksECB2124 - Web-Based Systems DevelopmentECB2253 - IT Project Management(NIT2112 AND NIT2213) OR (NIT2122 AND NIT2222) OR (ECB2123 AND ECB2124 AND ECB2253)
Description: This unit centres on an industry sponsored group project. In a team students develop an IT solution to solve a real-world problem for their client. Student activities include: design and implementation of the project based on business case analysis, business processes and requirement models; delivery, deployment and maintenance of the project in production environment. This unit brings together the knowledge and skills acquired by students in earlier units and apply them to a real-world system development project.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit knowledge for working on a real-world software development project; 2. Apply software engineering and database design methodologies in real-world project implementation and deployment; 3. Demonstrate IT project management skills, such as liaising with clients, working in a team; and 4. Create and produce project documentation.
Class Contact: Lecture2.0 hrsPC Lab4.0 hrsForty-eight (48) hours for one semester comprising group project work.
Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.
Assessment: Presentation, Oral presentation-1 on project progress (5-10 minutes), 15%. Presentation, Oral presentation-2 on project update (5-10 minutes), 15%. Test, User Acceptance Test, 20%. Project, Group project documentation (4000-5000 Words), 50%. Oral presentations - 25% LiWC (presentations of the progress of projects with clients' feedback and requirements) Project documents - 75% LiWC (working with client to create and produce analysis and design project documents).

NIT3213 Mobile Application Development

Locations: Footscray Park.
Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringECB2124 - Web-Based Systems DevelopmentNIT2112 or NIT2213 or ECB2124
Description: This unit introduces the development of applications on mobile and wireless computing platforms. Major mobile platforms (e.g., Android and IOS) will be used for teaching programming techniques and the development process of applications. Focus of this unit will be the tools and frameworks required for developing applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop mobile applications in major mobile platforms; 2. Publish and maintain these applications in the marketplace; 3. Apply current software technologies, framework architecture and standards used in mobile application development; and 4. Analyse the ecosystem of current mobile platforms as well as their features and differences.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Joe Conway 4 iOS Programming The Big Nerd Ranch Guide Bill Phillips 1 Android Programming The Big Nerd Ranch Guide
Assessment: Test, Practical Knowledge Test, 25%. Project, Mobile application development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3222 Virtualization in Computing

Locations: Footscray Park.
Prerequisites: NIT1104 - Computer NetworksNIT2122 - Server Administration and ManagementECB1131 - Computer Network ConceptsNIT2122 or NIT1104 or ECB1131
Description: This unit provides students with knowledge and skills of virtualisation in computing including design, implement and management of virtualisation. Content: fundamentals of virtualisation in computing, server virtualisation, storage virtualisation, desktop virtualisation, application virtualisation, design and develop virtualised environments, manage and administration of virtualised systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply core knowledge of virtualisation; 2. Manage a virtualisation environment with industry products; 3. Design and develop virtual machines with main-stream industry technologies; 4. Design, develop and manage desktop virtualisation; and 5. Design, develop and manage application virtualisation.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Jason Kappel, Anthony Velte, and Toby Velte (2009) Microsoft Virtualization with Hyper-V McGraw Hill
Assessment: Test, Practical Knowledge Test, 25%. Assignment, Design and implement virtualised environment (individual or group design project), 25%. Examination, Final Written Examination (2 hours), 50%. Assignment is assessed in simulated environment (LiWC) .

NIT3274 Small IT Business

Locations: Footscray Park.
Prerequisites: NIT2171 - Introduction to ICT ManagementNIT2271 - ICT Change ManagementECB1252 - Introduction to the Computing ProfessionNIT2171 or NIT2271 or ECB1252
Description: The unit will prepare students for starting and running a small IT business. It will enable students to research and develop a new IT business proposal. The students will role-play four forms of business ownership: sole proprietorship, partnership, corporation and trusts. The unit provides the opportunity for them to have a broad and coherent body of knowledge, including the types of IT-related businesses; business plan development; business functions: marketing, location, operations, staffing, accounting; government assistance; e-business; home-based business; taxation; borrowing; franchising; social, environmental and ethical considerations.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Distinguish the various forms of ownership of small businesses, including IT businesses; 2. Evaluate various IT business opportunities; 3. Prepare a proposal for starting and running a business; and 4. Appraise sources of finance for starting and running the business.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Hatten, T. S (2015) 6th Edition Small Business Management:

Entrepreneurship and Beyond Sydney: Cengage Learning Recommended Text: Longenecker, Justin G, Moore, Carlos W, Petty, J.W, Palich, Leslie, E (2003) Small business management : an entrepreneurial emphasis 12th ed. Thomson South-Western, Mason, Ohio.
Assessment: Test, Test, 10%. Project, Team Project: Business Website Development, 40%. Examination, Final Examination, 50%.

NIT5081 Fundamentals of Cyber Security

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Fundamentals of Cyber Security unit covers the importance of cybersecurity, the most common risks, and how to mitigate them. Students in this unit will learn about cyber security and how it is related to the industry growth. This unit introduces the basic cyber security concepts and the common architectures used as industry standards. Student will have an opportunity to study different types of malware and the potential attack vectors, including viruses and trojans, use network and system tools to manage security issues and maintain the working environment. Latest information technologies related to network security, such as cryptography, used to secure interactions.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit mastery of skills and knowledge required to support and secure network environments, 2. Critically review and analyse cybersecurity architecture and state-of-the-art security technologies, 3. Design and implement security system using network and system tools, and 4. Evaluate security risks and prepare incident response plan.
Class Contact: Lab 2.0 hrs Lecture 1.0 hr
Required Reading: Wu, C.H. & Irwin, J.D. (2013) 1st ed. Introduction to Computer Networks and Cybersecurity CRC Press
Assessment: Test, Practical test (2 hours), 20%. Assignment, Project-based Assignment (2,500 words), 30%. Examination, Final examination (3 hours), 50%.

NIT5082 Cloud Security

Locations: Footscray Park.
Prerequisites: Nil.
Description: Cloud computing offers organisations a multitude of potential benefits including cost savings, backup of valuable data, global access and improved business outcomes. However, there are a variety of information security risks that need to be carefully considered. In this unit, students will learn a broad set of policies, technologies, and controls deployed to protect data, applications, and the associated infrastructure of cloud computing. Students need to identify the majority of security issues that an organization may have when it moves its applications and data to cloud environment. Students will be asked to deal with data residency, data privacy and Industry & Regulation Compliance. Both basic and advanced technologies of cloud security will be introduced in this unit, such as cloud firewall, cloud encryption gateway, tokenization of data.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate and adapt cloud data protection platforms, 2. Investigate and analyse security risks for cloud data storage and cloud-based applications, 3. Critically review cloud security threats, propose protection solutions, and 4. Apply appropriate tools to secure cloud services.
Class Contact: Lab 2.0 hrs Lecture 1.0 hr
Required Reading: Thuraisingham, B. (2013) Developing and Securing the Cloud CRC Press
Assessment: Test, Practical test (1 hour), 10%. Assignment, A project-based group assignments (3,500 words), 40%. Examination, Final examination (3 hours), 50%.

NIT5083 Enterprise Security Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: Enterprise computer networks may be vulnerable to both inside and outside threats. Enterprise networks including Internet access, intranets, extranets and various business activities must be protected. Enterprise needs to manage and control security policies choosing from hundreds of available security rules. Within the network infrastructure, security protection software including firewalls, intrusion detection systems (IDS), virus detection systems, and Public Key Infrastructure (PKI) and Virtual Private Network (VPN) solutions. Important corporate information may be distributed across a variety of different systems. Networks have security point products - often from various vendors - with different security attributes and settings. Administrators are faced with the task of Enterprise Security Management such as coordination, implementation and monitoring of security attributes across varied, dispersed infrastructures. The dynamic nature of corporate networks means that they are no longer defined by physical boundaries, but instead by enterprise-wide security policies.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Audit an enterprise system for security vulnerabilities; 2. Critique the strengths and weaknesses in security products and adapt security measures; 3. Review and adapt system security and logging tools; 4. Critical review and analyse a system for deploying the most appropriate security solution; 5. Design and implement an enterprise security management system.
Class Contact: Lab 2.0 hrs Lecture 1.0 hr
Required Reading: Chwan-Hwa (John) Wu, J. David Irwin. (2013) 1st ed. Introduction to Computer Networks and Cybersecurity CRC Press
Assessment: Test, Practical Test (2 hours), 20%. Assignment, Case Study – Enterprise Security Solution (2,500 words), 30%. Examination, Final Examination (2 hours), 50%.

NIT5084 Cyber Security Law, Regulation and Policy

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit examines cybersecurity from legal, politics and technology perspectives. It covers public and private sector activities, government regulation, and international law and politics. It will allow students to evaluate legal challenge of cyber and digital worlds. It will enable them to develop knowledge and skills in relation to the legal rules, policies and cyber law in Australia and globally. In recognition of the interdisciplinary nature of cybersecurity problems, the unit is conducted through a series of seminars taught by guest lecturers from IT and legal industries and related areas.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit mastery of theoretical knowledge about the nature of the internet and cyberspace 2. Evaluate legal challenges of cyber and digital worlds from the IT point of view 3. Acquire knowledge and skills to interpret and implement the legal rules and policies 4. Analyse and track global trends and issues in cyberspace
Class Contact: Lab 2.0 hrs Lecture 1.0 hr
Required Reading: David Clark, Thomas Berson, and Herbert S. Lin,. (2014) At the

Nexus of Cybersecurity and Public Policy: Some Basic Concepts and Issues The National Academies Press
Assessment: Exercise, Exercise/class presentation, 20%. Assignment, Group-based Assignment (2,500 words), 30%. Project, Technical Report (4,000 words or 15 pages), 50%.

NIT5110 Networking Systems

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit presents an overview of computer networking systems, laying the foundation for more advanced wired and wireless networking units in the course. It includes a perspective on the evolution of networking systems and their future. Topics include: computer networks and the Internet, seven-layer OSI Model, network design, subnetworking, routing, switching, VLAN, IPv6, network implementation with CISCO routers and switches, and etc. This knowledge and skills will be applied to analyse, evaluate, develop and design current and future computer networks.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse existing networks to evaluate their suitability for the application; 2. Investigate complex system requirements, develop network design and implement to meet the changing needs of new applications and organisation models; and 3. Elucidate the advantages of a network design and communicate them, to both specialised and non-specialised audiences, to justify the suitability, or otherwise, of existing computer network and the proposed new network system architecture.
Class Contact: Lab 1.0 hr Lecture 2.0 hrs PC Lab 1.0 hr Thirty-six (36) hours for one semester comprising lectures, tutorials, laboratory sessions and online activities.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. James F. Kurose and Keith W. Ross, 2012 6 Computer Networking: A Top-Down Approach Pearson
Assessment: Assignment, Design Project/Report (1500 words), 25%. Test, Semester Test (2 hours), 30%. Examination, Final Examination (3 hours), 45%. The total combined assessment word equivalence for this unit is approximately 6,000 words.

NIT5120 Software Engineering

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit appraises software engineering processes in areas of software development and management in preparation for building real-world software applications. Topics include the software development process and software life-cycle models, software process improvement, requirements, classical analysis and design, object oriented analysis and design, implementation and testing.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct information gathering interviews with individuals and with a group, and design, implement and evaluate data gathering questionnaires; 2. Compare and critically evaluate alternative life cycle models for a given project, and formulate recommendations for an appropriate model; 3. Evaluate requirements for a complex software system; 4. Quantify and prioritise project tasks and assign resources; 5. Construct and explicate software development techniques for both classical and objected oriented systems; and 6. Communicate to specialised and non-specialised audiences the progress of system development and progress of a software project by preparing and presenting project milestone reports.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Schach, S.R., 2010 8 Object Oriented and Classical Software Engineering McGraw Hill
Assessment: Test, Mid-Semester Test - 1 Hour, 10%. Assignment, Design solution to a software engineering problem, 20%. Examination, Semester Test - 3 Hours, 70%. Students must attain a mark of 50% in each assessable component to pass this subject. Supplementary assessment will not be available. .

NIT5130 Database Analysis and Design

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit discusses the specialised skills for designing and using relational databases. It is a core unit in this advanced and applied IT course. The unit provides students with an in depth knowledge of the daily administration of the relational database. SQL is the standard language used in industry for storing information such as websites and business applications.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Abstract data requirements into data models using entity-relationship model and design relational databases; 2. Design proper queries with SQL language to adapt and translate data into useful information to users; 3. Assess and rationalise database design with functional dependencies and normal forms; 4. Propose and devise query optimisation, transaction and security management for relational database management systems; and 5. Exhibit mastery of theoretical knowledge and ability of creative application relating to the Relational Data Model and Relational Database Management Systems.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Elmasri and Navathe, 2011. 6 Database Systems Pearson
Assessment: Test, Lab Test, 20%. Assignment, Term assignment (15 hours), 20%. Examination, Final Examination - 3 hours, 60%.

NIT5140 Information Security

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5110 - Networking Systems
Description: Information is an asset to all individuals and businesses. Information Security refers to the protection of these assets in order to achieve confidentiality, integrity and availability. Security is critical to IT applications and business success. This unit discusses the concept and specialised applications of information security. Topics covered include cryptography fundamentals, computer security, network security, data security, web security, e-business security, social issues of security and implementation. This unit provides students with advanced knowledge and skills for IT security industry.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review cryptographic algorithms such as DES, RSA and security standards; 2. Survey and investigate specific security issues in networked computing environments; 3. Analyse the security of computer systems, networks, databases, websites and e-business; 4. Propose advanced solutions to prevent hacking, impersonation, forging; and 5. Design and implement protocols to protect networks against hacking.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr
Required Reading: Reading material will be negotiated in consultation with the

supervisor and will be appropriate to the topic under investigation.Stallings, W. 2014 6 Cryptography and network security: principles and practices Prentice Hall
Assessment: Assignment, Survey and Implementation of Algorithms (1000 word report and 200-line codes), 20%. Test, Multiple Choice (1 hour), 20%. Examination, Final Exam (3 hours), 60%.

NIT5150 Advanced Object Oriented Programming

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit provides practice in object oriented programming and methodology using advanced features of ASP.NET MVC. This unit is aimed at students with some programming background in an object orientated language. Model-View-Controller (MVC) is a modern software architecture pattern that allows for code reuse and separation of concerns, and provides new way to develop ASP.NET Web Applications. Building upon MVC framework, a deeper investigation into technologies such as C#, HTML, CSS, Web, HTTP, JavaScript, Databases and Object Relational Mapping will be undertaken. Application development using ASP.NET MVC will also involve the use of professional Content Management System to construct complete, real-world sites.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compose advanced object-oriented solutions for problem solving; 2. Design and develop real world applications using ASP.NET MVC; and 3. Demonstrate skills in databases design and development using Object Relational Mapping.
Class Contact: Lecture2.0 hrsPC Lab1.0 hr
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Galloway, J., Haack, P., Wilson, B., and Allen K. S. 2012 Professional ASP.NET MVC 4. . John Wiley & Sons, Indianapolis, Indiana
Assessment: Assignment, Practical programming project 1, 20%. Assignment, Practical programming project 2, 30%. Examination, Summative assessment - 2 Hours, 50%.

NIT5160 Cloud Computing

Locations: Footscray Park, VU Sydney.
Prerequisites:NIT5110 - Networking Systems
Description: This unit provides an in-depth analysis of cloud computing systems. It addresses concepts related to parallel computing and distributed systems. It presents contemporary cloud infrastructures, interrogates how they are being deployed at leading companies such as Amazon, Google and Apple, and their application in fields such as healthcare, banking and science. Furthermore it discusses how to successfully deploy a cloud application across the enterprise using virtualization, resource management and networking support, with content delivery networks and storage area networks.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Devise and defend innovative solutions to complex problems by utilising cloud computing systems; 2. Simulate and verify a proposed new cloud computing system design; and 3. Extrapolate systems and processes related to cloud computing which can be applied in a variety of contexts.
Class Contact: Thirty-six (36) hours for one semester comprising lectures, tutorials, laboratory sessions and online activities.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Dan C. Marinescu, 2013 1 Cloud Computing: Theory and Practice Morgan Kaufmann
Assessment: Assignment, Lab Assignment, 20%. Assignment, Project Assignments (1 to 3), 30%. Examination, Final Examination - 2 Hours, 50%.

NIT6041 Thesis 1

Locations: Footscray Park, VU Sydney.
Prerequisites:NIT5150 - Advanced Object Oriented ProgrammingNIT6130 - Introduction to ResearchNIT5140 - Information SecurityEPM5600 - Principles of Project ManagementEPM5700 - Project Management and Information TechnologyNIT5150 and NIT6130 and NIT5140 and (EPM5600 or EPM5700)
Description:A minor thesis enables students to apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base. The minor thesis (24 CP) is normally to be completed over two semesters. In Thesis 1, the student must clearly define a problem, produce a research plan, and undertake and present a review of theoretical and experimental literature on the topic area. The student introduces and formulates the problem and describes the proposed investigation. Thesis 2 is the continuation of Thesis 1 work and is usually undertaken in the following semester, when the student must submit a final, formal written thesis covering two semesters' work. To graduate from the Masters of Applied Information Technology, students are required to complete at least a 24 CP thesis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise an academic research problem, design and produce a research plan; 2. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 3. Prepare and deliver presentations on the thesis topic, addressing and incorporating feedback; and 4. Perform a critical review of the relevant literature which demonstrates advanced knowledge of requisite concepts and technologies.
Class Contact: Lab1.0 hrLecture2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Randy L. Joyner, William Rouse and Allan A. Glatthorn., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press
Assessment: Presentation, Two oral presentations (20 minutes each), 25%. Thesis, Proposal and Literature Review (4,000 words), 75%. Thesis 1 is the first part of a 2-unit thesis comprising of NIT6041 Thesis 1 and NIT6042 Thesis 2.

NIT6042 Thesis 2

Locations: Footscray Park, VU Sydney.
Prerequisites:NIT6041 - Thesis 1
Description: Thesis 2 is a continuation of Thesis 1, undertaken usually in the following semester when the student must submit a written thesis covering two semesters' work. A minor thesis enables students to apply knowledge and technical skills to the investigation of a contemporary research problem thereby making a contribution to the disciplinary evidence-base. The minor thesis is to be completed normally over two semesters of study. Thesis 2 comprises a written report of independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, and undertake and present the theoretical and experimental review of literature on the topic area. Results and conclusions from the study are elaborated and presented.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and justify an appropriate research methodology and methods to collect

and analyse data; 2. Prepare and deliver presentations on the final phase of the research, addressing and incorporating feedback; 3. Apply academic learning skills to the construction and compilation of a formal thesis incorporating a review of literature, methodology and methods, collection and analysis of data, findings and conclusion; and 4. Present the technical aspects of the research topic and compose thesis according to VU guidelines.

Class Contact: Lab 6.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Randy L. Joyner, William Rouse and Allan A. Glatthorn, 2013 1 Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press

Assessment: Presentation, Two oral presentations (20 minutes each), 15%. Thesis, Thesis (final report) (14,000-16,0000 words), 85%. NIT6041 Thesis 1 is the prerequisite for this unit.

NIT6043 Thesis 3

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5150 - Advanced Object Oriented Programming NIT6130 - Introduction to Research NIT5140 - Information Security EPM5600 - Principles of Project Management EPM5700 - Project Management and Information Technology NIT5150 and NIT6130 and NIT5140 (EPM5600 or EPM5700)

Description: A minor thesis enables students to apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base. The minor thesis (24 CP) is normally to be completed over two semesters. In Thesis 3, the student must clearly define a problem, produce a research plan, and undertake and present an indepth theoretical and experimental review of literature on the topic area. The student introduces and formulates the problem and describes the proposed investigation. Thesis 4 is the continuation of Thesis 3 work and is usually undertaken in the following semester, when the student must submit a final, formal written thesis covering two semesters' work. To graduate from the Masters of Applied Information Technology, students are required to complete at least a 24 CP thesis.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise an academic research problem, design and produce a research plan; 2. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 3. Prepare and deliver presentations on the final phase of the research, addressing and incorporating feedback; and 4. Perform a critical review of the relevant literature which demonstrates advanced knowledge of requisite concepts and technologies.

Class Contact: Lab 6.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Randy L. Joyner, William Rouse and Allan A. Glatthorn., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press

Assessment: Presentation, Two oral presentations (20 minutes each), 25%. Thesis, Proposal and Literature Review (4,000 words), 75%. Thesis 3 is the first part of a 4-unit thesis comprising of NIT6043 Thesis 3 and NIT6044 Thesis 4.

NIT6044 Thesis 4

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT6043 - Thesis 3

Description: Thesis 4 is a continuation of Thesis 3, undertaken usually in the following semester when the student must submit a written thesis covering two semesters' work. A minor thesis enables students to apply knowledge and technical skills developed during the Master of Applied Information Technology course to the investigation of a contemporary research problem thereby making a contribution to the disciplinary evidence-base. The minor thesis is to be completed normally over two semesters of study. Thesis 4 comprises of a comprehensive written report of independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, and undertake and present and indepth theoretical and experimental review of literature on the topic area. Results and conclusions from the study are elaborated and presented. To graduate from the Masters of Applied Information Technology, students are required to complete at least a 24 CP thesis.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 2. Prepare and deliver presentations on the final phase of the research, addressing and incorporating feedback; 3. Apply academic learning skills to the construction and compilation of a formal thesis incorporating a review of literature, methodology and methods, collection and analysis of data, findings and conclusion; and 4. Present the technical aspects of the research topic and compose thesis according to VU guidelines.

Class Contact: Lab 6.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Randy L. Joyner, William Rouse and Allan A. Glatthorn, 2013 1 Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press

Assessment: Presentation, Two oral presentations (20 minutes each), 15%. Thesis, Thesis (final report) (14,000-16,0000 words), 85%. NIT6043 Thesis 3 is the prerequisite for this unit.

NIT6110 Advanced Wireless Networking

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5110 - Networking Systems

Description: Advanced Wireless Networking builds on and extends the specialised knowledge and skills students acquired in the NMIT core unit 'Network Systems'. It identifies and analyses at an advanced level key existing and emerging wireless networking technologies. It also examines the history of wireless network development, standardization, and deployment. The complex problems each technology was designed to solve and the relationship between technologies in the marketplace are elaborated. Key technical and usage trends (current and emerging) are addressed. Topics include: The Wireless Ecosystem, Wireless Personal, Local and Metropolitan Area Networks, Various Generations of Cellular Communications: 2G, 3G, 4G and beyond.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse existing wireless networks in order to conceptually map current and emerging mobile devices technology; 2. Investigate wireless system requirements and extrapolate findings to develop wireless networks for mobile communication; and 3. Elucidate and justify the advantages of the proposed wireless network design to both specialist and non-specialist audiences.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Jack L. Burbank, Julia Andrusenko, Jared S. Everett, William T.M. Kasch, 2013 1 Wireless Networking: Understanding Internetworking Challenges Wiley-IEEE Press

Assessment: Report, Weekly Labs - 100 word report for each Lab., 20%. Project, Design Project Report – 500 words, 20%. Test, Semester Test - 1 Hour, 20%. Examination, Final Examination - 3 Hours, 40%.

NIT6120 Mobile Applications

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit will address the creation of mobile applications across platforms and Web systems for contemporary and emerging popular smartphone use. It provides hands-on experience in developing applications for Google Android, Apple iOS, and Windows Phone. Topics covered include: smartphone platforms,; the approach for developing identical applications for each platform; Web Applications,; and Cross-Platform Development with Phone Apps. Multiple platforms emphasises the portability of apps that students create and encourages a deeper understanding of programming principles to benefit students throughout their career.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Create innovative solutions to potential mobile applications in a variety of user domains; 2. Test and verify the proposed new mobile applications, with consideration of various platforms and operating systems; and 3. Communicate complex aspects of product development and implementation to specialist and non-specialists audiences including potential users.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs Thirty-six (36) hours for one semester comprising lectures, tutorials, laboratory sessions and online activities.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Thomas J. Duffy, 2013 1 Programming with Mobile Applications: Android™, iOS, and Windows® Phone 7 Cengage Learning
Assessment: Report, Weekly Labs (100 word report for each Lab), 20%. Project, Design Project Report (500 words), 20%. Test, Mid-Semester Test (1 hour), 20%. Examination, Final Examination (3 hours), 40%.

NIT6130 Introduction to Research

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: The focus of this unit is the investigative skills required to conduct research in industry or within a higher degree by research. Students will gain advanced skills to conduct research in Science and Technology disciplines and to prepare them for carrying out independent research in thesis units. They will be trained in writing a research proposal to develop their research project. Instruction will be provided in conducting a critical literature review to contextualise proposed research. Students will learn to critically evaluate ethical issues related to their topic. Oral and written communication skills will be developed through a series of presentations. The unit will be taken by students at the same time that they enrol in the minor thesis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically discuss social and ethical issues in Information and Communication Technology (ICT) domains; 2. Critically reflect on the current state of an aspect of information technology based on the existing literature; 3. Communicate research concepts to specialist and non-specialist audiences; 4. Strategise and implement concepts associated with writing a research thesis, such as planning and structure; and 5. Prepare and critically evaluate research plan for further investigation to contribute to the evidence base within the discipline of IT.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Randy L. Joyner, William Rouse and Allan A. Glatthorn, 2013 1 Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press
Assessment: Assignment, Ethics Issues (2,000 words), 25%. Assignment, Literature review (2,000 words), 25%. Assignment, Research Methodology (2,000 words), 25%. Assignment, Research Experiment Design and Analysis (2,000 words), 25%.

NIT6140 Sensor Networks

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5110 - Networking Systems
Description: Sensor Networks are used to monitor a variety of systems, from environmental threat alerts to civil structure and health monitoring. This unit presents the fundamental concepts, practical aspects and applications of wireless sensor networks. Using contemporary examples the unit provides an overview of the current state of the technology. Topics include: Wireless Sensor Network Application, Factors Influencing Wireless Sensor Network Design, Physical to Application Layers with Cross-layer Solutions, Time Synchronization, Localization, and Topology Management, Wireless Multimedia, Underwater and Underground Sensor Networks. Students will learn to analyse the requirements of new advanced applications, and design the architecture of a wireless sensor network.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Investigate and develop the requirements of a new application to present it to a prospective client; 2. Create innovative solutions to emerging applications of sensor network systems, so as to meet the client brief and requirements; and 3. Simulate and verify proposed new sensor network designs to test a number of real-world application scenarios.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Waltenegus Dargie, Christian Poellabauer, Wiley, 2010. 1 Fundamentals of Wireless Sensor Networks: Theory and Practice Wiley
Assessment: Report, Lab Report (100 words for each Report), 20%. Project, Design Report (500 words), 20%. Test, Semester Test (1 Hour), 20%. Examination, Final Examination (3 Hours), 40%.

NIT6150 Advanced Project

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5110 - Networking SystemsNIT5120 - Software EngineeringNIT5130 - Database Analysis and DesignNIT5150 - Advanced Object Oriented ProgrammingEPM5600 - Principles of Project ManagementEPM5700 - Project Management and Information Technology (NIT5110 or NIT5120 or NIT5130 or NIT5150) and (EPM5600 or EPM5700)
Description: Modern applications and websites are developed quicker and at a lower cost, often (but not always) by a team of programmers. Complex software will be developed using software engineering principles to ensure correct requirements are met and the maintainability of the finished product. Each student will work on a project as a member of a software development team, or on an individual software development project. The project will focus on software development for industrial and business applications such as computer games, financial systems and medical information systems. To successfully complete the project, students will be required to apply an advanced body of knowledge and specialist cognitive and technical skills in one or more computing and software engineering areas including user interface,

software development, database management systems, networking, wireless/mobile computing, web based and general application development environments. At the successful conclusion of this unit, students should be able to make use of software engineering processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adapt and manage complex software development processes to produce software more quickly and accurately, and with a lower failure rate; 2. Produce a software application with a strong industrial background; 3. Devise and design software systems by critical application of software engineering principles; 4. Create and generate requisite project documentation including project analysis and design documents; 5. Implement milestone testing of software and user acceptance testing; and 6. Interpret and transmit information to both specialist and non-specialist audiences.

Class Contact: PC Lab3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Schach, S.R., (2010) 8 Object Oriented and Classical Software Engineering McGraw Hill

Assessment: Report, System analysis and design. Project documentation (less than 5,000 words), 50%. Project, Project evaluation test. User acceptance test (30 min), 50%.

NIT6160 Data Warehousing and Mining

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5130 - Database Analysis and Design

Description: Data mining is the computational process of discovering patterns from large data sets. This unit discusses concepts and techniques of data warehousing and mining. Data mining is one of the most advanced tools used by IT industries. The topics covered include data warehouse models, data pre-processing, Online Analytical Processing, association rules mining, classification, clustering, sequential data mining and neural networks for data mining. In addition, students will learn how to use and apply relevant commercial data mining software to find solutions to real life business problems. This unit complements the student knowledge of database systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse the features and applications of data warehouses; 2. Disaggregate and appraise the components in a typical data warehouse architecture; 3. xtrapolate knowledge and skills to design a data warehouse to support and provide business solutions; 4. Investigate and apply knowledge discovery processes and associated algorithms to large business datasets; and 5. Experiment with popular data mining software and propose a conceptual framework to evaluate its useability and functionality.

Class Contact: Lab1.0 hrLecture2.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Han, J., and Kamber, M. 2011 3 Data Mining: Concepts and Techniques Morgan Kaufmann

Assessment: Assignment, Development of data warehouse (1000 word report and 200 line codes), 20%. Test, Multiple Choice (1 hour), 20%. Examination, Final Exam (3 hours), 60%.

NNE7001 Environmental Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigate and provide solutions to various environmental issues. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. This unit is designed to enable students to develop broad knowledge of contemporary environmental issues, the ability to develop and implement systems and procedures to ensure compliance with legal environmental requirements, and to appreciate the importance of risk management and sustainable development. It focuses specifically on specialised skills relating to air pollution control management, solid wastes management and water pollution control, and the assessment of project environmental impacts are key elements in maintaining public health and protecting the environment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically assess and demonstrate key issues relating to ecology and sustainable development issue; 2. Develop and implement systems and procedures to demonstrate knowledge of contemporary environmental issues and to ensure compliance with legal environmental requirements 3. Gain in-depth knowledge in pollution control technologies available to minimise the air and water pollution as well as solid wastes on the environment; 4. Evaluate different types of technologies to minimise impacts on human society and the environment and provide recommendations for upgrading their efficiency; 5. Formulate high quality technical reports, present information on environmental management technologies and demonstrate professional skills.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: There is no specific text book for this unit. Students can refer any of the below recommended text books.RECOMMENDED TEXTS: Vesilind, P, Morgan, S. And Heine, L.G (2010), Introduction to Environmental Engineering, 3rd (SI) edn, Cengage Davis, M and Cornwell, D. (2008), Introduction to Environmental Engineering, 4th (Intl) edn, McGraw Hill Davis, M & Masten, S. (2009), Principles of Environmental Engineering and Science, 3rd (Intl) edn, McGraw Hill Metcalf and Eddy (2003), Wastewater Engineering - Treatment and Reuse, 4th edn, McGraw Hill Gray, N.F. (2005),Water Technology, 2nd edn, Elsevier Kiely, G. (1997) Environmental Engineering, McGraw Hill Tyler Miller, JR (2007) Living in the Environment, 15th edn, Thomson Learning

Assessment: Test, In-class Test (0.5 hr), 10%. Assignment, Group Report (2000 words each), 30%. Presentation, Oral Presentation (15 min), 10%. Examination, Final Examination (3 hours - equivalent to 3000 words), 50%.

NNE7002 Advanced Water and Waste Water Treatment

Locations: Footscray Park.

Prerequisites: Nil.

Description: Advanced water and wastewater treatment processes becoming very important and popular due to the stipulated stringent environmental regulations and rapid urbanisation. Conventional treatment processes are mostly becoming ineffective as water sources and discharged wastewater consists of significantly high levels of persistent and other organic/inorganic micro-pollutants. Highly polluted industry (trade) wastewater discharge into reticulation systems is also very costly and complex due to the charges levied on trade waste generators. Safe water is a scarce resource in most of the parts in the World and therefore, the modern water and wastewater industry focuses to apply novel advanced treatment systems to overcome the current challenges in the industry. This unit of study focuses teaching and learning of the modern and effective techniques related to advanced water and wastewater treatment. This unit mainly covers the topics such as Advanced Primary

treatment technologies (Diffused air floatation - DAF), secondary Treatment methods (Membrane Bioreactor-MBR, SBR, RBC, and ANAMMOX), Biological Nutrient Removal, Recovery of Energy and resources, Advanced membrane separation technologies (UF/NF/RO/FO), Advanced oxidation processes (AOPs) and Activated Carbon Adsorption techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the fundamentals of advanced water and wastewater treatment and apply in various industrial contexts and challenges to develop sustainable and innovative solutions to the water and wastewater industry; 2. Critically apply the knowledge and expertise relevant to advanced water and wastewater treatment systems professionally; 3. Investigate and evaluate different types of water and wastewater treatment processes and provide recommendations for upgrading their efficiency; 4. Design and install efficient and reliable advanced water and wastewater treatment facilities to produce safe water, recover energy and resources; 5. Formulate high quality technical reports, present information on advanced water and wastewater technologies and demonstrate professional skills.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: There is no specific text book for this unit. Students can refer any text book relevant to Wastewater Treatment and Reuse. Recommended Text: D. G. Rao, R. Senthilkumar, J. Anthony Byrne, S. Feroz. (2012). Wastewater Treatment: Advanced Processes and Technologies. 4th edition, Metcalf & Eddy Inc.

Assessment: Project, Conduct a Scientific Group Project and produce a high quality technical report (2000 words each), 40%. Presentation, Oral Presentation (15 minutes each), 10%. Test, Mid Semester Test (1 hour), 10%. Examination, Final Examination (3 hours), 40%.

NNG6001 HDL and High Level Synthesis

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in Hardware Description Language (HDL) and High level Synthesis. The unit content has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer using EDA and VHDL tools. In this unit the students will be exposed to hardware modelling and advanced design and optimisation techniques using HDL and /or Verelog languages. Students will acquire knowledge and skills and demonstrate their application advance in circuit design using FPGAs with industry standard EDA tools. This design will include high level synthesis, optimization, verification and implementation techniques to meet the demands of the 21st century design specifications.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply specialist technical competence in designing Integrated Circuit using Hardware Description Language (VHDL) and or Verilog; 2. Generate the Architectural-level Synthesis of selected design problems; 3. Solve and implement Synthesis Field Programmable Gate Array (FPGA) for a complex design problem; 4. Identify and critically evaluate High level optimisations of the designed problem; 5. Generate standard Coding of the design problem; and 6. Utilise Industry Standard Electronic Design Automation (EDA) tools for the design problem.

Class Contact: Forty-eight hours (48) for one semester comprising lectures, laboratory exercises and project work.

Required Reading: There are a number of other text books that can be used in parallel to the prescribed one. Ewout S. J. Martens; Georges Gielen; 2008. High-level modelling and synthesis of analog integrated systems USA, Springer

Assessment: A Pass must be achieved in each assessment item in order to complete the unit. Project, Project (3000 words), 40%. Laboratory Work, Four (4) Laboratory Exercises (500 words per report), 30%. Examination, Written examination (2 hours-equivalent to 2000 words), 30%.

NNG6003 EDA Tools and Design Methodology

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in EDA tools and design Methodologies. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer exposed to EDA tools and design methodologies. This unit will familiarize the students with EDA design flow environment, and embedded development tools for analogue and digital applications (Specific Integrated Circuits ASIC). The design flow covers full and semi-custom IC design and mixed signal design. Getting these skills will enhance a student's employability in a profession where these skills are highly sought after.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Utilise and apply high level competence in EDA design flow environment for all IC design; 2. Apply high level technical competence in Back-end IC design flow and tools to all design; 3. Apply Front-end IC design flow and tools to all design; 4. Implement Functional design and verification in all design; and 5. Utilise the Mixed signal design flow for all design.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, laboratory/workshop and project.

Required Reading: There are a number of other text books that can be used in parallel the prescribed one. Chang, H., Cooke, L., Hunt, M., Martin, G., McNelly, A. and Todd, L, (2004) Surviving the SOC Revolution - A Guide to Platform-Based Design San Francisco: Kluwer Academic.

Assessment: A Pass must be achieved in order to complete the unit. Assignment, Assignment (1500 words), 25%. Project, Research project (4000 words), 40%. Laboratory Work, Three (3) laboratory reports (500 words each), 35%. The total combined assessment word equivalence is approximately 6,000 words.

NNG6014 RF and Mixed Signal Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an RF and mixed signal circuit designer. This unit covers specialised circuit design for RF wireless communication systems, including transceiver architectures and layout techniques, LNAs, oscillators, mixers, and phase detectors. Students will also learn how to design low voltage low power integrated circuits; design flow for analog and mixed signal circuits and systems utilising industry standard Electronic Design Automation (EDA) tools.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to:

1. Apply specialised technical RF and mixed signal design to the developed circuit; 2. Utilise a systems approach to evaluate RF circuit performance in terms of noise isolation and interference; 3. Critically review and implement various circuit design tools in order to insure proper performance; 4. Survey and investigate the operation of the key RF and mixed signal design standards; and 5. Propose and justify procedures for the operation and identification of strengths and weaknesses of popular RF circuit design techniques for both analogue and digital systems.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, laboratory exercises and tutorial projects.

Required Reading: Leung, B. (2011) 2nd VLSI for Wireless Communication Springer There are a number of other text books that can be used in parallel the prescribed text above, which the Lecturer will provide to students.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Laboratory Work, Three (3) Reports (500 words per report), 30%. Project, Project Report (3000 words), 40%. Examination, Final Examination (2 hours - equivalent to 2000 words), 30%.

NNG6551 Microwave Electronic Circuit Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Microwave electronic circuit designer. This subject will provide an in-depth approach to electronic circuit design based around the 'Micro strip' transmission line structure. Students will be given small design projects to cover frequencies relevant to mobile communications (i.e. 0.9 to 3 GHz). Extensive use will be made of Agilent's simulation and design package, ADS and other software packages in this course. In general the unit contains a review of basic transmission line theory; a review of microwave transmission structures; a discussion of corrections for micro strip discontinuities; a review of the Smith Chart; consideration of matching requirements for small signal amplifiers; a review of matching techniques; Bias circuit design, power amplifier design and Passive RF Components.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply in-depth technical electronic circuit design for microwave systems; 2. Utilise a systems approach to evaluate microwave system performance in terms of quality of service and grade of service; 3. Critically review and implement various circuit design tools; 4. Survey and investigate the operation of the key microwave standards; and 5. Propose procedures for the operation and identification of strengths and weaknesses of popular microwave access techniques for both analogue and digital systems.

Class Contact: Forty-eight (48) hours for one semester, comprising of lectures, tutorial and laboratory.

Required Reading: Pozer, D.M. (2011) 4th Microwave Engineering Wiley Other recommended text: Microwave & RF Engineering: A simulation approach with Keysight Genesys Software Written by Ali Behagi & Stephne Turner. Volume 1 2015. Publisher: BT Microwave LLG ISBN-13: 978-0983546030

Assessment: A Pass must be achieved in each assessment item in order to complete the unit. Assignment, Four (4) Assignments (1500 words each assignment), 30%. Laboratory Work, Three (3) Laboratory Practicals, 30%. Examination, Final Examination (3 hours), 40%.

NNG6600 Global Engineering Communication

Locations: Footscray Park.

Prerequisites: Nil.

Description: The material taught will provide students with a thorough grounding in academic discourse elements including relevant writing conventions and English language features required to critically analyse, write, present and communicate with a variety of professional audiences. This unit has been designed to provide students with the opportunity to share views and issues within the group to create a better understanding of the research task and to feel greater confidence with the research materials and research writing. The development of research and language skills through this unit will complement discipline based research activities. Students undertaking this unit will be able to negotiate assessment tasks which may stem from these activities.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and exploit academic discourse conventions in the field of engineering to explain and critique theories, theoretical propositions, and methodologies; 2. Exhibit, explicate and implement a critical understanding of and ability to employ discipline-specific linguistic and language elements needed in the field of engineering in order to communicate appropriately within discipline conventions; 3. Elucidate and convince in proficient English academic writing conventions to support all aspects of the design and development work fundamental to research activities; 4. Communicate and construe research information and theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional; 5. Conceptually map and critically reflect on the research process by identifying researchable problems and propose meaningful research questions, which are appropriate within discipline conventions.

Class Contact: Sixty (60) hours for one semester consisting of two (2) hours per week of face-to-face lectures, two (2) hours of workshops that involve group work, presentations and blended learning activities.

Required Reading: Reading material will be provided or specified in Unit Guides, with additional material provided through VU Collaborate.

Assessment: Journal, A reflective journal which includes at least 5 entries reflecting the various session topics (400x5 = 2000 words), 20%. Annotated Bibliography, An annotated bibliography of 6-8 texts (1000 words), 20%. Presentation, Abstract/summary (100 words) followed by oral presentation to class, comparing 2-3 readings relevant to student's research topic (5 mins), 30%. Review, A literature review report on an agreed aspect of student's research topic (3000 words), 30%.

NNM6513 Fibre Network Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in optical communication systems and networks. To meet the needs of modern optical infra-structure such as the national broadband network, the unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer in modern optical connected networks. This unit provides a detailed study of optical fibre systems. It commences with a review of basic optical theory. Optical fibre types are presented and the attenuation in silica optical fibres is considered. Modes in slab waveguides and optical fibres are studied particularly for the effect of dispersion and distortion. The sources and detectors required in optical fibre systems are explained along with

noise in detector systems. Finally, the design of fibre optic communication systems is presented, including optical amplifiers, wavelength division multiplexing and Bragg gratings, plus an introduction to fibre optic sensing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply critical high level practical competence to the underlying physical phenomena that enables communication through optical fibres; 2. Determine and critically evaluate the advantages and disadvantages of optical fibre communication systems compared to copper cables; 3. Critique and justify the operation, characteristics and components of fibre communication systems; 4. Generate innovative and appropriate solutions to complex and unknown problems involving components of optical communication system; and 5. Develop practical designs for given fibre optic communication system specifications.

Class Contact: Seminar3.0 hrsForty-eight (48) hours for one semester comprising of Lectures, Tutorials and Laboratories.

Required Reading: More text book recommendations will be made by the unit coordinator.Palais, J.C. (2005) 5th Fibre Optic Communications Prentice-Hall, NJ.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Examination, Written Exam (3 hours equivalent to 3000 words), 40%. Laboratory Work, Reports on Laboratory classes (2000 words), 35%. Test, Written Test (2 hours equivalent to 2000 words), 25%.

NNM7001 Power Generation

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and develop critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. Content has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to the field of engineering and power generation. The unit addresses in a readily accessible format processes by which power is generated with special emphasis on alternative renewable energy generation sources such as solar, wind, biomass and fuel cells. This unit takes into account the many challenges that Australia faces today due to the excess power supply but with a decrease in demand. The unit addresses the global pressures on replacing fossil fuel plants to renewables and the need for cheap and affordable power.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine design needs for power generation taking into account environmental effects; 2. Apply specialist competence to a power generation system to ensure optimal performance; 3. Identify appropriate solutions to problems inherent in power generation for given scenarios; 4. Utilise a systems approach to analysis, design and operational performance of a power generator; 5. Critically evaluate generation schemes applicable to a given application in order to enhance efficiency; and 6. Determine system performance in terms of power transients and disturbances to maintain uninterrupted power distribution.

Class Contact: Lecture1.0 hrPC Lab2.0 hrsTutorial2.0 hrs

Required Reading: To be advised by unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, 2 Hour in-class test (equivalent to 2000 words), 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour written exam (equivalent to 3000 words), 45%. Normally exam requirements are explained in advance.

NNM7002 Transient Analysis, Stability and Surge Protection

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit content has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to transient analysis, stability and power surge protection. This unit will provide hands-on approach to addressing dynamic and transient stability issues. Major limits to power transfer are voltage and angle stability, and this module will put these in the context of the operation of the National Electricity Market. Students will engage in the modelling of power system components for dynamics and simulation approaches for voltage and angle stability. Familiarisation with an interactive package such as PSSE /SINCAL/PowerWorld is mandatory and Stability Enhancement options such as Excitation, SVC and Tap Locking will be explored. Practical exercises using the interactive package on more extensive systems for both distribution and transmission systems will be available. A number of simple systems have been chosen to illustrate limitations to analysis techniques and applications in power supply systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop methodologies used to carry out transient analysis in power systems; 2. Apply specialist expertise in monitoring power system performance; 3. Identify and recommend appropriate solutions to complex problems in given surge scenarios; 4. Utilise a systems approach to transient analysis; 5. Critically evaluate stable power supplies and supplies under surge; and 6. Determine power supply system performance in terms of transients and surges.

Class Contact: Lecture1.0 hrPC Lab2.0 hrsTutorial2.0 hrs

Required Reading: To be advised by the unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, In-class 2 Hour Test (equivalent to 2000 words), 25%. Assignment, 2000 word Assignment, 30%. Examination, 3 Hour written exam (Equivalent to 3000 words), 45%. Exam requirements are normally explained in advance.

NNM7003 Overhead Design and Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: Material taught in this unit contributes to the training a student needs In order to acquire the skills required to work in the electrical power supply industry. In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving in overhead design and construction of power distribution networks. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important in power generation and distribution. Students will study power delivery requirement (in voltage and megawatts) and the maximum outage in order to specify the electrical, mechanical and environmental requirements for an Australian overhead line. This will lead into the design of an overhead line for a given Basic Insulation Line (BIL); in this practical undertaking students are expected to conduct transient analysis from a lightning and switching perspective.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply specialised technical knowledge and skills to ascertain the electrical, mechanical and environmental requirements for an Australian overhead line

for a given power delivery requirement (in voltage and megawatts) and a given maximum outage per 100 kilometre years; 2. Design and simulate an overhead line for a given Basic Insulation Line (BIL) and conduct transient analysis from a lightning and switching perspective; 3. Produce an environmental impact statement for a given overhead line route taking into account environmental and community statutory requirements and propose strategies to address emergent issues; 4. Conceptually map and evaluate the key design aspects of a given overhead line in regards to construction and maintenance for the next 30 years (including OHS issues and ongoing operational regimes); and 5. Survey the key design and construction characteristics for transmission, sub-transmission and distribution lines in order to maintain uninterrupted power supply.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Seminar 2.0 hrs Tutorial 1.0 hr

Required Reading: To be advised by the unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, 2 Hour in-class test equivalent to 2000 words, 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour Written - equivalent to 3000 words, 45%. Exam requirements are normally explained in advance.

NNM7004 Underground Design and Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to underground design and construction required in power generation. This unit provides an expert introduction to underground power system design. Students gain specialist knowledge about cable systems, types of system topologies, manufacturing practices and standards. The uses and design parameters of the equipment necessary for underground system design are also addressed. Subsequently, basic underground cable design practices are reviewed and installation practices for both transmission and distribution projects are considered as well as relevant as application concepts such as hydraulic pressures, commissioning and industry standards. Following an underground system case study, students undertake a final assignment replacing a low Pressure Fluid-Filled system and upgrading a High Pressure Fluid-Filled system.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialist technical knowledge of cable systems, types of systems, manufacturing practices and standards; 2. Design and implement specifications of the equipment needed for an underground system design; 3. Apply specialist knowledge of underground cable design practices and installation practices for both transmission and distribution projects; 4. Evaluate and apply relevant hydraulic pressure specifications, commissioning and industry standards to a given scenario; 5. Critically review a system case study of replacing a Low Pressure Fluid-Filled system and upgrading a High Pressure Fluid-Filled system in the High Voltage Lab; and 6. Independently or in collaboration with peers propose and complete a project that investigates type of cable, manhole spacing, pulling considerations and all relevant design calculations for underground power supply.

Class Contact: Seminar 2.0 hrs Workshop 2.0 hrs Sixty hours (60) for one semester, comprising lectures, tutorials, hardware and computer based labs.

Required Reading: To be advised by the unit coordinator.

Assessment: A pass must be achieved in each assessment to complete the unit. Test, 2 Hour in-class test - equivalent to 2000 words, 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour written exam - equivalent to 3000 words, 45%. Examination requirements are explained in advance.

NNM7005 Power Quality and Harmonics

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to power quality and harmonics during generation and distribution. The subject of power quality is very broad by nature. It covers all aspects of power system engineering from transmission and distribution level analyses to end-user problems. Therefore, electric power quality has become the concern of utilities, end users, architects and civil engineers as well as manufacturers. This unit is intended for undergraduate students in electrical and other engineering disciplines as well as for professionals in related fields. The increased use of power electronic components within the distribution system and the reliance on renewable energy sources which have converters as interface between the source and the power system lead to power quality problems for the operation of machines, transformers, capacitors and power systems. Power quality of power systems affects all connected electrical and electronic equipment, and is a measure of deviations in voltage, current, frequency, temperature, force, and torque of particular supply systems and their components. In recent years there has been considerable increase in nonlinear loads, in particular distributed loads such as computers, TV monitors and lighting. These draw harmonic currents which have detrimental effects including communication interference, loss of reliability, increased operating costs, equipment overheating, machine, transformer and capacitor failures, and inaccurate power metering. This subject is pertinent to engineers involved with power systems quality control, electrical machines performance evaluation, electronic equipment for power measurement, computers for power monitoring and manufacturing equipment that is power driven.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialist technical knowledge to determine power quality and harmonics in a variety of contexts; 2. Design and implement parameters of the equipment needed to diagnose power in order to determine quality and the presence of harmonics; 3. Apply specialist practices to ensure efficiency in both transmission and distribution of quality power; 4. Critique and apply specifications needed in commissioning power distribution; 5. Survey and propose solutions to power quality problems of electrical machines and power systems; and 6. Propose, implement and evaluate modelling, simulation and measuring techniques for transformers, machines, capacitors and power generation systems.

Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs Tutorial 2.0 hrs

Required Reading: To be advised by unit coordinator

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, 2 hour in-class - equivalent to 200 words, 25%. Assignment, 2000 words, 30%. Examination, 3 Hour written examination - equivalent to 3000 words, 45%. Examination requirements are explained in advance.

NNM7006 Insulation Co-Ordination and Sub-Station Design Principles

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical

analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to insulation coordination and sub-station design principles. The unit is designed for students specialising in the field of Electrical Power Engineering and will upgrade knowledge, skills and application of skills related to power sub-stations design and insulation coordination. This follows the procedures and protocols of international standards like AS1824, BS 6651, IEEE 1313.2 and 998, and IEC 62305 and 60099. These standards provide guidelines to design sub-station layout for transmission and distribution networks with a view to protect costly power apparatus from random occurring overvoltage transients. The design rules of sub-stations are broad and cover many areas of civil, mechanical, material science, life science and telecommunication engineering. This unit also highlights the steps involved in design and analysis of sub-station layouts. The theoretical and practical knowledge gained from this module notes and Sub-Station visit is the excellent foundation for those students who will start to work and design in the new and operating sub-station environment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design a sub-station layout for transmission and distribution systems, taking into account future power supply demand requirements; 2. Adhere to stringent requirements of insulation coordination principles to power system design; 3. Devise overvoltage protection systems on random occurring lightning and switching transient surges; 4. Demonstrate with real world sub-station layouts and analysis with the learned concepts can strengthen the generic concept followed in the industry; 5. Survey and conduct a case study for a site specific case; and 6. Propose, conduct and justify computational modelling to meet industry standards.

Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs Tutorial 2.0 hrs

Required Reading: To be advised by unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the whole unit. Test, 2 Hour in-class - equivalent to 2000 words, 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour written exam - equivalent to 3000 words, 45%. Examination requirements are normally explained in advance.

NNM7007 National Electricity Market and Regulation Principles

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to the national electricity market and regulation principles. The unit includes an overview of the regulation principles governing the management of electricity markets. Whilst the principles are general, they are demonstrated through the specifics of the National Electricity Market. The role of workplace OH&S regulations governing the supply and delivery of energy to the end user is considered. Students are exposed to authentic work relevant issues that underpin the regulation principles governing the management of electricity markets that supply and deliver energy to end users. Further, the unit covers the role and requirements of workplace Occupational, Health & Safety.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critical review the Role of the governments, COAG (Council of Australian Governments), and MCE (Ministerial Council on Energy); 2. Implement specialist recommendations by the regulators, AEMC (Australian Energy Market Commission), AER (Australian Energy Regulator), jurisdictional regulators; 3. Survey and critique the Objectives of electricity markets; 4. Conduct a specialist review of the role of market and system operators, AEMO (Australian Energy Market Operator); 5. Adhere to the Australian Energy Market Agreement and various legislative and regulatory instruments including the National Electricity Law and Rules (economic and technical requirements); 6. Employ specialist review of the Economic regulation of Network Service Providers including setting of revenues, incentives and network access regimes; and 7. Critical review of the Categories of Market Participants and compliance obligations.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Seminar 2.0 hrs Workshop 1.0 hr

Required Reading: To be advised by unit coordinator.

Assessment: A pass must be achieved in each assessment item to complete the unit. Test, In Class Test (2 hours), 25%. Assignment, Assignment (7000 words), 30%. Examination, Written Exam (3 hours), 45%. Examination requirements are normally explained in advance.

NNM7008 Environmental Issues and Sustainability

Locations: Footscray Park.

Prerequisites: Nil.

Description: The electricity supply industry is constantly being challenged by the environmental organisations for polluting the landscape. The unit will address the issues and the challenges facing the power supply industry and highlight ways to improve the environment and not be seen as major polluters. In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to environmental issues and sustainability in power generation and distribution. This unit is designed for postgraduate students specialising in the field of Electrical Power Systems. However, the content and perspectives have a wider relevance across energy engineering. The unit focuses on environmental issues relevant to electricity supply and delivery, and their potential impact on the future of the Australian electricity industry in the context of wider sustainability objectives.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critique an environmental impact assessment methodology and make recommendations regarding its useability; 2. Propose and justify advanced solutions to complex problems of sustainable energy in a variety of contexts; 3. Investigate and critically review energy and climate policies claiming to promote a more sustainable energy future; 4. Formulate and implement protocols to protect sustainable energy technologies and communicate these to specialist and no-specialist audiences; and 5. Design conduct and evaluate a specialised project on sustainable and renewable energy to test efficiency and reliability.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Seminar 2.0 hrs Tutorial 1.0 hr

Required Reading: To be advised by unit coordinator.

Assessment: A pass must be achieved in each assessment item to complete the unit. Test, In Class Test (2 hours) (equivalent to 2000 words), 25%. Assignment, Assignment (2000 words), 30%. Examination, Written Exam (3 hours) (equivalent to 3000 words), 45%. Exam requirements are normally explained in advance.

NNP7001 Fundamentals in Process Engineering 1

Locations: Werribee, Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and critical analytical skills which can be applied towards setting up complex problem solving scenarios inherent in process engineering systems. The unit material has been developed to enhance students' fundamental knowledge important to practice as an Engineer working in process engineering within water and foods industries. In order to build fundamental specialist knowledge required in the discipline of process engineering, this unit provides an overview of essential elements in process engineering thermodynamics. Processes require competent understandings of entropy and enthalpy, differences between simple and complex mixtures, vapour liquid equilibria, power cycles and chemically reacting systems. The unit will further develop the fundamental understandings by showing working examples of theories to achieve practically meaningful information that forms an essential element of modelling and designing processes in real applications. The unit explores equilibrium between solid, liquid and vapour phases of single components, and mixtures, forming the basis of understanding classic industrial operations such as drying and distillation. This is followed by phase behaviour in multicomponent systems, where food and water components can be isolated according to practical properties such as concentration, temperature and pressure. Thermodynamic cycles which form the basis of industries such as power generation will be included. The role of reactions in these processes will also be a component, where product yields and thermodynamic considerations are a key part when understanding and designing foods and water processes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map essential fundamental knowledge in thermodynamics needed for a process engineering specialisation applied in various contemporary and emerging foods and water processing; 2. Gain essential fundamental knowledge in process engineering thermodynamics needed to contribute to the discourse and practice in 'engineering sustainability' and link to innovation; 3. Critically apply knowledge and skills relevant to process engineering problems and to the broader Engineering discipline to new and uncertain professional practice scenarios, exhibiting a high level of personal autonomy and accountability; 4. Apply fundamental knowledge in process engineering thermodynamics to design, implement and evaluate food and water process projects or research which address complex issues and communicate findings to peers and broader audiences 5. Have the fundamental knowledge supporting an ability to formulate and strategize project management plans accurately meeting stakeholder needs and expectations.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Honig, Jurgen M. (2007) 3rd ed. Thermodynamics : Principles Characterizing Physical and Chemical Processes Academic Press Çengel, Yunus A. (2015) 8th ed. Thermodynamics : an engineering approach McGraw-Hill Recommended reading: J.M. Coulson and J.F. Richardson (1996) Coulson & Richardson's chemical engineering 6th ed. Oxford; Boston : Butterworth-Heinemann Sandler, S. I. (1999) Chemical and Engineering Thermodynamics 3rd ed. John Wiley & Sons
Assessment: Test, Two (2) In Class Tests (1 hour each, approximately 1000 word equivalent), 30%. Assignment, Two (2) individual written research assignments (1500 words each), 30%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7002 Fundamentals in Process Engineering 2

Locations: Werribee, Footscray Park.
Prerequisites: NNP7001 - Fundamentals in Process Engineering 1
Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied towards setting up complex problem solving scenarios inherent in process engineering systems. The unit material has been developed to enhance students' fundamental knowledge important to practice as an Engineer oriented towards processing systems in water and foods industries. In order to build fundamental specialist knowledge required in the discipline of process engineering, this unit provides an overview of critical fundamental elements in process engineering heat transfer and mass transfer, as well as fluid flow and transport phenomena. Processes require competent understandings of fundamentals of the transfer of thermal energy and mass, the behaviour of bulk fluids flowing through equipment and piping, as well as transport of molecules at a more fundamental molecular level. The unit will further develop the fundamental understandings by showing working examples of theories to achieve practically meaningful information that forms an essential element of modelling and designing processes in real applications. The unit explores the modes of heat transfer, the utilisation of boiling and condensation, and principles of heat exchangers. Mass transfer will also be presented, covering fundamentals of adsorption, distillation, extraction, ion exchange, drying and leaching. Theories including the calculation of heat and mass transfer coefficients will need to be understood as part of applying the fundamental processes. Fluid mechanics will be included, showing the types of fluid flow and how to find fluid properties to calculate flow resistances, pressure drops and residence times, with relevance to process equipment design. The flow of fluids at the molecular scale will also be shown, where fundamentals of molecular diffusion through gas, liquids and solids are an important feature of water and foods processes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map essential fundamental knowledge in heat and mass transport phenomena needed for a process engineering specialization applied in various contemporary and emerging foods and water processing; 2. Gain essential fundamental knowledge in process heat and mass transfer operations needed to contribute to the discourse and practice in 'engineering sustainability' and link to innovation; 3. Critically synthetises acquired knowledge and apply relevant skills to solve process engineering problems within new and uncertain professional practice scenarios with a high level of personal autonomy and accountability; 4. Apply fundamental knowledge of heat and mass transfer phenomena to design, implement and evaluate engineering aspects of food and water processing on various projects or research addressing more broader and complex issues, and communicating ideas and solutions to their peers and broader audiences; and 5. Have the fundamental knowledge supporting an ability to formulate and strategize project management plans accurately meeting stakeholder needs and expectations.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Holman, J. P. (2010) 10th ed. Heat transfer McGraw-Hill Education Theodore, Louis (2010) Mass transfer operations for the practicing engineer New York: Wiley Recommended reading: Crowe, C. T. (2005). Engineering fluid mechanics 8th edition. New York: Wiley Bird, R. Byron (1960). Transport phenomena. New York: Wiley Plawsky, Joel L., (2001). Transport phenomena fundamentals. New York : Marcel Dekker Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.
Assessment: Test, Two (2) In Class Tests (1000 words - 1 hour each), 30%. Assignment, Two (2) individual written research assignments (1500 words each), 30%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7003 Process Chemistry

Locations: Footscray Nicholson, Werribee, Industry, Footscray Park.
Prerequisites: NNP7002 - Fundamentals in Process Engineering 2
Description: In this unit students will acquire advanced theoretical knowledge in chemistry and physical chemistry related to food and water processing. The students will also gain practical and critical analytical skills relevant for addressing complex problem solving scenarios inherent in process engineering systems. Students will built on knowledge of basic chemistry properties, actions and reactions, in particular, matter and energy, atomic theory and the periodic table, solutions and aqueous chemistry, physical chemistry including chemical equilibrium and kinetics, acids and bases, thermochemistry and nuclear chemistry. This unit will provide students with knowledge of the main organic and inorganic constituents of food and water including waste water: proteins (structure and types of amino acids, peptide bonds, protein structures, conjugated proteins, structure-function relationship); carbohydrates (basic chemistry of carbohydrates, structure and examples of mono-di, oligo and polysaccharides, structure-function relationship); lipids (definition and main classes of lipids, structure and nomenclature of fatty acids, types of fatty acids, structure-function relationship); water (importance of water in food, structure of water and ice and their relation towards properties of food, types of water and its relation towards properties of food, relationship between water activity and moisture in food systems; minerals (importance of variety of minerals in food and water, important minerals and their properties in relation to properties of food and water); vitamins (importance of vitamins, structure-function relationship).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically appraise chemical properties of carbohydrates, proteins, fats, minerals and vitamins in food and water; 2. Characterize both solid and liquid systems using chemical and physical analysis techniques 3. Apply or design appropriate processing methods utilizing physical properties of organic and inorganic materials in food and water 4. Articulate principles underpinning laboratory testing and procedures of physicochemical properties of food and water; 5. Collate, determine and critically evaluate the data in terms of the specific food or water system to confidently apply theories towards the particular industry challenge.
Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hrWorkshop1.0 hr
Required Reading: Damodaran, S., Parkin, K.L., Fennema, O.R. (2008) 4th ed. Fennema's Food Chemistry Boca Raton : CRC Press; Taylor and Francis Group van Loon, G. W. Duffy, S. J. (2011) 3rd ed. Environmental Chemistry. A Global Perspective Oxford; New York : Oxford University Press Recommended reading: Atkins, P.W., De Paula, J. (2010) Atkins' physical chemistry Oxford ; New York : Oxford University Press Walstra, P. (2003) Physical chemistry of foods New York : Marcel Dekker Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.
Assessment: Test, Two (2) In Class Tests (1000 words, 1 hour each), 20%. Report, Four (4) Lab reports 750 words (3000 words in total), 40%. Examination, Final Examination with short answer and long answer question (2 hours, 2000 words equivalent), 40%. Total combined assessment word equivalence is approximately 7,000 words.

NNP7004 Safety and Quality Assurance

Locations: Footscray Nicholson, Werribee, Footscray Park.
Prerequisites: NNP7003 - Process Chemistry
Description: Consumers expect high quality, safe food produced and packaged under hygienic conditions. At the same time humans process water for various purposes noting that different waters vary in qualities such as temperature, colour, taste and odour. These qualities influence the suitability of water for certain purposes. Water for industry must be of adequate quality and required safety. In our global economy, where ingredients may be sourced from around the world and different manufacturing and production standards may be used, it becomes increasingly important to understand regulatory systems and ensure that standards regulating quality of food and water are enforced. This unit provides an introduction to the concepts and principles of food and water quality evaluation assurance, food and water legislation, food and water standards. It explores the concept of quality from sensory, scientific, regulatory and legal perspectives, including the concepts of total quality control (TQC) and total quality management (TQM). The importance of quality assurance principles and systems and both Australian and International standards codes in relation to food and water are emphasized.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review and apply principles of quality assurance and quality management systems in food and water processing, distribution and services; 2. Interpret and apply Australian and International legislations and standard codes with respect to quality assurance of food and water in manufacturing and services sectors; 3. Assess and implement principle statistical control techniques to assure the quality of food and water; 4. Apply and integrate the principles and practices of safety management of food and water; 5. Develop and design processing approaches using appropriate risk management tools (HACCP, SRP, ERAC) to ensure delivery of safe, clean and hygienic food and water;
Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hrWorkshop1.0 hr
Required Reading: Newslow, D. (2013) Food Safety Management Programs: Applications, Best Practices and Compliance Boca Raton: CRC Press Pollard, S.J.T. (2008) Risk management for water and wastewater utilities London: IWA Publishing Recommended reading: Hubbard, M. R. (2012) Statistical quality control for the food industry. 3rd ed. New York : Chapman and Hall Mortimore, S. (2001) HACCP Oxford : Blackwell Science Boyd, C.E. (2015) Water Quality An Introduction Zurich: Springer International Publishing Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.
Assessment: Test, Two (2) In Class Tests (1000 words - 1 hour each), 30%. Assignment, One (1) individual written research assignments (1500 words equivalent), 15%. Case Study, One (1) team case study (1500 words equivalent), 15%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7005 Units of Operation in Process Engineering

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in process engineering systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. In order to enhance and extend specialist knowledge required in the discipline of food and water process engineering systems, this unit provides an overview of the key units of operation in industrial processes, which involve mixing, separation, reaction and product handling. These are arranged in flowsheets that can range from simple single units, to complex highly integrated units, in order to achieve a desired food or water product goal. These goals include

producing, removing, purifying and/or concentrating a desired product or contaminant to meet market or environmental standards. In addition this unit shows how a desired process can be conceptualised into a series of unit operations and drawn into professional process flow diagrams and piping and instrumentation diagrams. The unit explores how to set up heat and mass balances for the unit operations, calculate piping sizes, draft equipment plans and undertake capital and operating cost estimations that would be an expected task in a professional engineering context. These are followed by the understanding and setup of control loops and instruments widely used in foods and water processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the most recent theoretical developments in designing functional process engineering units and justify their application in various contemporary and emerging professional contexts; 2. Contribute to the discourse and practice around 'engineering sustainability' and elaborate the links between effective foods and water engineering processes and innovation; 3. Critically apply knowledge and skills relevant to both the process engineering specialisation and the broader discipline of Engineering to new and uncertain professional practice scenarios, exhibiting a high level of personal autonomy and accountability; 4. Design, implement and evaluate food or water process projects or research which address complex issues and transmit subsequent findings to specialist and non-specialist audiences; and 5. Be competent in understanding, conceptualising, designing and evaluating a foods or water process to support the ability to formulate and strategise project management plans which accurately meet stakeholder needs and expectations.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr

Required Reading: McCabe, W., Smith, J. and Harriott, P. (2004) 7th ed. Unit operations of chemical engineering New York: McGraw-Hill Recommended reading: Ulrich, G. D. (1984) A guide to chemical engineering process design and economics New York: Wiley Silla, H. (2003) Chemical process engineering design and economics Boca Raton: CRC Press Perry, R. H. (2008) Perry's chemical engineers' handbook 8th ed. New York: McGraw-Hill Smith, R. (1995) Chemical process design New York: McGraw-Hill

Assessment: Assignment, One (1) individual written research assignment (2000 words), 15%. Project, Group process design project (report - 3000 words), 50%. Examination, Final Examination (3 hours - equivalent to 3000 words), 35%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7006 Industrial Biotechnology

Locations: Werribee, Footscray Park.

Prerequisites: NNP7003 - Process Chemistry

Description: This unit will explore the application and impact of current innovative and often controversial biotechnology processes to the food and water processing industries. Students will gain knowledge of the current principles and application of biotechnology and genetic engineering techniques to food and water processing. In addition, students will gain an understanding of the ethical, social and legislative issues related to the use of biotechnology in food production and in the environmental context. This unit will focus on enzymology, bio separations, biotransformation, industrial microbiology, fermentation technology, and the production and application of enzymes in food production and water and waste water treatment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elaborate the factors and conditions influencing enzyme action, and identify and explain the process used in bio separations; 2. Apply theoretical knowledge of biochemical mechanisms involved in bio-transformation in a practical and real settings; 3. Conceptually map biotransformation processes involved in food and water processing; 4. Critically synthesis and apply knowledge in the production and use of enzymes in food and water processing as well as interrogate production and use of genetically modified microorganisms; 5. Critically review the legislative, ethical and social issues related to biotechnology in food and water processing.

Class Contact: Lab 3.0 hrs Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Pometto, A., Shetty K., Palivath, G., Levin R., (2008) 3rd ed. Food Biotechnology Boca Raton : CRC press Evans, G.M., and Furlnog, J.C. (2011) 2nd ed. Environmental Biotechnology: Theory and Application Hoboken: John Wiley & Sons Recommended reading: Shuler, M.L. and Kargi, F., (2002) Bioprocess Engineering: Basic Concepts 2nd ed. New Jersey: Prentice-Hall Inc

Assessment: Research Paper, Individual written research assignment (1500 words) on the application of biotechnology and ethical/social implications, 20%. Laboratory Work, Four Lab reports (750 words each; total = 3000 words), 40%. Examination, 2 hour examination with short answer and long answer question (2000 words equivalent), 40%. Total combined assessment word equivalence is approximately 6,500 words.

NNR6001 Research Project A

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study together with NNR6002 provides an advanced program of research training and requires students to apply advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigate and resolve a complex problem inherent in a specified application with a high level of autonomy and present findings to professional and non-specialist audiences demonstrating advanced professional practice and scholarship. The unit provides students with a firm foundation from which they can undertake a research problem. For the duration of the semester guidance will be given to students for the identification of a research problem. The requirements of this unit have been developed to enhance students' theoretical application in problem solving, communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. Each student will undertake an individual research project under the guidance of an academic staff on a suitable topic, over the duration of a semester. Lectures, seminars, and regular meetings will be held collectively to expose students to research related matters such as Research Methodology, Literature Reviews, Feasibility Studies, Experiment Design, Modelling and Simulation Techniques and Tools, Results Validation and Decision Making, Report Writing, Structured Documentation, and Scientific Presentation. Accordingly, students are expected to develop a defensible research proposal. This proposal will be the basis of the research study the student will conduct in NNR6002.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review, analyse and critique discipline-based knowledge in engineering to identify and interrogate ill-defined and complex problems and develop a discipline-related research project within one or more sub-disciplines demonstrating a high level of personal autonomy; 2. Critically review basic research construction and evaluation and demonstrate discipline-appropriate application of research terminology and contribute to the discourse and practice around 'engineering sustainability' and the links between Engineering and innovation in contemporary life'. 3. Conceptually map the research process, identifying researchable problems and develop a

defensible conceptual framework for research, justifying the selected research methodologies as relevant to the topic under investigation; and 4. Prepare and critically evaluate research proposals and plan the research process by formulating and strategising project management plans.

Class Contact: Forty-eight (48) hours or equivalent for one semester comprising group seminars, group meetings and discussions with fellow researchers and project supervisors.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Presentation, Progress presentations (2 seminars each of 15 min. duration), 30%. Report, Final report (approx. 10,000 words), 50%. Presentation, Final presentation (30 min. duration), 20%.

NNR6002 Research Project B

Locations: Footscray Park.

Prerequisites: NNR6001 - Research Project A

Description: NNR6002 builds on the work carried out through NNR6001. The individual research project proposal developed in NNR6001 will be carried out under the guidance and supervision of an appropriate academic staff. Students will analyse results, and interpret evidence with regard to different bodies of knowledge and practice. The unit also requires students to communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply theoretical knowledge, technical and creative skills to systematically investigate, analyse and synthesise complex information with a high level of personal autonomy and independence; 2. Plan and manage a large project, including managing multiple stakeholders; 3. Analyse and interpret evidence with regard to different bodies of knowledge and practice with creativity and initiative; and 4. Communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Class Contact: Forty-eight (48) hours or equivalent for one semester comprising group seminars, group meetings and discussions with fellow researchers and project supervisors.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Presentation, Progress presentations (2 seminars, each of 15 min. duration), 20%. Thesis, Final Report (approximately 15,000 words),, 50%. Presentation, Final presentation and demonstration, 30%.

NNR6500 Research Project

Locations: Footscray Park.

Prerequisites: NNT6510 - Communication Theory

Description: This unit is designed to provide students with an advanced program of research training where students will demonstrate a high degree of autonomy, accountability, creativity and initiative. The unit requires students to acquire advanced theoretical knowledge, practical and analytical skills to investigate and resolve complex problems in specified applications and present findings to professional and non-professional audiences. Students will demonstrate advanced professional practice and scholarship by undertaking an individual research project on a suitable topic over the duration of a semester under the guidance of an academic staff. In general this unit provides students with a firm foundation from which they can identify, conceptualise and methodically investigate a substantial research problem, analyse results, and interpret evidence with regard to different bodies of knowledge and practice. The unit also requires students to communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse discipline-based knowledge in engineering to identify and interrogate ill-defined and complex problems and develop a discipline-related research project within one or more sub-disciplines demonstrating a high level of personal autonomy and independence; 2. Apply theoretical knowledge, technical and creative skills to systematically investigate, analyse and synthesise complex information; 3. Critically review basic research construction and evaluation and demonstrate discipline-appropriate application of research terminology and contribute to the discourse and practice around 'engineering sustainability' and the links between Engineering and innovation in contemporary life'; 4. Conceptually map the research process, identifying researchable problems and develop a defensible conceptual framework for research, justifying the selected research methodologies as relevant to the topic under investigation; 5. Plan and manage a large research project by formulating and strategising the process, project management plans, including managing multiple stakeholders; 6. Analyse and interpret evidence with regard to different bodies of knowledge and practice with creativity and initiative; and 7. Communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Class Contact: Forty-eight (48) hours of face-to-face contact with the supervisor. In addition, ninety-six (96) hours recommended for one semester or eight (8) hours per week, comprising of four (4) hours per week group seminar, four (4) hours per week (on average) individual meetings, discussions, etc.

Required Reading: To be advised by the supervisor of the project.Since this unit is research project based, information pertaining to the work involved is provided by the supervising academic.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Presentation, Regular seminar presentations (3 seminars, each of 20 min. duration), 30%. Thesis, Final report (Approximately 15,000 words), 50%. Presentation, Final presentation (of duration 40 min.), 20%. Final report is to be examined by an external examiner (who could also be present at the final presentation).

NNT6501 Advanced Communication System Design 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. The material taught introduces students to simulation procedures inherent in system modelling. All students are expected to master MATLAB's more advanced algorithms and its application in the design and simulation of communication subsystems such as the handling of RF signals in a communication channel and the use of complex envelope representation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering skills to a given task; 2. Apply in-depth technical design of

wireless sub-systems and optimise the physical layer; 3. Identify system issues and develop methodologies applicable to a given scenario; 4. Utilise a systems approach to analysis, simulation and design; 5. Gather, collate and evaluate data in a professional manner; and 6. Use modelling and simulation skills as an individual and as a team player.

Class Contact: Seminar3.0 hrsForty eight (48) hours for one semester comprising of lectures and practicals.

Required Reading: Attaway, T, (2009) 2nd Matlab-A practical introduction to programming and problem solving' Canada: Elsevier. Jeruchip, Balaban and Shanmugan (2000) 2nd Simulation of communications Systems New York: Kluwer.

Assessment: Project, Individual modelling project in Matlab (1.5 hours), 30%. Test, Individual practical simulation tests x 2 (2 hours), 40%. Test, Group modelling and simulation test (1.5 hours), 30%. Although there is a group modelling and simulation test, each individual is awarded a mark that reflects what her/his contribution is to the final submission.

NNT6502 Advanced Communication System Design 2

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Network Engineer. The material taught introduces students to simulation procedures inherent in Network modelling. All students are expected to master MATLAB's more advanced algorithms and its application in the design and simulation of vertical as well as horizontal structured networks. At a more advanced level, students will be expected to master and use OPNET and other industry standard simulation tools and their general application in all types of network configurations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply in-depth technical development of traffic activities in telecommunications networks; 2. Gather and collate data to establish statistical trends for a given network scenario; 3. Interpret the relationship between capacity demand and supply; 4. Utilise a systems approach to analysis, design and operational performance of a communications system; and 5. Distinguish classes of traffic and other quality of service measures.

Class Contact: Forty-eight (48) hours for one semester comprising of lectures and practicals.

Required Reading: To be advised by lecturer.

Assessment: A pass in all items is required to complete the unit Assignment, Preliminary Assignments x 4 (1500 words each), 40%. Test, In-Class Simulation Test (2 hours), 30%. Examination, Final Written Exam (2 hours), 30%.

NNT6510 Communication Theory

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in communication systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. In order to enhance and extend specialist knowledge required in the discipline of electrical and electronic communication system, this unit provides an overview of Telecommunication systems and introduces information theory (including self-information, channel matrix, trans-information source coding, redundancy, system configuration and entropy). In addition this unit reviews analysis techniques such as Fourier series, properties and transforms applicable to signals in a given communication link. The unit explores Power and energy signals, power spectral density, auto and cross-correlation analysis outcomes that modern network designers need to use in practical applications. These are followed by a review of Modulation Techniques commonly used in many telecommunication scenarios.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine and critically evaluate the design needs for a given communication link; 2. Exhibit requisite specialist technical competence in telecommunications system performance and implementation to a given scenario; 3. Generate appropriate solutions to complex problems in telecommunication contexts; 4. Utilise and critique the value of a systems approach to analysis, design and operational performance of a communication system; 5. Distinguish between modulation schemes applicable to a given application in order to design an optimal communication link; and 6. Determine and critically evaluate system performance in terms of signal-to-noise ratio to enhance grade of service and reliability.

Class Contact: Seminar5.0 hrsForty-eight (48) hours for one semester, comprising of lectures, tutorials, hardware and computer based labs.

Required Reading: Ziemer, R & Tranter, W (2009). 6th edition Principles of Communications NY: John Wiley & Sons Haykin, S (2005). 5th edition Modern Wireless Communications CH: Pearson Prentice Hall N. Benvenuto et al, (2007). 4th edition Communication Systems NY: Wiley Haykin, S and Moher, M. (2009). 5th edition Communication Systems NY: John Wiley & Sons Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.

Assessment: A pass must be achieved for each assessment item in order to complete the unit. Test, Four (4) In Class Tests (1000 words - 1 hour each), 60%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%.

NNT6531 Radio Frequency Engineering

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in modern 21st century wireless communication subsystems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to a practising Engineer.
This unit provides students with a theoretical and practical understanding of general wireless communication systems and the subsystems involved in them. It provides an overview of existing wireless systems with special reference to hardware implementation. Unit material has been developed to include Noise and Distortion, Duplexing methods and Propagation modelling at UHF with emphasis on Path loss, free space and plane earth models. In particular, Okumura's model will be used in Radio link design. Students are expected to take into account Shadowing, Rayleigh multipath fading, fade duration and level crossing rate and Delay spread when developing a link budget. In addition, coherence bandwidth, Antenna parameters, Diversity systems, Multiple-Input-Multiple- Output (MIMO), Interference cancellation, Modulation and coding for the mobile channel are topics that will be taught.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine and critically evaluate appropriate radio hardware components to meet a specified dynamic range (noise and third order distortion) specification for wireless equipment; 2. Utilise and critique the difference between different duplexing methods and discriminate the relevant performance trade-offs; 3. Apply high level technical competence to perform basic path loss estimation and radio link design, using calculations or specialised prediction software; 4. Analyse the causes of radio frequency fading and identify the most appropriate diversity countermeasure to this fading; and 5. Utilise and critique different MIMO modes of operation.

Class Contact: Seminar2.0 hrsForty-eight (48) hours for one semester comprising lectures, labs and tutorials.

Required Reading: Other relevant textbooks will be recommended by the unit coordinator.Wong, D. K. (2012) 5th edition Fundamentals of wireless Communications Hoboken: Wiley Rappaport T,S. (2007). 2nd edition Wireless Communications. New Jersey:Prentice-Hall. Molisch, A. F. (2005). 2nd edition Wireless Communications. Chichester:Wiley.

Assessment: A pass must be achieved in each assessment item to complete the unit. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Laboratory Work, Laboratory Reports x 2 (1000 words each report), 30%. Test, Written Tests x 2 (1 Hour each - equivalent to 1000 words), 30%. The total combined assessment word equivalence is approximately 7,000 words.

NNT6532 Satellite Network Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in microwave and satellite communication systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. This unit has been developed to cover principles of modern microwave systems planning and design. Students will study Microwave propagation, Beam bending, K-factor and Fresnel zone clearance and are expected to critique and implement Free space loss calculation methodologies. In addition this unit is comprised of: Component characterisation, Microwave antennas, oscillators, amplifiers, mixers, filters and isolators. Modulation schemes for analog and digital radio systems will be covered together with Multiplexing techniques, access techniques and system loading effects. This will lead into Microwave link planning and design techniques taking into account Noise budget calculations and Reliability calculations for uplink and downlink. In general, Satellite orbits, Elevation angles, Polarisation and frequency re-use techniques will be studied including System EIRP and figure of merit Effects of system non-linearity. Mastering these topics will enhance a student's employability with a service provider company or a private company that owns or deploys microwave and satellite communication systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. To determine and critically evaluate the technical fundamentals to design microwave links; 2. Apply high level technical competence in developing link budgets for a given microwave/satellite link; 3. Generate appropriate solutions to the design requirements for a low earth orbit satellite and a geostationary satellite; 4. Solve and implement techniques to guard against problems in satellite communications; and 5. Critically appraise the limits of the link performance for both microwave and satellite links.

Class Contact: Seminar3.0 hrsForty-eight (48) hours for one semester comprising of two (2) hour lectures and one (1) hour tutorial/laboratory.

Required Reading: Any text book that covers satellite communication systems engineering is highly recommended.Pritchard, W, 1993 Satellite communication system Engineering Prentice Hall Elbert, B., 1992, Introduction to Satellite Communication, Artech House. Latest edition by Pritchard et al is highly recommended

Assessment: A pass must be achieved in each assessment item to complete the unit. Test, Written Test (1.5 Hours - equivalent to 1500 words), 20%. Assignment, Lab simulation report (2500 words), 40%. Examination, Written examination (3 hours - equivalent to 3000 words), 40%.

NNT6542 Mobile Network Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Mobile and Personal communication engineer. This unit gives an overview of cellular Network design where students are taught Capacity calculations, Cell site engineering, Cell splitting and sectoring. Cellular network access mechanisms such as FDMA, TDMA and CDMA are analysed. Topics of interest such as Simplex, Half Duplex, Full Duplex, DSSS and Frequency Hopping are also taught. The unit further explores Spectral efficiency, Air link interface, Radio resource management, Mobility management, Handover and general Cellular traffic. In addition, Cellular networking, Micro and macro cellular systems, GSM, WCDMA, LTE systems and Mobile data networks are topics the unit covers. The wireless enterprise, PMR, Simulcast, Trunking, Standardisation, Security issues, Regulatory environment, Emerging and Future Standards are also covered to enhance student employability on graduation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialised technical cell planning for a specific wireless communication system; 2. Utilise a systems approach to evaluate wireless system performance in terms of quality of service and grade of service; 3. Critically review and implement radio cell planning software tools; 4. Survey and investigate the operation of the key wireless standards, GSM, WCDMA LTE and dimension networks accordingly; and 5. Propose procedures for the operation and identification of strengths and weaknesses of popular wireless multiple access techniques.

Class Contact: Seminar3.0 hrsForty-eight (48) hours for one semester comprising lectures, tutorials. Additional self-directed learning comprising assignments, projects and laboratory work.

Required Reading: Holma, H., & Toskala, A. (2009). ISBN 978-0-470-99401-6. LTE for UMTS, OFDMA and SC-FDMA Based Radio Access. Chichester:Wiley. Holma, H., & Toskala, A. (2007). (4th ed.). WCDMA for UMTS - HSPA Evolution and LTE. Chichester:Wiley. Molisch, Andreas F. (2005). ISBN 13 978-0-480-84888-3. Wireless Communications. Chichester:Wiley.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Examination, Final examination (3 Hours - equivalent to 3000 words), 40%. Test, Class Tests x 2 (equivalent to 2000 words), 30%. Laboratory Work, Laboratory Practicals x 2 (equivalent to 2000 words), 30%.

NNT6562 Digital Signal Processing

Locations: Footscray Park.

Prerequisites: NEE2201 - Linear Systems with Matlab Applications

Description: In this unit students will acquire advanced theoretical knowledge, analytical and practical skills that are effective in the investigation and resolution of complex problem solving scenarios. The unit has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities that are important to practising DSP engineers. The unit will provide an understanding of digital signal processing principles and techniques. The processing of deterministic signals and random signals will be emphasized equally, In deterministic signal processing, the topics cover include Discrete-time Fourier transform, Fast Fourier transform, IIR digital filter design via bilinear transformation and FIR digital filter design via windowing. Other topics of interest include frequency-sampling filters and linear-phase filters. In random signal processing, the emphasis will be placed on Linear Least Mean Squared Error estimators. In addition, adaptive filtering and the LMS algorithm will be introduced. Telecommunication engineering applications like channel equalizers and antenna-array beam formers are other topics of interest the unit covers.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret and apply digital signal processing principles and techniques; 2. Apply DSP applications in telecommunication systems and sub-systems; 3. Critically examine and analyse aliasing, quantisation, signal reconstruction filters. Design IIR digital filters and FIR digital filters; 4. Analyse and design Linear Least Mean Squared Error estimators; and 5. Apply in-depth random signal processing principles to channel equalisers and antenna-array beam formers.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, tutorials and laboratory.

Required Reading: Other textbooks may be recommended by the unit coordinator.Ifeachor, E.C. & B.W. Jervis, 2002 edition or later, Digital Signal Processing - A Practical Approach, Addison-Wesley

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Assignment, Design Assignment (1500 word report), 20%. Test, Mid-semester test (2 hours), 30%. Examination, Final Examination (3 hours), 50%.

NNW7001 Surface Water Planning

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire knowledge of surface water planning, covering water resources development (including river basin planning, multiple objectives, multiple purposes; conjunctive use of surface and groundwater); sustainability in water resource planning (economic, environmental and social evaluation); reservoir design (critical period methods and simulation); streamflow analysis; climate variability; stochastic data generation; water demand (urban, irrigation, environmental); single/multiple objective optimization and applications in water resources; conventional optimisation methods; evolutionary optimisation methods; climate change; GCM models; downscaling of GCM outputs to hydrologic variables; effect of climate change on hydrology and water resources; multi-criteria decision analysis and applications in water resources.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct quantitative analysis of water resources and their conjunctive use; 2. Evaluate sustainability in water resource planning; 3. Conduct streamflow analysis and reservoir design; 4. Evaluate stochastic generated climate and stream flow data ; 5. Conduct analysis using single and multiple objective optimisation including their application in water resources; and 6. Evaluate the climate change effect on hydrology and water resources.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: There is no single required text book for this unit. The unit material will be covered from various reference books and journals. The following reference books are recommended for this unit: Dzurik, A. (2003) Water Resources Planning, Rowman & Littlefield Publications, INC., USA. McMahon, T. A. and Adeloye, A. J. (2005) Water Resources Yield, Water Resources Publications, LLC, USA. Grafton, R. Q. and Hussey, K. (2011) Water Resources Planning and Management, Cambridge University Press. Mays, L.W. (2005) Water Resource Systems Management Tools, McGraw Hill Professional Engineering Publication. Linsley, R. K., Franzini, J. B., Freyberg, DL., and Tchobanoglous, G. (1992) Water Resources Engineering, McGraw Hill Publication.

Assessment: Assignment, Scientific review of water resources development and sustainability factors in water resources. (1500 words), 15%. Project, Project associated with reservoir design, stream flow analysis, water demand and optimization method application (2000 words), 30%. Research Paper, Research paper and presentation on the prescribed topics (2000 words), 25%. Examination, Final examination based on unit content (3hrs), 30%.

NNW7002 Water, Society and Economics

Locations: Footscray Park.

Prerequisites: Nil.

Description: Water is the key limiting resource for human development in many parts of the world. Growing population, intense agricultural and industrial activities, and increasing attention to river health are resulting in an increased demand for water not just in Australian cities, but in other cities around the world. Yet the security of water supplies in meeting increasing demand is fragile and uncertain. It is believed that climate change will have adverse effects on both supply and demand aspects of water systems and also on water quality of rivers and streams. This unit covers not just the scientific aspect of water management, but also the policies and laws governing the management of water resources. The topics covered include climate change impacts on water supply and demand, security of water supply in terms of quality and quantity, relationship between water and energy systems, social response to climate adaptation measures, policies that help the society adapt to new climatic conditions and trans-boundary water resources management. Also covered are topics related to the economics of water management, estimating the value of water, and economic tools needed to explain and solve water-related problems. The unit is a good preparation for those interested in working with water management agencies, relevant government departments, and industries that intensively use water, such as mining, smelting, and power generation. This unit also aims to hone oral and written skills needed to communicate with decision makers; conduct and understand scientific research; prepare research reports, policy evaluations; and give effective public presentations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the drivers of water supply and demand and impact of climate change 2. Critically review and propose alternate options that are available to adapt to the changing climate 3. Articulate the basic principles of social science and policy that are necessary to properly inform decision making for management of water resources. 4. Evaluate and apply economic concepts and tools needed to explain and solve water-related problems 5. Formulate evidence-based research reports and effective oral presentations to communicate with decision makers and other

professionals.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: The following textbooks are recommended for this unit: Tvedt, T. (2015) Water and Society, I.B. Tauris & Co Ltd Publications. Hussey, K and Dovers, S.' (2007). Managing water for Australia: the social and institutional challenges, CSIRO Publishing, Melbourne. Butler, D and Memon, F.A. (2005). Water Demand Management, IWA Publishing. Spulber, N. and Sabbaghi, A. (1998). Economics of Water Resources From Regulation to Privatization, Kluwer Academic Publications.

Assessment: The following assessments will be undertaken in this unit. Assignment, Literature review on the relationship between water and society, and associated economic factors (2000 words)., 20%. Case Study, A group case study report based on a site visit (1500 words)., 10%. Presentation, An oral presentation (20 minutes), 20%. Examination, An end of the semester final examination (3 hours)., 50%.

NNW7003 Ground Water

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to acquire knowledge of groundwater. This subject is being delivered by leading groundwater professionals, hydro-geologists and specialists in both public and private practice from the Australia's leading professional body for groundwater hydrology - The National Centre for Groundwater Research and Training (NCGRT). The School was first established in 1965 and has become Australia's leading course for training groundwater professionals. This subject introduces students with a broad introduction to groundwater and hydrogeology. Subjects covered include: hydrogeology, hydraulics, environmental isotopes in groundwater, recharge / discharge determination, dryland salinity and waterlogging, groundwater conceptual modelling, drilling methods, piezometer and bore design, an array of monitoring and sampling methods, groundwater microbiology, groundwater geophysics, groundwater pollution, groundwater and soil remediation, surface water groundwater interaction, ecosystem dependence on groundwater, groundwater management issues including resource allocation, quality protection and sustainability.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and assess case studies and devise solutions through applying relevant scientific concepts and tools; 2. Evaluate current groundwater management issue and make recommendations of possible solutions; 3. Evaluate and interpret physical properties of aquifers; 4. Investigate the interaction between groundwater, surface water and land-surface water systems.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr

Required Reading: There are no specific texts for this unit.

Assessment: Assignment, Research case study (2000 words), 15%. Presentation, Presentation on case studies (10 minutes), 15%. Research Paper, Project investigation (3000 words), 40%. Examination, End of semester exam (2 hours), 30%.

NNW7004 Integrated Urban Water Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to implement integrated urban water management (IUWM) and water sensitive urban design (WSUD) approaches, and decentralised and communal water, wastewater and stormwater systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. In order to enhance and extend specialist knowledge required in the discipline of IUWM, this unit provides an overview of integrated urban water systems incorporating centralised, decentralised, hybrid and water sensitive urban design approaches/systems. The unit will include the application of fit for purpose alternative water resources; sustainability assessment of IUWM approaches covering economic, environmental and social criteria; application of multi-criteria decision approaches. The students will apply these approaches in greenfield, infill and existing developments. The students will learn the application of AQUACUCLE, MUSIC, Urban Volume and Quality and Tank models for the quantitative assessment of IUWM approaches. In addition this unit covers conceptual water infrastructure design approaches, life cycle costing and the application of life cycle assessment outcomes for the quantitative assessment of IUWM. The students will also learn about the role of decentralised systems in the transition of current centralised systems to a more sustainable state with the application of IUWM.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct qualitative and quantitative analysis of various water, wastewater and stormwater servicing options; 2. Evaluate alternative water servicing options using multi-criteria decision assessment methods; 3. Develop the operational and maintenance requirements of planned systems; 4. Contribute to the planning and design guidelines and methods of systems at various scales; 5. Critically apply knowledge skills to apply local planning guidelines, policies and regulations; 6. Design integrated urban water management systems (IUWM).

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr

Required Reading: The unit material will be covered from various reference books, journals and technical reports. The following reference books are recommended for this unit: Maheepala, S., Blackmore, Jane, Diaper C., Moglia, M., Sharma A., and Kenway, S. (2010) Integrated Water Management Planning Manual, Water Research Foundation. Hormoz, P. (2016) Urban Storm Water Management, CRC Press. WSUD Engineering Procedures: Stormwater, Melbourne Water , CSIRO Publishing 2005. Argue, J.R. (2004) WSUD: basic Procedures for Source Control of Stormwater, A handbook of Australian Practice, Urban Water Resource Centre, UniSA Adelaide. Sharma, A.K., Begbie, D. and Gardner, T. (2015) Rainwater Tank Systems for Urban Water Supply - Design, Yield, Energy, Health risks, Economics and Community perceptions, IWA Publishing. Memon F.A., Ward, S. (2015) Alternative Water supply Systems, IWA Publishing. Mays, L. W. (2001) Stormwater Collection System Design, McGraw Hill Publication.

Assessment: Assignment, Literature review on the adoption of IUWM to address climate change and urbanisation impacts at different scale (1500 words)., 15%. Project, Planning and design of water services in a greenfield urban development with IUWM approaches (2000 words) and associated presentation (20 minutes), 35%. Assignment, Planning, design and implementation of specified decentralised and WSUD tools in urban developments (1500 words)., 15%. Examination, Final Examination (3 hours), 35%.

NNW7005 Flood Hydrology and Hydraulics

Locations: Footscray Park.

Prerequisites: Nil.

Description: Floods are one of the costliest and the most common natural disasters which have significant hydrological, social and economic impacts. Civil and water resources engineers play a critical role in minimising flood risk, and identifying infrastructure and planning solutions to manage the adverse consequences of flooding. This unit focuses on teaching the key fundamentals of hydrology and

hydraulics involved in minimising flood risk and mitigating the adverse impacts of floods. This unit mainly covers the topics such as hydrologic concepts used in flood modelling, probabilistic treatment of flood data, streamflow routing program used to calculate flood hydrographs, structural and non-structural methods for flood mitigation, design of stormwater and wastewater infrastructure used to manage floods, one and two dimensional flood modelling and calculation of flood profiles. Students will undertake projects demonstrating real world problems using industry standard computer software.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Propose solutions for managing and minimising flood risk by apply basic principles of hydrology and hydraulics; 2. Calculate interception, infiltration and base flow, and the unit hydrograph, and differentiate between alternative methods for estimating runoff; 3. Implement 1D and 2D hydraulic modelling for minimising the adverse impacts of floods, and explicate the theoretical basis of each model; 4. Use the software packages 'HEC-RAS' and 'RORB' to understand the concepts and methods used in flood management. Analyse and design various hydraulic structures used in management of floods. 5. Produce high quality professional engineering reports and build experience with real-world flood management projects.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: There are no specific texts for this unit. The following textbooks are recommended for this unit: V. T. Chow, D. R. Maidment, L. W. Mays (1988) Applied Hydrology, McGraw-Hill Book Company, New York. J. E. Gribbin (2014) Introduction to Hydraulics and Hydrology, 4th ed., Delmar Cengage Learning.

Assessment: The following assessments will be undertaken in this unit. Project, Undertake a project using RORB software for hydrologic analysis (2000words), 20%. Project, Use HEC-RAS software for 1D hydraulic modelling (2000words, 20%. Project, Use HEC-RAS software to undertake a project on 2D flood modelling (2000words), 20%. Examination, End of semester final Examination (3 hours), 40%.

NNW7006 Water quantity and quality modelling using SOURCE

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to acquire an understanding of both the theoretical and practical principles in applying a specific software - SOURCE, to simulate management strategies in managing water resources. SOURCE is a water resources software tool that is recognised by the Council of Australia and is used widely in Australia and internationally. This unit is delivered in 6 parts: Introduction to SOURCE using both schematic and geographic settings; River system management - which covers water sharing and environmental demand; Urban demand which covers climate dependent model and regression modelling; Optimisation module which covers formulation of objective functions both single and multi-objectives; Groundwater modelling looking at the interaction of groundwater and surface water and setting up the model; and catchment model covers simulation of catchment water quality. In each of the above part, students will develop case study models and undertake scenarios runs.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Simulate and critically assess supply and demand management strategies; 2. Plan and design urban water saving management strategies; 3. Develop river and catchment networks using both schematic and geographical methods; 4. Formulate objective functions to optimise sharing of water supply.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr

Required Reading: There are no specific texts for this unit.

Assessment: Assignment, Case Study (1500 - 2000 words), 25%. Assignment, Case Study (1500 - 2000 words), 25%. Assignment, Case Study (1500 - 2000 words), 25%. Assignment, Case Study (1500 - 2000 words), 25%.

NPU2101 Analytical Methods 1

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: RCS1110 - Chemistry for Biological Sciences A or RCS1601 - Chemistry 1A and RCS1120 - Chemistry for Biological Sciences B or RCS1602 - Chemistry 1B

Description: Analytical Methods 1 builds upon the fundamental principles introduced in first year Chemistry studies and introduces students to instrumental analytical chemistry. This unit provides basic training in modern spectroscopic (Infra-Red, UV/Vis, Atomic Absorption and Nuclear magnetic Resonance), chromatographic (Liquid and Gas Chromatography) and spectrometric (Electron impact Mass Spectrometry) methods of analysis as currently used in the chemical and pharmaceutical industry. Lectures and complementary laboratory exercises will link theory with practice and students gain 'hands-on' experience with modern analytical instruments and associated analytical and physiochemical techniques. Laboratory work includes statistical analysis of analytical data and interpretation of spectroscopic, spectrometric and chromatographic data. For students interested in teaching chemistry, taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Methods 1 and Organic Synthesis adequately prepares students to deliver units 1, 2, 3 and of the VCE chemistry curriculum.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning quantitative and qualitative instrumental chemical analysis; 2. Discuss fundamental principles behind chromatography, spectroscopy and spectrometry and diagrammatically present their basic operating principles, clearly expressing ideas and perspectives; 3. Interpret various analytical data including chromatographic (liquid and gas), spectroscopic (absorption, emission, infra-red and nuclear magnetic resonance) and spectrometric (electron-impact mass spectrometry) as relevant to given problems; 4. Apply standard methodology to the analysis of various real samples (food, pharmaceutical and environmental) including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific instrumental competency in collaboration with peers; and 5. Evaluate the quality of own analytical data and review team members data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: Skoog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) 9th ed. Fundamentals of Analytical Chemistry Brooks/Cole, Cengage Learning

Assessment: Assignment, Written report (1000 words), 20%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 40%. Examination, Written Exam (2 hours), 40%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (4,5) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU2102 Analytical Methods 2

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: NPU2101 - Analytical Methods 1

Description: Analytical Methods 2 builds upon the concepts studied in Analytical Methods 1 and provides advanced studies in instrumental chemical analysis with

training in modern hyphenated techniques. Topics covered include gas chromatography-mass spectrometry and liquid chromatography-mass spectrometry. Studies also include an introduction to capillary electrophoresis, X-Ray crystallography and Carbon 13 NMR. Lectures and complimentary laboratory exercises link theory with practice and students gain 'hands-on' experience with state-of-the-art instruments to determine the identity, structure and physical properties of an unknown pharmaceutical product. Assessment includes report writing according to industry standards and interpretation of spectroscopic, spectrometric and chromatographic data.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate the fundamental principles behind hyphenated techniques including GC/MS. LC/MS and MS/MS; 2. Devise methods of analysis for pharmaceutical samples adopting the analytical process and using modern analytical techniques; 3. Interpret various analytical data including that from LC/MS, GC/MS and 1H and 13CNMR; and 4. Evaluate the quality of their own analytical data and review team members' data and communicate the findings to peers and demonstrators with responsibility and accountability.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: Skoog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) 9th ed. Fundamentals of Analytical Chemistry Brooks/Cole, Cengage learning

Assessment: Assignment, Initial data analysis on laboratory work (1000 words), 10%. Laboratory Work, Written Report (1500 words), 30%. Presentation, Oral Presentation (on laboratory work) (20 min), 20%. Examination, Final Exam (2 hours), 40%.

NPU2103 Organic Synthesis

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: RCS1120 - Chemistry for Biological Sciences B or RCS1602 - Chemistry 1B

Description: This unit builds upon the fundamental Organic Chemistry covered in first year chemistry studies and introduces students to some of the theoretical and practical aspects of synthetic organic chemistry and their use in pharmaceutical applications. The theoretical material is presented with an emphasis on understanding the mechanism of reactions to enable students to predict a range of reaction outcomes. Industrially important reactions such as electrophilic substitution reactions and the preparation and properties of common polymers are integral to this unit. Spectroscopic and spectrometric techniques introduced in Analytical Methods 1 are utilised and further explored in this unit. For students interested in teaching chemistry taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Methods 1 and Organic Synthesis adequately prepares students to deliver units 1, 2, 3 and 4 of the VCE chemistry program.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning synthetic organic chemistry and polymer science based upon modern reaction processes to given problems; 2. Employ chemical mechanisms to explain simple organic chemical reactions and explain the factors which influence reactivity in given situations; 3. Discuss aromaticity and the common reactions of aromatic compounds, clearly expressing ideas and perspectives; 4. Discuss the preparation and properties of common polymers; 5. Adapt common practical organic chemistry manipulations and interpret various analytical data including infra-red and nuclear magnetic resonance spectra, in collaboration with others and with responsibility for own output; and 6. Evaluate the quality of their own synthesised products and related analytical data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Sixty (60) hours per semester comprising of two (2) hours of lectures and three (3) hours of Laboratory work each week.

Required Reading: McMurry, J.E., 2016, Organic Chemistry, 9th edn, Cengage.

Assessment: Assignment, Short problem solving exercise (200 words equivalent), 10%. Laboratory Work, Portfolio of laboratory work with summary addressing criteria (1500 words), 45%. Examination, Final Exam (2 hours), 45%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (specifically Learning Outcome 5) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU2104 Drug Discovery and Development

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: Nil.

Description: This unit is an introduction to the processes involved in the discovery and development of pharmaceutical products. Through a series of case studies, students will investigate the often serendipitous discovery of biologically active products and their chemical manipulation to become modern pharmaceutical products. The role traditional remedies (Western, Asian and Indigenous, for example) have played in discovering new drugs will also be examined.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the historical and scientific context from which modern pharmaceutical products have been discovered and developed; 2. Research and evaluate various literature relevant to drug discovery and development; 3. Report research data to peers and demonstrators with initiative and judgement; and 4. Critically review research data and present findings in written format.

Class Contact: Lecture 2.0 hrs Sixty (60) hours per semester, consisting of two (2) hours of lectures per week. Students are expected to undertake prescribed reading and research of up to three (3) hours per week.

Required Reading: Fischer, J., (2015) Successful Drug Discovery Wiley

Assessment: Assignment, Initial Report on pharmaceutical discovery (1,000 words), 20%. Project, Report on drug discovery (2,000 words), 40%. Presentation, Oral presentation on project (20 minutes), 40%.

NPU2110 Australian Landscapes and Biota

Locations: Werribee.

Prerequisites: Nil.

Description: This unit introduces students to both the range of environments and landscapes present across the Australian continent and the nature of the plants and animals that inhabit these landscapes. This will be achieved by: 1) discussing the factors that have shaped the various Australian environments, including geomorphological and climatic processes, and historical factors; 2) introducing the distinctive flora and fauna of Australia and the evolutionary pressures that have shaped the Australian biota; and 3) reviewing relationships between the biota and the environment. The unit also provides foundational knowledge on the Australian environment for students not continuing in the biological sciences.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Utilise practical and computer-based tools to identify, describe and demonstrate how various factors, including geomorphological, climatic, historical and evolutionary, have shaped present Australian landscapes and the various environments contained within; 2. Demonstrate and elaborate the relationships between biotic (living)

elements in the Australian environment and how these interact with various abiotic (non-living) elements; 3. Analyse a range of environmental data with practical and computer-based tools; 4. Communicate individually and collectively, in written, oral and visual forms, complex inter-relationships between organisms and their environments; and 5. Contextualise the influence of humans and various 'cultures' to the Australian landscape and biota from both historical and present day perspectives.

Class Contact: Field Trip 8.0 hrs Lecture 2.0 hrs

Required Reading: Attiwill, P. (2007). Ecology: An Australian Perspective. Oxford.

Assessment: Other, Field Work Reports, 40%. Assignment, Assignments, 20%. Examination, Examination, 40%.

NPU3101 Pharmaceutical Regulatory Processes

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: NPU2102 - Analytical Methods 2R CS2602 - Analytical Chemistry 2B Either NPU2102 or RCS2602.

Description: Pharmaceutical Regulatory Processes has as its foundation the fundamental chemical principles introduced in Chemistry 1A and 1B and underlying basics of instrumental chemical analysis and synthetic organic chemistry studied in Analytical Methods 1 and Organic Synthesis, respectively. The Unit provides students with training in Pharmaceutical Laboratory management and presents an overview of current pharmaceutical laboratory practice. Topics covered include occupational health and safety; quality systems including GLP, GMP and accreditation of laboratories; analytical methods and reliability of scientific data; familiarisation with international standards (ICH and FDA) and official methods of analysis (British and US Pharmacopeia). Assessment includes report writing according to industry standards. For students interested in teaching chemistry this unit along with Drug Testing and Analysis extends the minimum requirements (see four units mentioned above) and gives a working insight into more advanced chemistry and industry specific practice.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the industry standards in pharmaceutical laboratory management and practice both locally and globally; 2. Develop risk assessments on laboratory practice including the identification of physical/chemical hazards and proposing methods of minimising risk; 3. Review industry quality systems both locally and globally and initiate good laboratory practice (GLP) and good manufacturing practice (GMP) in own context; 4. Devise an analytical protocol incorporating method selection, method verification, method validation and measurement uncertainty; 5. Apply standard methodology to the analysis of various pharmaceutical samples including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific instrumental competency; and 6. Review and present data to peers and demonstrators with responsibility and accountability.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: Skoog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) 9th ed. Fundamentals of Analytical Chemistry Brooks/Cole, Cengage learning

Assessment: Assignment, Written Risk Assessment (500 words), 10%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 40%. Project, Written Assignment (3000 words), 50%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (4,5) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU3102 Drug Design

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: NPU2103 - Organic Synthesis NPU2104 - Drug Discovery and Development

Description: This Unit follows on from NPU2104 Drug discovery and Development and examines the modern techniques used to design pharmaceutical products. Students will undertake studies in Structure-based (SBDD) and ligand-based (LBDD) drug design, computer-aided drug design and subsequent synthetic pathway design.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review pharmaceutical methodology for the design of new drugs and propose synthetic pathways for their preparation; 2. Devise appropriate methodology for the design of new drugs; 3. Apply drug design methodology, including computer-aided and related techniques to the design of a new drug; and 4. Review and present data to peers and demonstrators with responsibility and accountability.

Class Contact: Lecture 1.5 hrs PC Lab 1.5 hrs

Required Reading: Kristian Stromgaard, K., Krogsgaard-Larsen, P., Madsen, U., (2009) 4th ed. Textbook of Drug Design and Discovery CRC Press

Assessment: Assignment, Written Assignment (1000 words), 20%. Assignment, Written Assignment involving computer-aided drug design (1500 words), 40%. Examination, Final Exam (2 hours), 40%.

NPU3103 Techniques in Pharmaceutical Synthesis

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: NPU2103 - Organic Synthesis NPU3104 - Drug Testing and Analysis RCS2100 - Organic Chemistry 2A Either NPU2103, NPU3104 or RCS2100.

Description: This unit builds upon the basic synthetic chemistry covered in NPU2103 Organic Synthesis with a clear focus on the techniques used in the synthesis of modern pharmaceutical products. Important synthetic methodologies for the preparation of chiral compounds are emphasised including an introduction to bio-catalysis. Modern spectroscopic and spectrometric techniques are further utilised in this unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply and explain the principles of various organic synthetic procedures to drug synthesis; 2. Categorise the different classes of protecting groups and describe their role in organic synthesis; 3. Evaluate various chiral synthetic methodologies, including bio-catalysis, and their application to drug synthesis; 4. Articulate the principles and application of combinatorial synthesis; 5. Adapt common practical organic chemistry manipulations and interpret various analytical data including infra-red and nuclear magnetic resonance spectra, in collaboration with others and with responsibility for own output; and 6. Evaluate the quality of their own synthesised products and related analytical data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: McMurry, J.E., (2016) 9th ed. Organic Chemistry Cengage

Assessment: Assignment, Short Answer Assignment (1000 word equivalent), 10%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 45%. Examination, Final Exam (2 hours), 45%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (5,6) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU3104 Drug Testing and Analysis

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: NPU2101 - Analytical Methods 1
Description: Drug Testing and Analysis builds upon the concepts studied in Analytical Methods 2. This Unit is focussed upon modern and topical aspects of Drug Testing (workplace, sport, clinical and forensic) and Drug analysis (trace component and impurity profiling). Lectures and complimentary laboratory exercises link theory with practice and students gain 'hands-on' experience with state-of-the-art instruments and techniques including sample preparation and the investigation of complex samples including pharmaceutical products and drugs and metabolites in biological fluids.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review modern advanced methods of analysis as currently used in the Drug Testing and Analysis industry in Australia and globally; 2. Devise methods of analysis for drugs in complex samples and review the suitability of their method to a range of situations; 3. Interpret various analytical data relating to drug testing and analysis, adapting information to diverse contexts; and 4. Evaluate the quality of their own analytical data and review team members' data and communicate the findings to peers and demonstrators with responsibility and accountability.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: Skoog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) 9th ed. Fundamentals of Analytical Chemistry Brooks/Cole, Cengage learning
Assessment: Literature Review, Written Report (1000 words), 10%. Project, Written Report (2000 words), 25%. Presentation, Oral Presentation on Project (20 mins), 25%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 40%.

NPU3105 Project

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: Nil.
Description: This Unit of Study provides third year students with an opportunity to select and undertake either (a) a brief research project in an area of interest with staff members of the Biomedical Sciences or Chemical Sciences or an established research institution; or (b) a work-based placement in the industry he/she intends to enter. Both the research and work-based placements enable the student to undertake a structured work experience program as an integral part of their degree course. Gaining practical experience in their chosen field enables students to test interest and ability in these areas.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and solve problems with intellectual independence and demonstrate time management and project-related organisational skills in a work-based or laboratory project; 2. Articulate and justify research questions/project objectives and methods; 3. Critically report on a research/work-based project demonstrating appropriate scholarly and discipline based practices. 4. Communicate clear, coherent findings and ideas of a research/work-based project to peers and supervisors.
Class Contact: Projects will involve work conducted at Victoria University or within industry, the community or both. Projects can range from reports or practical work to fieldwork or industry placements. Contact hours are dependent on the type of project undertaken and will be arranged by negotiation with the student's approved Industry Project unit supervisor(s).
Required Reading: Material appropriate to the students project will be provided by the supervisor
Assessment: Report, Written Report on Project (5000 - 7000 words), 70%. Presentation, Oral Presentation (15 minutes), 30%.

NPU3106 Conservation Genetics

Locations: Werribee.
Prerequisites: RBF1310 Biology 1, RBF1320 Biology 2, RBF2610 Fundamentals of Ecology
Description: This unit focuses on the practical applications of genetics of the individual and population as it relates to the conservation of Australian plants and animals. Particularly, this unit examines the genetic basis for management decisions and the formulation of conservation-based breeding programs. Applications of genetics and formulation of management plans based on genetics form a major area of study in this unit. Some specific topics involve genetic structuring of populations, gene flow and fragmentation, hybridization and retaining genetic diversity in limited populations.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe and elucidate the role and importance of genetics to the management of species and populations and its application to the field of natural resource management as a whole, including the limitations of genetic data; 2. Formulate and argue a theoretical basis on which to base management decisions aimed at long-term conservation of genetic resources in a population; 3. Construct and exhibit a practical understanding of the methods used in modern genetics and how these tools can be applied to the management of species and populations; 4. Critically analyse published data relating to taxonomy and phylogenetic relationships and their implications for conservation; and 5. reproductive interventions such as manual pollination or selective breeding.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Sixty (60) hours per semester, comprising of five (5) hours per week consisting of two (2) hour lectures per week and the equivalent of three (3) hours per week of practical work including laboratory sessions, field trips and computer sessions.
Required Reading: Frankham R, Ballou JD, Briscoe DA (2010) Introduction to Conservation Genetics. Cambridge University Press, Cambridge.
Assessment: Examination, Two hour written examination, 40%. Assignment, Written assignment of 2000 words, 30%. Presentation, Class Presentation of the assignment, 10%. Report, Practical reports and simulations, 20%.

NSC1210 Skills for the Scientist

Locations: Footscray Park.
Prerequisites: Nil.
Description: Skills for the Scientist will develop a set of fundamental skills that are required to navigate through all stages of the scientific process. The unit will explore the history and philosophy of science, leading to an understanding of the current approach to scientific thinking. Students will become familiar with accessing library resources, including popular science databases, and will learn the accepted referencing practices for the sciences. Methods will be taught for the management and interpretation of data, leading to the development of written and oral communication skills. Safe and ethical work practices in the laboratory and field will be discussed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of the principles of science and the hypothetic-deductive method; 2. Locate, synthesise and correctly cite/reference scientific literature; 3. Manage scientific data, perform basic data manipulations and

produce scientifically acceptable written and graphic outputs; 4. Create scientific documents and oral presentations; and 5. Demonstrate and apply an understanding of ethical and occupational health and safety procedures and practices in the field and laboratory.

Class Contact: Lecture 2.0 hrs Workshop 2.0 hrs

Required Reading: Lindsay, D.R. (2011) 1st Edition Scientific Writing = Thinking in Words Collingwood, Victoria, Australia, CSIRO Bower, G.S. (2012) 1st Edition Scientific Method: A Historical and Philosophical Introduction London, Routledge

Assessment: Assignment, Literature review, 30%. Report, Scientific report, 30%. Presentation, Group oral presentation, 40%.

NSC2101 Physics 2A

Locations: Werribee, Footscray Park.

Prerequisites: NEF1102 - Engineering Physics 1

Description: This unit of study aims to provide a basic understanding in the two broad areas of electrical circuit fundamentals and of optics. The various topics covered in these two areas are: Electrical Fundamentals: charge and electrical current leading to Ohm's and Kirchhoff's laws. Series and parallel resistor circuits are analysed and their equivalent resistive circuits are developed. DC sources are studied. Analysis of single and multiple loop circuits as well as voltage dividers. The Principle of Superposition, Thevenin's Theorem, Norton's Theorem, the Nodal Voltage method, and equivalent circuits will be emphasised. Introduction to diodes and voltage amplification in electrical networks. Optics: Spherical mirrors, lenses, ray tracing, thin lens and mirror formulae for image position, lateral magnification. Wave nature of light, interference and diffraction, resolving power. Polarisation, methods of producing polarised light, double refraction and interference, applications of polarisation. Introduction to lasers.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply Ohm's law and Kirchhoff's laws in single and multiple loop circuits; 2. Analyse DC circuits by Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, and Norton's theorem; 3. Calculate voltage amplification in electrical circuits; 4. Calculate the behaviour of optical systems involving mirrors or lenses; 5. Analyse single and multiple slit diffraction gratings; 6. Apply knowledge of light to explain polarisation phenomena such as polarisation by reflection; and 7. To provide practical experience in these topics through a range of experiments.

Class Contact: Lab 1.5 hrs Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Halliday and Resnick, 2013 10th Fundamentals of Physics Wiley

Assessment: Laboratory Work, Laboratory experiments and reports, 20%. Assignment, Regular submitted assignments, 20%. Examination, End-of-semester (3 hour written exam), 60%. End of semester examination, assignments as advised by lecturer and laboratory reports.

NSC2102 Physics 2B

Locations: Werribee, Footscray Park.

Prerequisites: NEF1202 - Engineering Physics 2

Description: This unit of study aims to provide a basic understanding in the broad areas of the physics of quanta leading to an introduction to atomic, nuclear and particle physics: Planck's hypothesis, photons and the photoelectric effect, Compton effect, pair production, de Broglie Waves and wave-particle duality, Bohr model of the atom, quantum numbers, Heisenberg uncertainty principle. Schrodinger equation: wave functions, expectation values, eigenfunctions, zero potential, potential steps and barriers, tunnelling, particle in a box, simple harmonic oscillator. One-Electron Atoms: eigenfunctions and eigenvalues, probability densities, orbital angular momentum, electron spin, orbital and spin magnetic dipole moments, spin-orbit interaction, total angular momentum. Multielectron atoms: exclusion principle and periodic table of the elements. Production and absorption of x-rays. Nuclear & Particle Physics: Properties of the nucleus - binding energy, radioactive decay, half-life, radioactive dating, fission and fusion, nuclear structure and nuclear models. Nuclear decay schemes. Nuclear reactors, particle accelerators, interaction of radiation with matter. Overview of the standard model of particle physics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain how quantum physics arose through the inability of classical physics to explain certain experiments satisfactorily; 2. Apply quantum mechanics to atomic, nuclear and particle physics; 3. Provide an overview of nuclear properties including ionising radiation; 4. Describe current knowledge in particle physics; and 5. Provide practical experiences in physics through a range of experiments and visits to appropriate facilities, e.g. synchrotron.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Halliday and Resnick, 2013 10th Fundamentals of Physics Wiley Recommended Reading: Eisberg, R., and Resnick, R., 1985, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles", 2nd Edition, John Wiley, USA.

Assessment: Laboratory Work, Laboratory experiments, reports and oral presentations, 20%. Assignment, Regular submitted assignments, 20%. Examination, End-of-semester exam (3 hours), 60%. End of semester examination, assignments as advised by lecturer, laboratory reports and oral presentations.

NSC3010 Biotechnology Applications

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1R BF1320 - Biology 2R CS1601 - Chemistry 1A

Description: Biotechnology Applications is a capstone unit of the Biotechnology major that builds upon the concepts studied throughout this major. This unit is focussed upon the applications of biotechnology across a number of industries, including pharmaceutical, food, agriculture, forensic, environmental management and medical fields. Lectures that outline the methods and applications of biotechnology using specific, real-world examples are complemented by hands-on practical experience in techniques used in biotechnology industries and field trips to companies in these industries. This allows students to link theoretical concepts and frameworks in biology to applications and practice.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Deduce the key steps in protein and enzyme production in pharmaceutical production, demonstrate these in a laboratory setting and critically assess the outcome of these techniques; 2. Evaluate the techniques used in fermentation technologies and analyse and critically interpret the results of ethanol fermentation in a laboratory setting; 3. Critically evaluate and summarise the applications of biotechnology in the medical, pharmaceutical, food, agriculture and forensic industries; 4. Contrast the methods used to produce and applications of transgenic plant and animals in biotechnology and evaluate the potential ethical implications of these technologies; and 5. Summarise the basis of common genetic diseases, devise methods of diagnosis and evaluate current gene therapy strategies.

Class Contact: Sixty (60) hours per semester comprising of three (3) hours of lectures per week and six (6) x four (4) hour practical/field trip sessions.

Required Reading: Mitchell, R. (1993) Environmental Microbiology Wiley-Liss Inc. Shuler, M.L and Kargi, F., (2002) 2nd ed. Bioprocess Engineering: Basic Concepts Prentice-Hall Inc.

Assessment: Laboratory Work, Two reports (2000 words in total), 30%. Review,

Review of a modern biotechnology application (2000 words), 30%. Presentation, Presentation on a modern biotechnology application (10 minutes), 20%. Report, Industry field trip report (1500 words), 20%. Students must attend at least 80% of the practical classes/field trips and pass the laboratory work assessment to pass this unit.

NSC3020 Biotechnology Project

Locations: Werribee, Industry, Footscray Park.
Prerequisites: RBF2300 - Microbiology 1RBF2520 - Biochemistry 1RBF2390 - Molecular GeneticsRBF2330 - Cell Biology
Description: This Unit of Study provides third year students undertaking a major in Biotechnology an opportunity to select and undertake either (a) a brief research project in an area of interest under the supervision of staff members in Biotechnology or an established research institution; or (b) a work-based placement in the industry he/she intends to enter. Both the research and work-based placements enable the student to undertake a structured work experience program as an integral part of their degree course. Undertaking a project in their chosen field enables students to gain experience in their chosen industry and provides an introduction to further study and research at the postgraduate level.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and solve problems with intellectual independence and demonstrate time management and project-related organisational skills in a work-based or laboratory project; 2. Articulate and justify research questions/project objectives and methods; 3. Demonstrate proficiency in critical thinking in writing a research/work-based project final report, including a rationale, quantitative analysis of data and a depth of biotechnology knowledge in the elected project area; 4. Elucidate clear, coherent findings and future implications of a research/work-based project to peers and supervisors; and 5. Identify, assess and devise strategies for ameliorating risks in industry and research settings.
Required Reading: Material appropriate to the students project will be provided by the supervisor.
Assessment: Literature Review, Proposal on Project or Industry Placement (1500-2000 words), 20%. Report, Final Report on Project (3000-4000 words), 60%. Presentation, Oral Presentation (10 minutes), 20%.

NSC3030 Molecular & Systems Biology

Locations: Werribee.
Prerequisites: RBF2520 - Biochemistry 1RBF2390 - Molecular Genetics
Description: This unit provides students with knowledge of and experience in using many of the techniques that facilitate research and diagnostics in modern molecular biological laboratories. This unit provides a structured overview and practical experience in modern nucleic acid and protein analysis, from the level of individual gene analysis, through system-wide analytical techniques in genomics, transcriptomics, proteomics and metabolomics. This unit utilises the theoretical foundations established in the units RBF2520 Biochemistry 1 and RBF2390 Molecular Genetics to provide students with knowledge of the research methods used in genetic engineering and molecular biology and how these have been developed from studying individual gene function to whole genome analysis, to cellular networks of RNA and protein expression and metabolite profiling. Major topics to be explored include recombinant DNA technologies and vectors, the polymerase chain reaction and its variations and uses, DNA sequencing technologies, genome sequencing projects, methods to assess global gene expression profiles at the RNA and protein level and metabolite profiling. Students will receive practical experience in nucleic acid purification, plasmid cloning, PCR, DNA sequence analysis and protein analysis in the laboratory setting.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contrast the methods and vectors used in recombinant DNA technology, demonstrate the technique of plasmid cloning and assess the outcome of this technique in a laboratory setting; 2. Analyse the steps and applications of the polymerase chain reaction, design and perform this technique in a laboratory setting and critically assess the results of this methodology; 3. Investigate the evolution of DNA sequencing technologies and how genome projects have been improved as a result and critically analyse DNA sequence data using bioinformatics tools and databases; 4. Distil and critically synthesise the relevant scientific literature on emerging technologies in the fields of molecular and systems biology and weigh the risks and benefits of these technologies in a broader societal context; and 5. Deduce and discriminate the methods used to study the genome, transcriptome, proteome and metabolome and how these approaches are utilised to gain insight into cellular function.
Class Contact: Three (3) hours of lectures per week and eight (8) x three (3) hour practical sessions during the semester.
Required Reading: Lecturer will provide a list of notes and readings for the students.
Assessment: Laboratory Work, 2 Reports (total 2000 words), 30%. Assignment, 1500 words, 20%. Test, Mid-semester test on molecular techniques, 15%. Examination, 2 hours, 35%. Students must attend at least 80% of the practical classes and pass the laboratory work assessment to pass this unit.

NSC8900 Science (Full-Time)

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes and procedures outlined as part of the university's Higher Degrees by Research Policy.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to design, develop and implement a research project/s to systematically investigate a research problem; to develop, adapt and implement research methodologies to extend and redefine existing knowledge; and to manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal

interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals; 6. Intellectual independence, initiative and creativity in new situations and/or for further learning; 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Class Contact: Regular meetings with supervisor and participation in agreed research professional development activities.

Required Reading: To be determined in consultation with the supervisors.

Assessment: Thesis, Research Thesis, Pass/Fail. The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be internally assessed by the supervisory team, the College and University through 6- or 12-monthly progress reports. On completion, the thesis will be assessed through independent examination by at least two external expert examiners of international standing.

NSC8901 Science (Part-Time)

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: Nil.

Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes and procedures outlined as part of the university's Higher Degrees by Research Policy.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to design, develop and implement a research project/s to systematically investigate a research problem; to develop, adapt and implement research methodologies to extend and redefine existing knowledge; and to manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals; 6. Intellectual independence, initiative and creativity in new situations and/or for further learning; 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Class Contact: Regular meetings with supervisor and participation in agreed research professional development activities.

Required Reading: To be determined in consultation with the supervisors.

Assessment: Thesis, Research Thesis, Pass/Fail. The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be internally assessed by the supervisory team, the College and University through 6- or 12-monthly progress reports. On completion, the thesis will be assessed through independent examination by at least two external expert examiners of international standing.

RBF1150 Global Environmental Issues

Locations: Footscray Park.

Prerequisites: None

Description: Global Environmental Issues introduces students to some of the fundamental aspects of both historical and contemporary global environmental issues. Students will be required to explore a range of areas relating to sustainable growth and the connection between social justice and environmental issues within the context of risk management and ethical and moral frameworks. Lectures and tutorials link the various topics and provide a platform for further discussion of the issues and strategies to assist students develop their written and oral communication skills.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contextualise the underlying fundamental principles and terminology of sustainability and the environment from which to pursue further studies in Environmental Science and other sciences including educational roles; 2. Explain the interconnectedness between actions and lifestyles and their impact upon a range of environmental factors in developed and less-developed countries; 3. Discuss the breadth and depth of coverage of subjects in various media contributing to an appreciation of environmental issues; 4. Articulate and debate a variety of environmental issues with a sense of self-confidence and tolerance toward others with differing points of view and different cultural perspectives; and 5. Question their own lifestyle in relation to various environmental issues.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Miller, G. T. & Spoolman, S., (2012). 17th Living in the environment Cengage

Assessment: Assignment, Case Study (1000 words), 30%. Portfolio, Portfolio (1000 words), 30%. Examination, Final Exam (2 hours), 40%.

RBF1160 Australian Landscapes and Biota

Locations: Werribee.

Prerequisites: Nil.

Description: This unit introduces students to both the range of environments and landscapes present across the Australian continent and the nature of the plants and animals that inhabit these landscapes. This will be achieved by: 1) discussing the factors that have shaped the various Australian environments, including geomorphological and climatic processes, and historical factors; 2) introducing the distinctive flora and fauna of Australia and the evolutionary pressures that have shaped the Australian biota; and 3) reviewing relationships between the biota and the environment. The unit also provides foundational knowledge on the Australian environment for students not continuing in the biological sciences.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe factors that have shaped various Australian environments, including

geomorphological, climatic, historical and evolutionary; 2. Explain the relationships between the biota and the environment; 3. Use a limited range of practical skills appropriate to the field; and 4. Produce written tasks indicating critical thinking and basic research skills.
Class Contact: Forty-eight (48) hours or equivalent for one semester comprising lectures and a series of all-day field trips.
Required Reading: De Blij, H. J., & Muller, P. O. (1993). Physical geography of the global environment. Canada: Wiley.
Assessment: Other, Field Work Reports, 40%. Assignment, Assignments, 20%. Examination, Examination, 40%. In order to obtain a pass or higher in this graded unit, normally all components of assessment must be passed. .

RBF1310 Biology 1

Locations: Footscray Park, St Albans.
Prerequisites: Nil.
Description: This unit introduces students to the structure and function of living organisms, with an emphasis on animals. This unit will expose students to basic ideas about biological molecules and how the different components of a cell functions. These ideas will be expanded upon to describe internal transport, gas exchange and homeostasis. Key concepts about the function of the digestive system as well as muscle structure and the nervous system will also be described The lecture content will be supplemented by laboratory-based work. Students will receive hands-on learning including organ systems, respiration, circulation as well as protein and cellular studies. This unit provides a fundamental basis of knowledge for students specialising in biotechnology, ecology or science education and will be built upon in RBF1320, Biology 2.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify major organelles and structures in a typical cell and elaborate on their function; 2. Exhibit the correct use of a microscope in a laboratory setting; 3. Analyse the scientific literature and report on a specific topic in biology, expressing ideas and perspectives; 4. Examine the processes involved in the operation of major biological systems, including digestion, gas exchange, muscle contraction and neural control; 5. Classify key structures of the mammalian heart, lungs and eye; and 6. Gather and interpret data in a laboratory setting in relation to given and/or unpredictable problems.
Class Contact: Lab 3.0 hrs Lecture 1.0 hr Sixty (60) hours per semester comprising of three (3) hours of lectures and two (2) hours of laboratory per week.
Required Reading: Solomon, E., Martin, C, Martin D., & Berg, L (2015). Biology (10th ed.). Cengage Learning.
Assessment: Essay, Essay, 10%. Laboratory Work, Practical Work, 30%. Examination, Written, 60%. Students must pass the Laboratory Work assessment item in order to pass the unit.

RBF1320 Biology 2

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides students with knowledge and understanding of key concepts in biology for students specialising in biotechnology, ecology or science education. The lecture content will be supplemented by laboratory practicum. Students will develop scientific literacy, practical and writing skills in a student centred learning environment with a focus on ecology, plant structure and function, genetics, evolution and bioenergetics.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the structure of the main plant tissues and describe how the structure relates to the function, including the main metabolic pathways; 2. Describe the relationship between heredity, transmission of heredity and phenotypic variation; 3. Provide examples of scientific evidence and evolutionary theory that support biological evolution; 4. Apply knowledge of population and community ecology and environmental variation to predict the structure and functioning of ecosystems; 5. Communicate scientific results, information, or arguments using a range of modes (written, oral, visual); 6. Develop teamwork and time-management skills; 7. Demonstrate practical skills and apply quantitative data to solve problems in genetics, ecology and evolution; and 8. Work effectively, ethically, and safely in an individual or team context in a laboratory setting.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: Solomon, E., Berg, L., & Martin, D. W., (2015) 10th ed. Biology Cengage Learning, Canada.
Assessment: Essay, Essay, 20%. Laboratory Work, Practical work, 30%. Examination, Written examination, 50%.

RBF2300 Microbiology 1

Locations: Werribee.
Prerequisites: RBF1310 Biology 1.
Description: In this unit, students will be introduced to the theory and practical applications of bacteria, protozoans, fungi and viruses within the environmental, clinical and industrial setting. Topics include: microbial cell morphology and the structure and function of cell components; growth, reproduction and enumeration of micro-organisms; control of microbial growth: the effect of physical and chemical environments on growth; and microbial metabolism and genetics. Students will gain practical skills in the isolation, culture and identification of a range of microbiological species.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare and contrast the characteristics of virus, bacteria, fungi and protozoa and understand how each group impacts on the community; 2. Demonstrate competency in aseptic technique and methods for isolation, enumeration and identification of key micro-organisms; 3. Appraise and synthesise relevant scientific literature; and 4. Investigate the principles of biosafety and bioethics within the context of microbiology practice.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: To be advised by lecturer.
Assessment: Assignment, Written Assignment, 20%. Laboratory Work, Written Laboratory Reports, 25%. Examination, Written Examination (3 hours), 55%.

RBF2330 Cell Biology

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: RBF1310 Biology 1 or RBM1528 Human Physiology 2.
Description: This unit provides a strong foundation for students moving into areas such as: biotechnology, molecular biology, medical sciences and environmental sciences. Topics include: Eukaryotic cell organisation (covering all of the major organelles) and compartmentalisation; membranes and transport mechanisms; the cell surface; intracellular targeting of proteins including co-translational and post-translational pathways; transport and docking of vesicles; motor proteins, movement and the cytoskeleton; communication between cells including receptors and signal transduction pathways; cell cycle and its regulation; apoptosis; the molecular basis of cancer. Students will gain practical skills in plant and mammalian cell culture in the

laboratory setting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review how eukaryotic cell structures relate to their respective functions; 2. Map the pathways of signal transduction and the cell cycle in normal and cancerous cells and identify targets for novel cancer therapies; 3. Determine mechanisms of intracellular transport and apply this knowledge to the design and delivery of anticancer therapies; 4. Appraise and synthesise relevant scientific literature; 5. Investigate the principles of biosafety and bioethics within the context of cell biology practice; and 6. Demonstrate competency in plant and mammalian cell culture techniques.

Class Contact: Lab 3.0 hrs Lecture 3.0 hrs

Required Reading: Becker, W., Kleinsmith, L.J., & Hardin, J. 8th ed The world of the cell Benjamin Cummings

Assessment: Assignment, Assignment (approx. 1500 words), 20%. Examination, Written Examination (3 hours), 50%. Practicum, Practical Reports, 30%. In order to obtain a pass or higher in this graded unit, all components of assessment must be passed.

RBF2390 Molecular Genetics

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2

Description: This unit provides an introduction to developments at the forefront of molecular biology of gene and genome structure/function and molecular genetics. The unit explores the structure of eukaryotic genomes and the function of various sequences that make up these genomes. Mechanisms that lead to change and evolution of eukaryotic genomes and the maintenance and regulation of individual genes within them will also be covered. These concepts will also be linked to the laws of Mendelian genetics covered in RBF1320 Biology 2. The content of this unit provides students with an important theoretical framework and underlying concepts that are essential for studies in biotechnology, molecular biology and science education.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review the organisation, maintenance and evolution of eukaryotic genomes including repetitive and non-repetitive DNA sequences; 2. Collaborate and connect known mechanisms of genomic rearrangement to observed features of eukaryotic genomes; 3. Collaborate and connect the replication of DNA at the telomeres to problems associated with the maintenance of linear chromosomes, cancer and cellular aging; 4. Investigate the mechanisms of regulation of gene expression in eukaryotic organisms; 5. Articulate epigenetic mechanisms of gene regulation including the methylation and imprinting of DNA; and 6. Analyse the scientific literature on a genetic mechanism in a eukaryotic organism(s) and critically evaluate and present that information to peers and relevant audiences.

Class Contact: Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Krebs JE et al. (2012) Genes XI Jones & Bartlett

Assessment: Assignment, Group, peer-reviewed assignment (~1500 words), 20%. Assignment, Individual assignment (~1500 words), 20%. Examination, 3 hour duration, 60%.

RBF2520 Biochemistry 1

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1 RCS1601 - Chemistry 1A or equivalent

Description: This unit provides a general introduction to the field of biochemistry, providing fundamental knowledge of the molecules of life and principles of metabolic processes that underpin life. This unit builds upon knowledge from RBF1310 Biology 1, providing further detail on the structure and function of the biological macromolecules: carbohydrates, lipids, proteins and nucleic acids. The link between the structure of these molecules and fundamental biological processes, including membrane function, enzyme catalysis, how nucleic acids underpin genetics and heredity will be explored. Key concepts in bioenergetics, enzyme kinetics and how these link to the function and regulation of metabolic pathways in the cell will also be described. This content will be supported by laboratory-based work, wherein key techniques in spectrophotometry, carbohydrate analysis, enzyme assay and protein analysis, as well as the analysis and presentation of scientific data, will be undertaken. This will provide key skills for further study and careers in biological-based research.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Classify the major biological macromolecules and summarise their general structures and functions; 2. Review the mechanisms that underpin enzyme function and calculate the kinetic properties of an enzyme; 3. Elaborate on the function of nucleic acids, focusing on DNA replication, transcription, the genetic code and protein translation in relation to cellular function; 4. Summarise the energy producing pathways of cells, focussing on central metabolism and photosynthesis, evaluating the function of these pathways and contrasting the mechanisms that regulate them; 5. Collect and analyse biochemical data, including protein analysis (SDS-PAGE) and quantitative UV/Vis spectrophotometry data in a laboratory setting; and 6. Assess the scientific literature and review this information to probe a specific topic in biochemistry demonstrating accountability for personal learning.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Tymoczko, JL, Berg, JM & Stryer, L. (2011) 2nd Biochemistry: a short course WH Freeman and Company

Assessment: Laboratory Work, Eight (8) Lab Reports (total 2000 words), 30%. Examination, Final Exam (3 hours), 55%. Assignment, Assignment (1500 words), 15%.

RBF2610 Fundamentals of Ecology

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2 Or equivalents to be determined by Unit coordinator.

Description: This unit covers a range of topics related to the basic understanding of the nature of Ecology. The areas covered include the history and development of the philosophical underpinnings of our modern understanding of ecology and the evolutionary process. Included in this unit are the fundamentals of the responses of plants, animals and other organisms to their environment and the interaction of these organisms as they form communities and ecosystems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and clearly elucidate key ecological processes at population, community and ecosystem levels; 2. Relate ecological concepts to real-life field situations and environmental management; 3. Determine methods of studying and measuring species behaviour, interactions and dynamics; and 4. Critically examine and articulate complex ecological thought in both written and spoken form.

Class Contact: Lab 8.0 hrs Lecture 2.0 hrs Forty-eight (48) hours or equivalent for one semester comprising lectures and practicals (mainly field excursions).

Required Reading: Attiwill, P., & Wilson, B. (2006). Ecology: An Australian perspective. Oxford University Press.

Assessment: Assignment, Field Studies, 60%. Examination, Final Exam (2 hours), 40%.

RBF2620 Australian Plants

Locations: Werribee.
Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2Or equivalents to be determined by Unit coordinator.
Description: There are approximately 250,000 plant species on the planet Earth. The importance of plants as the primary means of converting minerals and solar energy into 'life' is critical to the functioning of all other forms of life, including humans and the planet as a whole. This unit focuses on developing a fuller understanding of the diversity and evolution of plants (including fungi), particularly in the Australian context. This understanding helps us to come to a greater appreciation of the role plants play in our everyday life. More specifically, there is emphasis on the morphological characteristics and life histories of the various major plants groups, their evolution and relationships, systematics, nomenclature, identification and classification. Additionally, there is a focus on how the biogeography of Australian plants can be explained by their life history and the history of the continent and particularly, how and why Australia has evolved a diverse and highly endemic primarily sclerophyllous flora where the forests and woodlands are dominated by two tree genera, Eucalyptus and Acacia.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Distinguish and identify key morphological features and life history characteristics of plants; 2. Distinguish major families, genera and species of Australian plants with professional skill and judgement; 3. Devise tools for collecting and preserving plant specimens with creativity and initiative; 4. Use high-level identification guides to determine and differentiate a wide range of plant species; and 5. Articulate clearly, orally, diagrammatically and in writing, complex information on the morphology, life cycles and relationships of various plant families and report on their evolutionary history to peer groups.
Class Contact: Lab3.0 hrsLecture2.0 hrs
Required Reading: Knox, B., Ladiges, P., Evans, B., & Saint, R. (2010). Biology (4th ed.). McGraw-Hill.
Assessment: Laboratory Work, Practicals (6 x labelled illustrations - 100-150 words each), 20%. Assignment, Written Report (1200 words), 10%. Portfolio, Approximately 30 page Herbarium, 30%. Examination, Examination (2 hours), 40%. In order to obtain a pass or higher in this graded unit, normally all components of assessment must be passed. .

RBF2630 Community and Environment

Locations: St Albans.
Prerequisites: Nil.
Description: Exploration of the various socially-based conceptual frameworks for understanding the range of environmental viewpoints in the community, and the consequences of these frameworks for practical environmental protection and repair. Practical experience in working with a wide range of community representatives on environmental protection and repair projects. Practical skills development in how to communicate with community groups and individuals, including clear, simple explanations, active and reflective listening, negotiating, consulting and drawing up and presenting project proposals. Insights into the range of skills and experience required to gain employment in environmental management fields, and the range of employment available.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss complex issues relating to community participation in environmental protection and repair projects; 2. Work collaboratively to develop and argue a number of position statements relating to environmental outcomes; and 3. Contribute positively to environmental projects in the local community.
Class Contact: Forty-eight (48) hours or equivalent for one semester (usually in block mode) comprising lectures, tutorials, practical workshops and site visits.
Required Reading: Irwin, A. (2001). Sociology and the environment. Oxford: Polity Press.
Assessment: In order to obtain a pass or higher in this graded unit, normally all components of assessment must be passed Assignment, Assignment, 40%. Workshop, Practical workshop and field reports, 50%. Other, Evidence of contribution, 10%.

RBF2640 Australian Animals

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2
Description: This unit builds on RBF1310 Biology 1 and RBF1320 Biology 2 and explores the diversity of animal life on Australian fauna. The unit examines the science of systematics, including cladistic analysis, Bauple's, evolution and origin of biodiversity in marine and terrestrial environments and historical and ecological biogeography. The unit also analyse faunal regions and habitat types, and the 'uniqueness' of the Australian fauna.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyses and synthesise the characteristic features of major animal phyla; 2. Contextualise the principles of ecological biogeography in relation to the fauna of Australia; 3. Evaluate the features adopted by animals for living in either a marine, freshwater or terrestrial environment and appraise the uniqueness of Australian fauna; 4. Contextualise the evolution and origin of biodiversity in marine and terrestrial environments demonstrating conceptual and technical understanding in the area to colleagues and peer groups; and 5. Articulate clearly, orally, diagrammatically and in writing, complex information on the morphology, life cycles and relationships of various animal families and report on their evolutionary history to peer groups.
Class Contact: Lecture2.0 hrsForty-eight (48) hours or equivalent for one semester comprising lectures and field excursions.
Required Reading: Hickman, C. (Jr); Keen, S.; Larson, A.; Eisenhour, D.; l'Anson, H. and Roberts, L. (2013) 16th ed. Integrated Principles of Zoology McGraw-Hill
Assessment: Other, Practical Assessment, 40%. Examination, Final Examination (3 hours), 40%. Assignment, Essay, 20%.

RBF3110 Marine & Freshwater Ecology

Locations: Werribee, Footscray Park.
Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2RBF2640 - Australian Animalsor equivalents.
Description: This unit builds on RBF1310 Biology 1 and RBF1320 Biology 2 and provides an overview to the ecology and management of freshwater, estuarine and marine ecosystems in southern Australia. The material covered includes: ecology of upland and lowland-floodplain rivers (including impact of flow regulation and environmental water allocations); ecology of lakes and reservoirs (including algal bloom control and impacts of recreation); wetland ecology and management (including international conventions on waterbirds); seagrass, mangrove and saltmarsh ecology and management; significance of rocky shore habitats in southern

Australia; estuarine ecology (with particular emphasis on Port Phillip Bay and the Gippsland Lakes) and environmental degradation and repair of aquatic systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Distinguish and evaluate marine and freshwater environments found in southern Australia in contrast to that found in other parts of Australia; 2. Adapt skills in biological techniques utilised in marine and freshwater ecology to solve complex problems in the area; 3. Assess forms of environmental degradation that occur in marine and freshwater environments and provide creative strategies to mitigate them; 4. Differentiate amongst different management strategies applied in marine and freshwater ecology and critique their effectiveness in application in wide ranging context; and 5. Articulate clearly, orally, diagrammatically and in writing, complex information on a range of ecologically important concepts in relation to marine and freshwater ecosystems.
Class Contact: Lecture 2.0 hrs Forty-eight (48) hours or equivalent for one semester comprising lectures, tutorial/directed learning, and five (5) field excursions (two (2) whole day and three (3) half day).
Required Reading: Edgar, G. J. (2012). Australian Marine Life. Reed New Holland
Assessment: Essay, Essay, 20%. Report, Five field reports, 60%. Presentation, Oral Presentation, 20%.

RBF3210 Environmental Rehabilitation

Locations: Werribee, Footscray Park.
Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2
Description: This unit RBF3210 Environmental Rehabilitation builds on RBF1310 Biology 1 and RBF1320 Biology 2 and introduces a range of tools that will assist in the rehabilitation of Victoria's terrestrial environments and communities. Topics include the ecological parameters and adaptations of organisms in diverse environments and the key ecological relationships amongst organisms. Rehabilitation projects based on approaches using ecological theory will be reviewed using contemporary case studies. Practicals will include hands-on experience in the use of the Native Vegetation Management Framework, the Habitat Hectare approach, development of land management plans, and specific threatened species rehabilitation programs.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and elucidate ecological principles to environmental rehabilitation practices with creativity and responsibility, contributing to local and global communities; 2. Create a land management plan collaboratively with accountability for own input; 3. Communicate in oral and written form to professionals and the general community, approaches to rehabilitation based on complex ecological principles; 4. Justify the selected methods of assessment and management of communities and specific species exercising professional judgements; and 5. Evaluate, argue and implement the principles of the Habitat Hectare approach and the Native Vegetation Management Framework to contemporary, environmental assessment issues and propose creative and sound solutions.
Class Contact: Lab 8.0 hrs Lecture 2.0 hrs
Required Reading: Williams, S.G., Marshall, A. (2015) Land of Sweeping Plains: Managing and Restoring the Native Grasslands of South-eastern Australia. CSIRO
Assessment: Project, Essay, 40%. Report, Field and practical, 60%.

RBF3610 Biostatistics

Locations: St Albans.
Prerequisites: RMA1110 - Mathematics for the Biological and Chemical Sciences 1 RMA1120 - Statistics for the Biological and Chemical Sciences 2
Description: This unit introduces students to the practical use of statistics in the biological, ecological and health sciences. Particular emphasis is given to experimental design and 'real world' use of statistical procedures. Material covered includes: Revision of statistical concepts and the significance of statistics/biometrics in biological/environmental analysis. Distributions and the nature of data; the use of correlation and regression in developing hypotheses. Sampling regimes and units, confounding variables, hypothesis testing, parametric versus non-parametric procedures and assumptions, post-hoc testing. Design tools for experimental and field collection of data; type-I versus type-II errors, statistical power and the use of statistical power in experimental design. BACI models and design issues; pseudoreplication and true replication. Optimisation of sampling regime for a given sampling unit and variance. Inferential procedures, multiple factorial designs, univariate versus multivariate procedures in biological and environmental programs.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the main types of sampling distribution; 2. Generate appropriate descriptive statistics from data obtained through environmental investigation; 3. Utilise techniques such as regression, correlation, univariate and multivariate analysis; 4. Critically evaluate experimental and statistical models; 5. Select appropriate statistical methods for the testing of hypotheses; 6. Generate multifactorial experimental designs; 7. Apply parametric and non-parametric methods to biometric data as appropriate; 8. Control for confounding variables in experimental investigations; 9. Recognise types of sampling error; and 10. Interpret the output from statistical testing.
Class Contact: Four hours per week over one semester, comprising two hours of lectures and two hours of interactive practicals/tutorials per week.
Required Reading: Zar, J.H. (1996). Biostatistical analysis (3rd ed). USA: Prentice Hall
Assessment: Assignments (20%); Examinations (80%)

RBF3620 Conservation and Sustainability

Locations: Werribee, Footscray Park.
Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2 RBF2610 - Fundamentals of Ecology
Description: This unit ties together, in both theoretical and practical ways, concepts and practices for maintaining biological diversity, and how these concepts and practices can be integrated with social and economic needs. The development of conservation theory and practice in Australia; extinction and its significance, including pathways to extinction; the meanings, levels and interpretation of concepts of biodiversity; ecological and adaptive management approaches to conservation and recovery, including design of reserves, setting priorities, off-reserve conservation and ex-situ (captive breeding, reintroduction and translocation). Practical field studies and site visits will investigate the contributions of zoo's, national and state parks, friends groups, councils and shires, other government agencies and private landholders to the conservation and recovery of plant and animal species, from insects to mammals, and from mushrooms to trees. The subject will also include practical appraisals of techniques used to determine integrity of ecosystems, landscapes and overall environment, the contributions made by biodiversity to ecosystem services and integrated methods for recovery and sustainable management of species and ecosystems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to:

1. Evaluate and implement ecologically and genetic principles to the conservation and management of plant and species and populations in an ethical and fact-based manner; 2. Work individually and collectively to critically assess and formulate conservation management actions as they apply to in-situ and ex-situ conservation programs; 3. Argue, debate and report in written and oral form, conservation programs and principles to a range of end-users groups; 4. Critically analyse a range of data types and published literature and data to support and justify sound decision-making processes in relation to conservation and sustainability; and 5. Formulate a theoretical basis on which to base conservation and sustainability management decisions.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Lindenmayer, D. and Burgman, M. (2016) Practical Conservation Biology CSIRO Publishing, Collingwood.

Assessment: Assignment, Practicals and Reports, 40%. Essay, Major assignment, 30%. Presentation, Individual/Group Oral Presentation, 15%. Test, In-Class tests and quizzes, 15%.

RBF3630 Environmental Impacts and Monitoring

Locations: St Albans.

Prerequisites: RBF1310 Biology 1, RBF1320 Biology 2

Description: This subject aims to introduce students to the 'real world' application of ecological studies, especially in the process of sustainable development. Topics covered will include: Overview of Australian natural resources subject to environmental degradation (e.g. land, soil, water, biota); The social and industrial factors responsible for degradation (e.g. erosion, water pollution, salinisation, habitat destruction, exotic species, extraction, biodiversity loss etc); The Environmental Impact Assessment process used to quantify impacts (e.g. role of consultants, the EEI process itself); Approaches to monitoring environmental degradation and recovery (e.g. sampling design, monitoring procedures, rapid assessment protocols, ANZECC guidelines); Mechanisms and approaches available to minimise impacts (reserve systems, limits of acceptable change technologies, financial tools, role of government departments). Particular emphasis is given to 'hands on' experience.

Credit Points: 12

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Environment Australia, 2001, State of the environment, EA, Canberra. Thomas I., 1998, Environmental impact assessment in Australia, Federation Press, Sydney.

Assessment: Within-semester (on-going) assessment at Weeks 6 and 13 (60%) plus one case study report or project (40%, including group presentation).

RBF3650 Pollution Biology

Locations: St Albans.

Prerequisites: RBF2610 Fundamentals of Ecology, RBF1310 Biology 1, RBF1320 Biology 2, Biometrics RBF3610, or subject co-ordinators discretion.

Description: This subject aims to introduce students to the impact of pollutants on natural ecosystems. Topics covered include: Principles and concepts which apply to the analysis and evaluation of pollutant impacts on the natural environment. Experimental methodology employed in the evaluation of organism and ecosystem responses to pollutant exposure with special emphasis on statistical procedures which can be employed in evaluating impacts. Types of and significance of different groups of pollutants. Tolerance and susceptibility of organisms and biological systems to pollutants; pollution monitoring, biological indicators of pollution induced environmental stress; sequestering of exogenous compounds; partitioning; sources and environmental transport; uptake and depuration; case studies.

Credit Points: 12

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: To be advised

Assessment: Practicals and assignments: 40%; examination: 60%.

RBF4001 Science Honours

Locations: Werribee.

Prerequisites: Nil.

Description: The program will consist of a research project and a coursework component. The major focus of the course component is research methodology and subjects include experimental design, statistics in research, data analysis, computer applications and software, literature analysis and critical appraisal, ethics in research, scientific writing and data presentation. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.Required Reading To be advised by the lecturer.

Credit Points: 48

Class Contact: An average of 20 hours per week for one semester.

Required Reading: To be advised by the lecturer.

Assessment: The nature of the coursework assessment will vary and may be based on written assignments, seminar presentations and a written examination. The research project assessment will consist of an oral presentation and submission of a thesis.

RBF4002 Science Honours

Locations: Werribee.

Prerequisites: RBF4001 - Science Honours

Description: This subject, the aim of which is to enable students to competently research an area of study utilising knowledge and skills gained in previous studies, consists of a project carried out by students on an individual basis. The project is expected to be a scientific investigation of an approved topic, followed by the submission of a suitably formatted thesis in which the topic is introduced and formulated; the scientific investigation described in detail; results and conclusions from the study are elaborated; and an extended discussion presented. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.

Credit Points: 48

Class Contact: An average of 30 hours per week for one semester.

Required Reading: To be advised by the lecturer.

Assessment: The nature of the coursework assessment will vary and may be based on written assignments, seminar presentations and a written examination. The research project assessment will consist of an oral presentation and submission of a thesis.

RBM2201 Conservation Genetics

Locations: St Albans.

Prerequisites: RBF1310 Biology 1, RBF1320 Biology 2, RBF2610 Fundamentals of Ecology

Description: Context and overview Genetic diversity: single loci Genetic diversity: quantitative variation Large population: natural selection, adaptation, mutation and migration Small populations: loss of diversity, genetic drift, effective population size, inbreeding and inbreeding depression Captive populations: Management, reintroductions, breeding and case studies Molecular tools Species biology: taxonomy, genetic distances, tree of life, phylogeography and phylochronology, consequences of hybridization, management of hybridization and kinship Populations: structure, gene flow and fragmentation, conservation units, management and viability analysis. Life states and extinction modelling. Laboratory/ practical sessions DNA extraction Electrophoresis Determining ploidy levels Phylogenetics Polymerase Chain Reaction (PCR) methods for genetic analysis

Inbreeding/outbreeding models Use of computer software for simulations (population viability analysis), and various genetic indices to determine phylogenetic relationships) Field Trips

Credit Points: 12

Learning Outcomes: Upon completion of the subject, students will have a thorough understanding of the role and importance of genetics to the management of species and populations and its application to the field of natural resource management as a whole, including the limitations of genetic data. As well as having a theoretical basis on which to base management decisions, students will have practical experience with the methods used in modern genetics and how these tools can be applied to the management of species and populations. Students will be able to critically analyse published data relating to taxonomy and phylogenetic relationships and their implications for conservation. Students will therefore be equipped to make decisions about the appropriateness of reintroduction of plants or animals, and the implications of reproductive interventions such as manual pollination or selective breeding.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs

Required Reading: Frankham R, Ballou JD, Briscoe DA (2002) Introduction to Conservation Genetics. Cambridge University Press, Cambridge. 617pp

Assessment: Examination, Two hour written examination, 40%. Assignment, Written assignment of 2000 words, 30%. Presentation, Class Presentation of the assignment, 10%. Report, Practical reports and simulations, 20%.

RBM3101 Geographic Information Systems (GIS) for Conservation & Health

Locations: St Albans.

Prerequisites: RBF2610 - Fundamentals of Ecology RBF2620 - Australian Plants RBF2640 - Australian Animals RBM2260 - Diet and Nutrition RBM2530 - Pathophysiology 1 RBM2540 - Pathophysiology 2 Either/ Or

Description: Types of data. GIS software applications in common use. Methods for data collection and entry, specific plotting and mapping of integrated data. The interpretation of complex temporal and spatial data. Practical applications of GIS including the use of data from programs that monitor and manage endangered species in the Australian context. Computer simulations and the formulation of models to predict the outcome of the effects of habitat degradation, conservation management activities or health service provision.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Locate, process and evaluat information relevant to natural resource management, conservation and public health; 2. Develop high level problem solving and decision-making abilities based on the interpretation of complex information; and 3. Communicate complex information in written form.

Class Contact: Four hours per week comprising two hours of lecture and two hours of workshops providing hands on experience with data collection and GIS.

Required Reading: Students will be provided with recent case studies and research from the scientific literature along with material based on current research by University personnel and Associates. Excerpts from relevant software manuals will be provided.

Assessment: Laboratory reports and computer exercises (30%). CGA: P3, I3, O2, C2. Written Assignment of 2500 words based on analysis and discussion of GIS data: 40%: I3, P3, W3, A3. Examination (1.5 hours): 30%: The examination will assess the main theoretical concepts underlying the applications of GIS discussed throughout the unit. CGA: I3, A2

RBT8001 Research Thesis 1 Full Time

Prerequisites: Nil.

Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 48

RBT8002 Research Thesis - Sem 2 (Full-Time)

Locations: Werribee.

Prerequisites: Nil.

Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 48

RBT8011 Research Thesis 1 Part Time

Prerequisites: Nil.

Description: Eligibility for entry to a Master of Science or Doctor of Philosophy program. This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 24

RBT8012 Research Thesis - Sem 2 (Part-Time)

Locations: Werribee.

Prerequisites: Nil.

Description: Eligibility for entry to a Master of Science or Doctor of Philosophy program. This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 24

RCM1114 Introduction to Computing and the Internet

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit aims to develop a set of skills associated with technical and online communication. Students will be involved in locating and assembling reliable sources of information for collation and presentation. Content includes: overview of the Internet, characteristics and functions of browsers, web design and authoring, resources on the Internet, using search engines effectively, scripting languages,including reliability and safety of software systems, future of the Internet and intellectual property.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate sound Internet computing skills; 2. Design and develop Web sites relevant to contemporary settings; 3. Locate Web-based resources as relevant to given context; 4. Access reliability of resources and justify position; 5. Discuss social, ethical and Intellectual Property (IP) issues arising from computing in society; and 6. Develop communication and team work skills, respecting and valuing diversity.

Class Contact: Forty-eight (48) hours or equivalent for one semester comprising lectures and practical sessions.

Required Reading: Felke-Morris, T. (2011) Web Development and Design Foundations with XHTML 5th Ed. Pearson Education

Assessment: In order to obtain a pass or higher in this graded unit, normally all components of assessment must be passed. Assignment, Web page design and development, 20%. Laboratory Work, Four (4) practical tasks, 20%. Examination, Final Written Exam (2 hours), 60%. The combined assessment word count will be approximately 3000 words.

RCM1613 Applied Statistics 1

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit of study will introduce students to data analysis and statistical techniques used in the workplace and community to help make sense of the vast amounts of data collected in all fields. It will include displaying and describing data, sampling and population distributions, control charts, time series experimental and survey designs. This is an introductory unit in a stream that will allow students to undertake a qualification to become a registered teacher.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate data collection methods, types of variables, types of data; 2. Present data using graphical and numerical methods; 3. Conduct elementary-level exploratory data analysis, to gain in particular, basic knowledge from real life data using basic statistical tools; 4. Monitor processes using appropriate quality control charts; 5. Use the principles of time series to model data collected in this way and forecast using these models; 6. Articulate the principles of experimental design and survey design; 7. Explain correlation and regression analysis; and 8. Obtain and interpret a simple regression model using an appropriate software package.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Victoria University School of Computer Science and Mathematics. Lecture notes for Applied Statistics 1 Melbourne: Fuchun Huang & Ian Gomm Levine, D.M., Stephan, D., Krehbiel, T.C., & Berenson, M.L., (2013) 7th Edition Statistics for managers using Microsoft Excel Pearson Education

Assessment: Test, Tests (90 minutes), 40%. Examination, Final Examination (2 hours), 60%. In order to obtain a pass or higher in this graded unit, all components of assessment must be passed.

RCM1614 Applied Statistics 2

Locations: Werribee, Footscray Park.

Prerequisites: Nil.

Description: This unit of study is the second unit of applied statistics following RCM1613: Applied Statistics 1. It will introduce students to more statistical techniques of data analysis and modelling used in the workplace and community to help make sense of the vast amounts of data collected in all fields. It will include basic probability and probability distribution of discrete and continuous random variables, confidence interval estimates and hypothesis tests of one or two samples. Besides Z tests, T tests, McNemar tests, and some other tests of means or proportions, Chi-square test of independence and Chi-square test of a discrete distribution will also be introduced to students. Students will also learn how to use Microsoft Excel's Data Analysis Tool to obtain interval estimates and perform the tests covered in this unit. Another statistical data analysis software package widely used in industry will also be introduced to students near the end of teaching. This is a unit in a stream that will allow students to undertake a qualification to become a registered teacher.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Estimate and calculate probabilities of outcomes from a range of random variables using distributional properties; 2. Make valid inferences from samples and explain the assumptions they have made to arrive at these inferences; 3. Apply basic statistical techniques to formulate solutions to problems; and 4. Present solutions in a comprehensible statistical fashion.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Fuchun Huang (2014) Lecture notes for Applied Statistics 2 Victoria University, College of Computer Science and Mathematics, Melbourne, Australia Recommended Text: Jessica M. Utts, Robert F. Heckard and Helen MacGillivray (2014), Mind on Statistics: Australian & New Zealand (2nd Edition), Cengage Learning

Assessment: Test, Test (restricted open book), 40%. Examination, Final Exam (3 hours, 15 mins), 60%. Word equivalence not required as assessments mainly consist of numerical data. In order to obtain a pass or higher in this graded unit, normally all components of assessment must be passed.

RCM1711 Mathematical Foundations 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit reviews and builds on fundamentals, including basic algebra, handling of functions, and some trigonometry. The rest of the unit is devoted to the algebra of matrices and vectors, and their application to geometry and linear systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform algebraic operations including the handling of indices and logarithms, factorisation and expansion of simple expressions and the simplification of fractions; 2. Solve linear and quadratic equations presented in a variety of forms and with different solution methods; 3. Graph straight lines in the plane and determine gradients and intersections; 4. Use trigonometric functions to analyse geometric figures; 5. Perform arithmetic on vectors and matrices; 6. Apply matrices to the geometric transformation of vectors; and 7. Solve simultaneous linear equations using matrix methods.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Alasdair McAndrew (2011) Mathematical Foundations: notes for

Assessment: Test, Eight (8) small tests during class time., 20%. Test, Mid-semester test (1 hour), 30%. Examination, Final Examination (2 hours), 50%. In order to obtain a pass or higher in this graded unit, normally all components of assessment must be submitted and an aggregate mark of at least 50% must be attained.

RCM1712 Mathematical Foundations 2

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: Introduction to the use of modern computer algebra system calculators to solve mathematical problems. Extension of a student's number system to include complex numbers: their definition and basic operations using rectangular, polar and exponential forms. Combinatorics and the binomial theorem. Introduction to calculus: solving rate of change problems using derivatives, proving rules for differentiation, applications to curve sketching, and the solution of equations. Concepts of integration: the relationship between integration and differentiation, area between curves. Integration methods: integration by substitution, integration by parts. Numerical integration: trapezoidal and Simpson's rule. First order differential equations: separation of variables method and application to growth/decay problems and Newton's law of cooling. This subject continues the stream that will allow students to satisfy mathematics teacher registration.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform arithmetic on complex numbers and plot them on an Argand diagram; 2. Use the binomial theorem for expansion of algebraic forms; 3. Explain the concepts of differentiation and integration, and the relationship between them; 4. Differentiate standard algebraic and transcendental functions, using the product, quotient and chain rules; 5. Perform indefinite and definite integration, using substitution and integration by parts; 6. Apply simple numerical methods to equation solving and quadrature problems; and 7. Solve simple differential equations taken from a variety of applications.
Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 2.0 hrs
Required Reading: McAndrew, A. (2012). Combinatorics & Calculus: Notes for RCM1712 Mathematical Foundations 2. Melbourne: Victoria University.
Assessment: Test, Mid-semester test (1 hour), 25%. Laboratory Work, Laboratory, 15%. Examination, Final Exam (3 hours), 60%. Word equivalence not required as assessments contain mostly statistical and numerical data. In order to obtain a pass or higher in this graded unit, normally all components of assessment must be submitted and an aggregate mark of at least 50% must be attained.

RCM2611 Linear Statistical Models

Locations: Werribee, Footscray Park.
Prerequisites: RCM1614 Applied Statistics 2
Description: This unit of study is the third unit of applied statistics following RCM1614: Applied Statistics 2. It will introduce students to simple and multiple linear regression models, general linear models with categorical data, ANOVA and simple experimental designs, simple logistic regression models for binary response. Students will learn how to build, diagnose and validate linear statistical models. Statistical software package R will be used to practise the techniques covered in this unit. This is a unit in a stream that will allow students to undertake a qualification to become a registered teacher.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Build general linear regression models; 2. Assess and diagnose general linear regression models by various numerical and graphical tools; 3. Perform ANOVA analysis and make simple experimental designs; 4. Build and diagnose simple linear models for binary responses; and 5. Present solutions in a comprehensible statistical fashion.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Fuchun Huang (2014) Lecture notes for Linear Statistical Models Victoria University, College of Computer Science and Mathematics, Melbourne, Australia Recommended Text William Mendenhall and Terry Sincich (2013), A Second Course in Statistics: Regression Analysis (7e), Pearson Higher Education, USA.
Assessment: Assignment, Data analysis report (15 to 20 pages including graphs), 25%. Test, One (1) hour test, 25%. Examination, Final Exam (3 hours), 50%. The assignment is to model and analyse a data set by using a statistical software package, and report the results in a PDF or Word document. Both the test and examination are open book, and any calculators are allowed.

RCM2712 Mathematics of Continuous Processes A

Locations: Footscray Park.
Prerequisites: RCM1712 - Mathematical Foundations 2
Description: First order and second order differential equations. Laplace and Fourier transforms and application to differential equations. Approximation via Taylor and Fourier series and elementary extension to orthogonal expansions. Multivariate calculus: partial derivatives and chain rule, multiple integration including regions and coordinate transformation. Improper integrals as well as functions defined by integrals. Modelling of continuous processes using differential and functional equations.
Credit Points: 12
Learning Outcomes: Lecture and tutorial work as well as small group project work.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Nil.
Assessment: 15% mid-semester test (1 hour) 15% project work 70% end of semester examination (3 hours)

RCM2713 Modelling for Decision Making

Locations: Footscray Park.
Prerequisites: RCM1712 - Mathematical Foundations 2
Description: This unit builds on RCM1712 Mathematical Foundations 2 and is designed to provide an overview of the modelling process; including problem identification, factors and assumptions, formulation and solution, interpretation comparison of results with original problem. The unit also explores setting up models and the interpretation of mathematical models as well as interpolation, extrapolation, spectral decomposition and fitting models to data. Applications of continuous models via differential equations and data fitting, discrete versus continuous modelling and discrete/continuous combinations with examples of general interest in a variety of fields, are other topics explored in this unit. This is a core unit in a stream that will allow students to undertake a qualification to become a registered teacher.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review, analyse, consolidate and synthesise knowledge to identify a modelling process and provide solutions to complex problems with intellectual independence; 2. Adapt and use various ordinary differential equations, in the continuous case and interpolation methods, in the discrete case, for modelling common situations; 3. Develop simple models to solve real life problems with intellectual independence;

4. Solve differential equations that play an essential role in continuous models such as the velocity field of fluid in pipe flows, temperatures and stresses in a solid, and electric field that applies continuously over the entire model due to a point charge; and 5. Articulate a clear and coherent exposition of knowledge and ideas on continuous and discrete mathematical modelling to a variety of audiences.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Bender, E. A. (2003), Introduction to Mathematical Modelling, Dover Publications Inc., New York

Assessment: Assignment, Assignment consisting of Mathematical problems (approx. 1000 words), 30%. Examination, Final Exam (3 hours), 70%. The total combined assessment word equivalence is approximately 4,000 words.

RCM2911 Linear Optimisation Modelling

Locations: Footscray Park.

Prerequisites: Nil.

Description: Introduction to linear programming; Mathematical models; Graphical solution; Maximisation and minimisation problems; Spreadsheet models. Sensitivity analysis for LP; Applications of LP. Transportation problems, Assignment and Transhipment problems. Simplex method, Hungarian method. Pure and mixed integer linear programming; Branch and bound method; Knapsack problems. This unit is part of a stream of units that will allow students pursuing an education qualification to satisfy the requirements of a VIT (Victorian Institute of Teaching) registered mathematics teacher.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse optimisation problems and formulate suitable linear programming (LP) models for them; 2. Implement graphical and other mathematical techniques (Simplex) to evaluate alternatives and determine the best alternative in a given situation; 3. Reflect on the underlying assumptions, and on the sensitivity of the LP models developed; 4. Formulate special LP models for transportation, assignment and transhipment problems, and determine their optimal solutions using Hungarian method and other methods; 5. Formulate integer linear programming problems, including knapsack problems, and determine their solutions using techniques like greedy heuristic, and branch and bound; and 6. Construct spreadsheet models for the LP models mentioned above and interpret the solutions obtained by MS EXCEL Solver.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Hillier, F. S. and Lieberman, G. J. (2015) 10th ed. Introduction to Operations Research McGraw-Hill, New York.

Assessment: Test, Class Test (closed book) 1 hour (approx. 1000 words), 20%. Assignment, Individual task (approx. 600 words), 10%. Examination, Final Exam (open book) 3 hours, 70%.

RCM3021 Logistics Analysis and Solutions

Locations: Footscray Park, City Flinders.

Prerequisites: Nil.

Description: The unit of study aims to develop problem solving skills of students through various analytic techniques and relating them to a number of logistics related business problem areas. Students will identify problems and resolve them using optimisation modelling and computerised solutions. Professionally appropriate reports will be prepared in responts to selected supply chain problems associated with transportation, materials handling and storage.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the logistic problems of transport; construct the transportation, transshipment and shortest path optimisation models; evaluate and compare the alternative solutions, and recommend the best alternative; 2. Analyse the logistic problems of storage and material handling; construct container loading and bin packing optimisation models; evaluate and compare the alternative solutions, and recommend the best alternative; 3. Interpret the various costs of keeping inventory; compute and compare the total costs of ordering and carrying different quantities using economic order quantity models, and recommend the best inventory option; 4. Formulate spreadsheet models for the problems described above and determine solutions by MS EXCEL Solver; 5. Effectively argue decision-making and recommendations using visual and written skills, through reports on a range of complex logistics issues; and 6. Work individually and/or collaboratively with others, in addition to critically evaluating and responding to their own performance and that of others.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Frederick S Hillier and Gerald J Lieberman (2015) 10th Introduction to Operations Research McGraw-Hill, New York.

Assessment: Case Study, Four Small Case Studies (4 x 600 words each), 50%. Assignment, Minor Team Assignment #1 (1000 words per person), 20%. Assignment, Major Team Assignment #2 (1500 words per person), 30%. Total word equivalence of the above assessment tasks is 4,900 words.

RCM3711 Computational Methods

Locations: Footscray Park.

Prerequisites: RCM1712 - Mathematical Foundations 2

Description: This unit introduces students to numerical and approximate techniques to solving applied mathematical problems. Topics include approximation and interpolation, optimization and root finding, linear algebra, quadrature, and methods for solving differential equations. The students will also be introduced to a modern computing environment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the errors inherent in numerical processes; 2. Fit an interpolation polynomial to a sequence of points using matrix methods, Lagrange polynomials, and Newton forward differences. Fit a piecewise cubic spline to data points; 3. Apply techniques such as Newton-Raphson, secant and others to the solution of non-linear equations, and investigate the orders of convergence; 4. Use iterative methods to solve linear systems, as well as partial pivoting to lessen errors in Gaussian elimination; 5. Apply techniques such as Newton-Cotes rules and Gaussian quadrature to the approximation of definite integrals, and analyse the errors; 6. Investigate the numerical solution of differential equations using the methods of Euler, Heun, and Runge-Kutta; and 7. Implement all the above techniques using a computer algebra system, either handheld (CAS Calculator), or on a computer.

Class Contact: Forty-eight (48) hours for one semester comprising lectures and tutorials.

Required Reading: Alasdair McAndrew (2012) Computational Methods: Notes for RCM3711 VU Publications

Assessment: Test, Written Test (1 hour) (1,000 words equivalent), 20%. Assignment, Practical Assignment x 1(1000 words equivalent, 30%. Examination, End of Semester Exam (2 hours) (2,000 words equivalent), 50%. The total combined assessment word equivalence is approximately 4,000 words. To pass the unit a student must obtain an aggregate mark of at least 50%. The test and exam

will be mainly theoretical; the assignment mainly practical, and requiring extensive use of the computing environment.

RCM5800 Object Oriented Programming GD1

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: Programming language; basic object oriented concepts; programming, algorithm development and elementary data structures objects and classes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss and apply fundamental aspects of computer program development; 2. Assess software development activities; 3. Construct algorithms and create solutions using basic programming constructs; 4. Manipulate primitive data types and structured data types; 5. Design program using graphical user interface; and 6. Apply object-oriented approach to program design and implementation.
Class Contact: Thirty-six (36) hours for one semester comprising lectures and practicals.
Required Reading: Lewis J., DePasquale P., & Chase J (2011) 2nd Edition Java Foundations: Introduction to program design and data structures Pearson Education
Assessment: Assignment, Programming Assignment (500-700 lines of code), 15%. Laboratory Work, 5-6 Programming tasks, 15%. Examination, 3 hours written Final Examination, 70%. Assignment assesses: Learning Outcomes:1, 2, 3, 4, 5 and 6 and Graduate Capabilities:Problem solve in a range of settings; Locate,critically evaluate, manage and use written, numerical and electronic information; work both autonomously and collaboratively. Laboratory work assesses: Learning Outcomes:1, 2, 3, 4, 5 and 6 and Graduate Capabilities: Problem solve in a range of settings; Locate,critically evaluate, manage and use written, numerical and electronic information. Examination assesses: Learning Outcomes: 1, 2, 3, 4, 5 and 6 and Graduate Capabilities: Problem solve in a range of settings; Locate,critically evaluate, manage and use written, numerical and electronic information. .

RCM5802 Information Systems

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: Database concepts and design methodology; ER modelling; normalisation; relational approach and relational calculus; SQL; database applications.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design databases by applying ER model and EER model; 2. Design relational database queries with SQL; 3. Design and develop database applications; and 4. Normalise a database to 3NF and BCNF.
Class Contact: Lecture2.0 hrsTutorial1.0 hr
Required Reading: The listed text or advised by the lecturer. Elmasri, R., & Navathe, S. B. (2011) (6th ed.). Database Systems. Pearson. The lecturer may supply additional course material in addition to the required text.
Assessment: Examination, 3 hour examination, 70%. Test, 1 hour test, 10%. Assignment, Database application designing and implementation equivalent to 20 pages report, 10%. Laboratory Work, Eight to ten one-hour practical work, 10%. Examination assesses: Learning Outcomes (1, 2, 3, 4) and Graduate Capabilities (1,2,4,5,6) Test assesses: Learning Outcomes (1,2,3,4) and Graduate Capabilities (1,2,4,5,6) Assignment assesses: Learning Outcomes (1,2,3,4) and Graduate Capabilities (1,2,3,4,5,6) Laboratory work assesses: Learning Outcomes (1,2,3,4) and Graduate Capabilities (1,2,3,4,5,6) .

RCM5803 Data Structures and Programming

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5800 Object Oriented Programming GD1
Description: Program development and testing using Software Engineering principles; object oriented programming languages; organisation and manipulation of data; the software environment; object oriented design and analysis; abstract data types.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply Software Engineering principles to computer program development; 2. Select an appropriate data structure for a given problem type; 3. Apply object-orientated principles to real-world problem solving; 4. Formulate a suitable computing algorithmic solution for a problem description; 5. Design computer programs using the advanced data structures; and 6. Manipulate classes provided in the programming API and incorporate them into computing solutions.
Class Contact: Lecture2.0 hrsTutorial1.0 hr
Required Reading: Main & Savitch (2011) 4th ed. Data Structures and Other Objects Using C++ Pearson Education
Assessment: Examination, Final 3 hours written examination, 70%. Assignment, Programming Assignment(500-700 lines of code), 15%. Laboratory Work, 5 Programming Tasks, 15%. Examination assesses: Learning Outcomes 1., 2., 3., 4.and 5 and Graduate Capabilities Problem solve in a range of settings & Locate, critically evaluate, manage and use written, numerical and electronic information. Assignments assesses: Learning Outcomes 1., 2., 3., 4. and 5 and Graduate Capabilities; Problem solve in a range of settings ; Locate, critically evaluate, manage and use written, numerical and electronic information & Work both autonomously and collaboratively.

RCM5805 Communication and Networks

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: Introduction - types of networks, master/slave polling networks, equality networks, circuit switches and packet switched networks, topologies, network structure, costings; layered design of networks and the ISO reference model - protocols, interfaces, communication techniques, multiplexing; public networks in Australia - Datel, DDS, Austpac, etc.; local area networks - transmission media, topologies, access control, comparison of local area network products; PC Networks - servers, workstations, network disks, directory structure, network security, access control and file locking.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design enterprise networks with proper IP schemes, routing and switching protocols; 2. Evaluate and resolve problems in existing networks; and 3. Design and implement interconnected networks with Cisco Routers and Switches.
Class Contact: Lecture2.0 hrsPC Lab1.0 hr
Required Reading: Course material will be provided by the lecturer. Students who are interested in CISCO certificates may use certificate texts as the supplementary text.
Assessment: Will be based on a combination of examination and assignment. Examination, 2 hour examination, 60%. Assignment, Design and implementation of enterprise network with Cisco Routers and Switches, equivalent to 15 pages reports., 40%. Examination assesses Learning Outcomes (1,2,3) and Graduate Capabilities (1,2,4,5,6) Assignment assesses Learning Outcomes (1,2,3) and Graduate Capabilities (1,2,3,4,5,6) .

RCM5810 Software Development

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: Software development with Microsoft .NET Framework, including VB.NET, C#.NET, ASP.NET. Applications include database management systems, web systems and mobile applications.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Systematically apply design process and the implementation process for software development; 2. Model and design software using different software development paradigms; 3. Analyse the complexity of deliverable software products; and 4. Develop a real-world or similulated real-world application with the software development techniques.

Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs

Required Reading: Stoecker, M.A. (2011). ISBN:0735627428. Windows Application Development with Microsoft .NET Framework 4. Microsoft Press,U.S. Northrup, T., & Snell, M (2011). ISBN: 0735627401. Web Applications Development with Microsoft .NET Framework 4. Microsoft Press,U.S.

Assessment: In order to pass, students must obtain at least 25% of the combined Laboratory and Assignment mark and 25% of Test and Examination mark in this unit. Each assignment is about 800 lines of code. Laboratory Work, Weekly one hour Labs, 20%. Assignment, Development of a Windows Application, 15%. Assignment, Development of a Web Application, 15%. Test, Mid-Semester Test (2 hours), 25%. Examination, Final Written Examination (2 hours), 25%. Laboratory Work assesses: Graduate Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Assignment 1 assesses: Graduate Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Assignment 2 assesses: Graduate Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Examination assesses: Graduate Capabilities 1, 2,3,4, 5 and Learning Outcomes 1, 2, 3, 4.

RCM5811 Operating Systems

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: Operating System (OS) concepts, OS architectures; threads and processes; concurrency issues and deadlocks, memory management, devices and device drivers; file systems, input and output case studies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Summarise the role of an operating system; 2. Appraise the tasks accomplished by an operating system as an interface between user and computer and as the resource manager for the computer system; 3. Compare social impacts of different operating systems, including mobile OS; 4. Apply concepts of resource allocation to case study problems; 5. Research and report information on operating system types; and 6. Peer assess and evaluate critically written essays.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: McIver-McHoes & Flynn. (2008) 6th edn. Understanding Operating Systems Cengage Learning

Assessment: Examination, Final 3 hours written examination, 70%. Assignment, Written essay (2500-3000 words), 30%. Examination assesses: Learning Outcomes 1, 2, 3 and 4. and Graduate Capabilities; Problem solve in a range of settings, Locate, critically, evaluate, manage and use written, numerical and electronic information. Assignments assesses: Learning Outcomes 1, 2, 5, and 6. and Graduate Capabilities; Locate, critically, evaluate, manage and use written, numerical and electronic information, Communicate in a variety of contexts and modes; Work both autonomously and collaboratively.

RCM5813 Artificial Intelligence

Locations: Footscray Park, VU Sydney.

Prerequisites: RCM5800 - Object Oriented Programming GD1

Description: Introduction to artificial intelligence and intelligent systems, including a study of knowledge representation and problem solving strategies of rule-based expert systems, fuzzy logic, artificial neural networks and genetic algorithms. Practical work provides exposure to various artificial intelligence strategies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare various artificial intelligent technologies and their applications; 2. Summarise the history and evaluate the social impacts of artificial intelligent systems; 3. Research and report information on intelligent system types; and 4. Design and code computer programs which implement an artificial intelligence strategy.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Negnevitsky (2011). (3rd ed.). Artificial Intelligence. Pearson Education.

Assessment: Examination, Final 3 hours written examination, 70%. Assignment, Report on problem solving task (2500-3000 words), 30%. Examination assesses: Learning Outcomes 1. and 2. and Graduate Capabilities: Locate, critically evaluate, manage and use written, numerical and electronic information. Assignments assesses: Learning Outcomes 3. and 4. and Graduate Capabilities Problem solve in a range of settings; Work autonomously and collaboratively; Work in an environmentally, socially and culturally responsible manner. .

RCM5814 Computer Graphics

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit covers image process techniques including State Management and Drawing Geometric Objects, Viewing, Coloring, Lighting, Blending, Antialiasing, Fogging, Shading, Texture Mapping, and applying OpenGL for image processing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the principles of computer graphics; 2. Model and represent 2D and 3D pictures; 3. Apply the popular graphics algorithms and techniques for generating 2D and 3D animations; and 4. Develop 2D and 3D graphics programs, (e.g. using OpenGL).

Class Contact: Lecture 1.0 hr PC Lab 2.0 hrs

Required Reading: Shreiner, D. (2009) 7/ISBN-10: 0321552628. OpenGL Programming Guide: The Official Guide to Learning OpenGL. Addison-Wesley Professional.

Assessment: In order to pass, students must obtain at least 25% of the combined Laboratory and Assignment and 25% of Examination mark in this unit. Laboratory Work, Weekly Labs, 20%. Assignment, 2-D Computer Graphics Assignment, 15%. Assignment, 3-D Computer Graphics Assignment, 15%. Examination, Final Examination (three hours), 50%. Laboratory Work - Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Assignment 1 - Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Assignment 2 - Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Examination - Capabilities 1, 2,3,4, 5 and Learning Outcomes 1, 2, 3, 4.

RCM5820 Network Operating Systems Administration

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5805 Communication and Networks.
Description: Overview of computer networks. Architecture of a specific network operating system, e.g. Windows Enterprise or Data Center Servers, Network operating system components and their installation. Workstation and server configurations. Network applications. Network administration. Performance monitoring and tuning. Hands-on network installation and administration.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and deploy network operating systems for given enterprise context; 2. Configure and manage network operating systems; and 3. Develop solutions for monitoring and optimising performance of network operating systems.
Class Contact: Lecture2.0 hrsTutorial1.0 hr
Required Reading: Behrouz A. Forouzan (2007) 4/e Data Communications and Networking McGraw Hill
Assessment: Assignment, 2 assignments (25% each) for network operating system design, deployment, and management (each eqivalent to a report of about 15 pages)., 50%. Examination, Final examination (2 hours), 50%. Examination assesses: Learning Outcomes (1,2, 3) and Graduate Capabilities (1,2,4,5,6) Assignments assess assesses: Learning Outcomes (1,2, 3) and Graduate Capabilities (1,2,3,4,5,6) .

RCM5824 Object Oriented Programming GD2

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5800 Object Oriented Programming GD1
Description: This unit provides practice to object oriented programming and methodology using advanced features and the application programming interface of the Java programming language. A deeper discussion of classes and objects, encapsulation, polymorphism, inheritance, relationships among classes of objects and programming with related classes along with exception handling, multithreading, file I/O and building GUI components.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Revise the application of advanced computer programming constructs; 2. Compose object-orientated solutions for problem solving; 3. Evaluate and apply the concepts of inheritance and polymorphism amongst classes; 4. Develop computer programs using the advanced concepts of multithreading and exception handling; 5. Manipulate classes provided in the programming API and incorporate them into computing solutions; and 6. Integrate advanced features of graphical user interfaces.
Class Contact: Lecture2.0 hrsTutorial1.0 hr
Required Reading: Deitel & Deital (2012). (9th ed.). Java How to Program. Pearson Education.
Assessment: Examination, Final 3 hours written examination, 60%. Test, Written 1 hour test, 20%. Laboratory Work, Programming exercises (5-6), 10%. Assignment, Programming Assignment (700 -1000 lines of code), 10%. Examination assesses: Learning Outcomes: 1., 2., 3., 4., 5., and 6 and Graduate Capabilities: Problem solve in a range of settings; Locate, critically evaluate, manage and use written, numerical and electronic information. Test assesses: Learning Outcomes:1., 2., 3., 4., 5., and 6 and Graduate Capabilities: Locate, critically evaluate, manage and use written, numerical and electronic information. Laboratory work assesses: Learning Outcomes: 1., 2., 3., 4., 5., and 6 and Graduate Capabilities: Locate, critically evaluate, manage and use written, numerical and electronic information. Assignments assesses: Learning Outcomes: 1., 2., 3., 4., 5., and 6 and Graduate Capabilities: Locate, critically evaluate, manage and use written, numerical and electronic information, work both autonomously and collaboratively. .

RCM6102 Thesis (2 Units)

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: The minor thesis enables students to apply knowledge and technical skills developed in the course. The thesis is a written report of an independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, to undertake the theoretical and experimental review of literature on the topic area. The suitably formatted thesis introduces and formulates the problem and describes the investigation. Results and conclusions from the study are elaborated, and a discussion presented. The student will be allocated supervisor(s) who will normally hold a degree at Master's level or above. RCM6102 thesis is to be completed by the end of semester.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify an academic research problem, design a produce a research plan; 2. Choose a research methodology and methods and use these methods to collect and analyse data; 3. Apply their academic learning to constructing a formal thesis incorporating a review of literature, a methodology and methods, collection and analysis of data, findings and conclusion; 4. Prepare and deliver presentation on thesis topic; and 5. Format thesis according to VU guidelines.
Class Contact: No formal class contact, however, there will be regular meetings with the students' supervisor(s).
Required Reading: To be advised by the supervisor.
Assessment: The thesis will normally be assessed by an examiner from appropriate areas of expertise. Thesis, Final Report (up to 12,000 words), 85%. Presentation, Two Oral Presentation (20 minutes), 15%. Thesis examination assesses Learning Outcomes 1, 2, 3 and 5.and all Graduate Capabilities. Presentation assesses Learning Outcomes 1, 2 and 4 and Graduate Capabilities 1, 2, 3 and 5. .

RCM6103 Thesis (4 Units)

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: The minor thesis enables students to apply knowledge and technical skills developed in the course. The thesis is a written report of an independently conducted academic research which establishes the student's ability to clearly define a problem, produce a research plan, to undertake the theoretical and experimental review of literature on the topic area. The suitably formatted thesis introduces and formulates the problem and describes the investigation in detail. Results and conclusions from the study are elaborated, and an extended in depth discussion presented. The student will be allocated supervisor(s) who will normally hold a degree at Master's level or above. RCM6103 (48 CP) thesis is to be completed by the end of semester.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify an academic research problem, design and produce a research plan; 2. Choose a research methodology and methods and use these methods to collect and analyse data; 3. Apply their academic learning to constructing a formal thesis incorporating a detailed review of literature, a methodology and methods, collection and in depth analysis of data, findings and conclusion; 4. Prepare and deliver presentation on thesis topic; and 5. Format thesis according to VU guidelines.
Class Contact: No formal class contact, however, there will be regular meetings with

the students' supervisor(s).

Required Reading: To be advised by supervisor.

Assessment: The thesis will normally be assessed by two examiners from appropriate areas of expertise. Thesis, Final Report (up to 20,000 words), 90%. Presentation, Two Oral Presentation (20 minutes), 10%. Thesis examination assesses Learning Outcomes 1, 2, 3 and 5.and all Graduate Capabilities. Presentation assesses Learning Outcomes 1, 2 and 4 and Graduate Capabilities 1, 2, 3 and 5. .

RCM6104 Thesis (1 Unit)

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: The minor thesis enables students to apply knowledge and technical skills developed in the course. The thesis is a written report of an independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, to undertake the theoretical and experimental review of literature on the topic area. The suitably formatted thesis introduces and formulates the problem and describes the investigation in detail. Results and conclusions from the study are elaborated, and a discussion presented. To graduate, students are required to complete at least two thesis units (24 CP). RCM6105 (12 CP) is the second part of the 2-unit thesis, a continuation of RCM6104.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify an academic research problem and design a produce a research plan; 2. Choose a research methodology and methods and use these methods to collect and analyse data; 3. Apply their academic learning to constructing a formal thesis incorporating a review of literature, a methodology and methods, collection and analysis of data, findings and conclusion; 4. Prepare and deliver presentation on thesis topic; and 5. Format thesis according to VU guidelines.

Class Contact: No formal class contact, however, there will be regular meetings with the students' supervisor(s).

Required Reading: To be advised by the supervisor.

Assessment: RCM6104 (12 CP) is the first part of a 2-unit thesis. On the completion of RCM6105 student will be awarded the same final mark in all thesis units. Thesis, Research plan and written literature review chapter, 85%. Presentation, Oral presentation (20 minutes), 15%. Thesis examination assesses Learning Outcomes 1, 2, 3 and 5.and all Graduate Capabilities. Presentation assesses Learning Outcomes 1, 2 and 4 and Graduate Capabilities 1, 2, 3 and 5. .

RCM6105 Thesis (1 Unit)

Locations: Footscray Park, VU Sydney.

Prerequisites: RCM6104 - Thesis (1 Unit)

Description: The minor thesis enables students to apply knowledge and technical skills developed in the course. The thesis is a written report of an independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, to undertake the theoretical and experimental review of literature on the topic area. The suitably formatted thesis introduces and formulates the problem and describes the investigation in detail. Results and conclusions from the study are elaborated, and a discussion presented. To graduate, students are required to complete at least two thesis units (24 CP). RCM6105 (12 CP) is the second part of the 2-unit thesis, a continuation of RCM6104.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify an academic research problem and design a produce a research plan; 2. Choose a research methodology and methods and use these methods to collect and analyse data; 3. Apply their academic learning to constructing a formal thesis incorporating a review of literature, a methodology and methods, collection and analysis of data, findings and conclusion; 4. Prepare and deliver presentation on thesis topic; and 5. Format thesis according to VU guidelines.

Class Contact: No formal class contact, however, there will be regular meetings with the students' supervisor(s).

Required Reading: To be advised by the supervisor.

Assessment: RCM6104 and RCM6105 form the 2-unit thesis (24 CP) normally to be assessed by an examiner from appropriate areas of expertise. On the completion of RCM6105 student will be awarded the same final mark in all thesis units. Thesis, Final Report (up to 12,000 words), 85%. Presentation, Two oral presentation (20 minutes each), 15%. Thesis examination assesses Learning Outcomes 1, 2, 3 and 5.and all Graduate Capabilities. . Presentation assesses Learning Outcomes 1, 2 and 4 and Graduate Capabilities 1, 2, 3 and 5.

RCM6106 Thesis (2 Units)

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: The minor thesis enables students to apply knowledge and technical skills developed in the course. The thesis is a written report of an independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, to undertake the theoretical and experimental review of literature on the topic area. The suitably formatted thesis introduces and formulates the problem and describes the investigation in detail. Results and conclusions from the study are elaborated, and a discussion presented. The student will be allocated supervisor(s) who will normally hold a degree at Master's level or above. RCM6106 is the first part of a 4-unit thesis. Normally, RCM6106 (24 CP) and its continuation RCM6107 (24 CP) are to be completed over two semesters.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify an academic research problem and design a produce a research plan; 2. Choose a research methodology and methods and use these methods to collect and analyse data; 3. Apply their academic learning to constructing a formal thesis incorporating a review of literature, a methodology and methods, collection and analysis of data, findings and conclusion; 4. Prepare and deliver presentation on thesis topic; and 5. Format thesis according to VU guidelines.

Class Contact: No formal class contact, however, there will be regular meetings with the students' supervisor(s).

Required Reading: To be advised by supervisor.

Assessment: RCM6106 (24 CP) the first part of a 4-unit thesis. On the completion of RCM6107 student will be awarded the same final mark in all thesis units. Thesis, Research plan and written literature review chapter, 85%. Presentation, Two oral presentations (20 minutes), 15%. Thesis examination assesses Learning Outcomes 1, 2, 3 and 5.and all Graduate Capabilities. Presentation assesses Learning Outcomes 1, 2 and 4 and Graduate Capabilities 1, 2, 3 and 5.

RCM6107 Thesis (2 Units)

Locations: Footscray Park, VU Sydney.

Prerequisites: RCM6106 - Thesis (2 Units)

Description: The minor thesis enables students to apply knowledge and technical skills developed in the course. The thesis is a written report of an independently conducted academic research which establishes the student's ability to clearly define a problem, produce a research plan, to undertake the theoretical and experimental review of literature on the topic area. The suitably formatted thesis introduces and formulates

the problem and describes the investigation in detail. Results and conclusions from the study are elaborated, and an extended in depth discussion presented. RCM6107 (24 CP) is the second part of the 4-unit thesis, a continuation of RCM6106 (24 CP).
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify an academic research problem and design a produce a research plan; 2. Choose a research methodology and methods and use these methods to collect and analyse data; 3. Apply their academic learning to constructing a formal thesis incorporating a detailed review of literature, a methodology and methods, collection and in depth analysis of data, findings and conclusion; 4. Prepare and deliver presentation on thesis topic; and 5. Format thesis according to VU guidelines.
Class Contact: No formal class contact, however, there will be regular meetings with the students' supervisor(s).
Required Reading: To be advised by the supervisor.
Assessment: RCM6106 and RCM6107 form the 4-unit thesis (48 CP) to be normally assessed by two examiners from appropriate areas of expertise. On the completion of RCM6107 student will be awarded the same final mark in all thesis units. Thesis, Final report (up to 20,000 words), 85%. Presentation, Two oral presentation (20 minutes each), 15%. Thesis examination assesses Learning Outcomes 1, 2, 3 and 5.and all Graduate Capabilities. Presentation assesses Learning Outcomes 1, 2 and 4 and Graduate Capabilities 1, 2, 3 and 5. .

RCM6702 Internet Data Representation 1

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM6822 - Internet ProgrammingOR equivalent unit determined by Unit coordinator.
Description: XML data access and use; Metadata, such as Resource Description Framework; XML tools; XML definition and declaration, such as XML Schema; Parsers and validators; Presentation of XML data.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply XML syntax to creating XML documents; 2. Apply different XML technologies to creating various types of documents; and 3. Develop software tools for working on or with XML documents (such as XML parsers and validators).
Class Contact: Thirty-six (36) hours for one semester comprising lectures, tutorials and laboratory sessions.
Required Reading: Carey, P. (2007). (2nd ed.). New Perspectives on XML - Comprehensive. Course Technology.
Assessment: Assignment, Two assignments (10 hours), 30%. Examination, Final examination (3 hours), 70%. Assignments assess Learning Outcomes 1, 2 and 3 and Graduate Capabilities 1 and 2. Examination assesses Learning Outcomes 1 and 2 and Graduate Capability 1.

RCM6710 Internet Data Management 1

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5810 - Software Development
Description: Introduction to Class; Introduction to ASP.NET; Introduction to Visual Studio.NET; Using Server Controls; Using ASP.NET Rich Controls; Using Visual Basic.NET Within an ASP.NET Page; Managing Data Sources; Building Data-Driven ASP.NET Applications; Building Data-Driven Web Applications; Configuring an ASP.NET Application; Troubleshooting and Deploying an ASP.NET Application.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply object-oriented programming to plan and design web applications for real-world clients; 2. Integrate data sources with web applications; 3. Create and utilise web services; and 4. Build a multi-tier web application.
Class Contact: Forty-eight (48) hours for one semester comprising lectures, laboratory/tutorials.
Required Reading: Kalata,K (2004). Introduction To Asp.net. USA: Course Technology.
Assessment: To pass this unit students must obtain at least 25% of Assignments and 25% of Examination. Assignment, Assignment-1 (Web systems development), 25%. Assignment, Assignment-2 (Web systems development), 25%. Examination, Final 3 hours written examination, 50%. LiWC - 25% Assignment-2 Assignment 1 - Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Assignment 1 - Capabilities 1, 2,3, 4, 5 and Learning Outcomes 1, 2, 3, 4 Examination -Capabilities 1, 2,3,4, 5 and Learning Outcomes 1, 2, 3, 4.

RCM6812 Cryptography Computer & Network Security

Locations: Footscray Park, VU Sydney.
Prerequisites: A year of tertiary mathematics
Description: This unit introduces the theory and practice of modern cryptography - the mathematics of information security - as well as implementation using a modern high level computer system. Students will also briefly discuss cryptanalysis - the "breaking" of cryptogaphic systems - as well as the ways in which such systems can be used to increase security, or misused so as to compromise security. Topics include: Basic number theory: prime numbers, primarily testing, factorization, modular arithmetic, discrete logarithms. Simple (classical) cryptosystems; methods of attack. Public key cryptosystems: RSA, Rabin, El Gamal. Uses and weaknesses. The knapsack cryptosystem and its cryptanalysis. Block ciphers and modes of encryption. Hash functions, message authentication codes and their importance to communications security The Data Encryption Standard: history, structure, weaknesses. Finite fields and the Advanced Encryption Standard: history and structure, and a simple version for hand computation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform modular computations by hand, include modular exponentiation; 2. Cryptanalyse classical ciphers, and evaluate the security of such systems by different models of cryptanalysis; 3. Apply modular arithmetic to the implementation of modern public-key cryptosystems; 4. Analyse strengths and weaknesses in different systems; 5. Implement the basic structure of the DES and AES private-key systems; 6. Summarise the uses of hash functions in a modern security environment, and critically analyse a hash function for its suitability; 7. Justify the strengths and limitations of cryptography in a complete security system; 8. Implement cryptographic algorithms in a modern high level computer system; and 9. Perform security configuration on Cisco routers.
Class Contact: Thirty Six (36) hours for one semester comprising 24 hours lectures and 12 hours computer laboratory work. 3 hours/week: 2 hours lectures and 1 hour computer laboratory
Required Reading: Textbook:Stallings, W. (2013). (6th ed.). Cryptography and Network Security. Pearson. Lecture Notes.
Assessment: Laboratory Work, 10 Security Labs, 30%. Examination, Paper Exam (3 hours), 70%. Each computer laboratory consists of a number of questions: of problems to be solved by using the system. These problems are scaffolded to range from simple changing the values in a given command, to programming and implementing a complete cryptographic system. Laboratory Work assesses Learning Outcomes 3,8 & 9 : The 10 security labs will enable students to apply their academic knowledge in a real world situations. Examination assesses Learning

Outcomes 1,2,4,5,6 & 7 : The examination enables students to apply their academic knowledge to solve theoretic security problems. Graduate Capabilities for Labs and Examination (1, 2 of the GC): Problem solve in a range of settings; Locate, critically evaluate, manage and use written, numerical and electronic information. .

RCM6813 Internet Security

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5800 - Object Oriented Programming GD1RCM5802 - Information Systems
Description: This unit covers computer security process, human factors, physical security mechanisms, software security, encryption and key management, firewalls, secure sockets (Secure Socket Layer-SSL), email security (PGP and GnuPG, S/MIME), hacking analysis and enforcing security with Cisco equipments.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the theoretical algorithms which underlay modern network security; 2. Implement these algorithms in JavaScript; 3. Apply cryptosystems for security systems; 4. Justify the strengths and limitations of cryptography; 5. Justify and use appropriate security measures for a variety of security tasks; and 6. Configure IPSec and SSL on Cisco routers.
Class Contact: Thirty- six (36) hours for one semester comprising lectures and computer laboratory work. 3 hours/week: 2 lectures and 1 computer laboratory.
Required Reading: WILLIAM STALLINGS/2013 Sixth Edition Cryptography and Network Security PEARSON Supplied notes
Assessment: Laboratory Work, 10 X 1hour Practical Labs, 30%. Examination, Paper Examination (3 hours), 70%. Each computer laboratory consists of a number of questions: of problems to be solved by using the system. These problems are scaffolded to range from simple changing the values in a given command, to programming and implementing a complete cryptographic system. Laboratory Work assesses Learning Outcomes 2 & 6. The 10 security labs will enable students to apply their academic knowledge in a real world situations. Examination assesses Learning Outcomes 1,3,4 & 5. The examination enables students to apply their academic knowledge to solve theoretic security problems. Graduate Capabilities for Labs and Examination: Problem solve in a range of settings; Locate, critically evaluate, manage and use written, numerical and electronic information. .

RCM6819 User Interface Design

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM6822 Internet Programming
Description: User interface design principles; guidelines for user interface design; practical issues in design and usability during software development; user interface evaluation; application in real world applications such as producing software artefact for mobile devices (e.g. Android Phone, Windows Phone, and iPhone)
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design user friendly user interface for software products; 2. Evaluate user interface design and develop improvement to mal designed user interfaces; and 3. Design real world applications applying user interface design principles.
Class Contact: Thirty six (36) hours for one semester comprising lectures and tutorials. 3 hours/week: two hours of lectures and one-hour tutorial.
Required Reading: Materials to be distributed by the lecturer, including articles reporting latest user interfaces design methods.
Assessment: Assignment, The analysis, design and implementation of a real world application with friendly user interface (up to 20 pages report)., 40%. Examination, 2 hours written examination, 60%. Assignment assesses Learning Outcomes (1, 2, 3) and the Graduate Capabilities (1,2,3,4,5,6) Examination assesses Learning Outcomes (1, 2, 3) and the Graduate Capabilities (1,2,4,5,6) .

RCM6820 Distributed Systems

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit will cover advanced topics in distributed systems, including networks in distributed systems, Client-Server models, group programming, concurrency control, multithreading and cloud computing.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design parallel, distributed architectures including the network design and software architecture design; 2. Design concurrency control mechanisms for distributed system; and 3. Design and develop distributed system solutions for real applications, such as cloud services.
Class Contact: Thirty six (36) hours for one semester comprising lectures and tutorial/laboratory. 3 hours/week: two hour lecture and one-hour tutorial/laboratory.
Required Reading: Materials will be distributed by the lecturer.
Assessment: Assignment, Design and development of a distributed system (equivalent to a 15 page report)., 30%. Examination, Three hour written examination, 70%. Assignment assesses Learning Outcomes (1, 2, 3) and Graduate Capabilities (1,2,3,4,5,6) Examination assesses Learning Outcomes (1, 2, 3) and Graduate Capabilities (1,2,4,5,6) .

RCM6822 Internet Programming

Locations: Footscray Park, VU Sydney.
Prerequisites: The previous pre-requisite of RCM5800 is being removed. It makes no sense that for a student to study this unit they must have completed a unit on Object Oriented Programming like RCM5800. Object Oriented Programming is not applicable to this unit, and knowledge of the area is therefore not required.
Description: This unit develop the core concepts of web technology; HTML (and XHTML), JavaScript. Cascading style sheets (CSS), using layered pages to achieve dynamic effects (DHTML), programming Android devices.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply client web technologies; 2. Design and implement website using XHTML and CSS; and 3. Apply JavaScript to provide better website user experience.
Class Contact: Thirty six (36) hours for one semester comprising lectures and laboratory work. 3 hours/week: two hour lectures and one-hour laboratory
Required Reading: Carey, P (2010). (3rd ed.). New Perspectives HTML, XHTML and XML. Course Technology, Cengage Learning. Felke-Morris, T (2011). (5th ed.). Web Development and Design Foundations with XHTML. Addison-Wesley.
Assessment: Test, End of semester practical test, 10%. Laboratory Work, Five programming exercises per semester, 10%. Assignment, Programming assignment, 20%. Examination, Final 2 hour written examination, 60%. Test assesses: Learning Outcomes 1, 2 and 3 and Graduate Capabilities 1, 2, 3, 4. Assignment assesses: Learning Outcomes 1, 2, 3, 4 and Graduate Capabilities 1, 2, 3, 4, 5. Laboratory assesses: Learning Outcomes 1, 2, 3, 4 and Graduate Capabilities 1, 2 and 3 Examination assesses: Learning Outcomes 1, 2, 3 , 4 and Graduate Capabilities. 1, 2, 3, 4, 5 .

RCM6823 Database Design, Management and Administration

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5802 - Information SystemsGood knowledge of relational databases; basic understanding of UNIX.
Description: Database Environment. Database planning, design and administration. Methodology - physical database design. Database integrity and security. Transaction management. Distributed database systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the fundamental elements of a relational database management system; 2. Model and Design database application scenarios with ER and EER diagrams; 3. Convert ER diagrams into relational tables, populate a relational database and formulate SQL queries on the data; 4. Criticise a database design and improve the design by normalisation; 5. Determine a physical database design by considering various file organisations and file indexing techniques; 6. Create database views to enhance database security and performance; and 7. Design concurrency control and recovery for multi-user database systems.
Class Contact: Thirty six (36) hours for one semester comprising lectures and labs 3 hours/week: Two hour lectures and one hour laboratory.
Required Reading: Connolly, T., & Begg, C. (2010). (5th ed.). Database Systems: A Practical Approach to Design, Implementation and Management. Addison-Wesley.
Assessment: Examination, 3 hour examination, 70%. Test, 1 hour test, 10%. Assignment, Database application design and implementation, management, and admin equivalent to 10 page report, 10%. Laboratory Work, Weekly exercises (1 hour per week), 10%. Examination assesses Learning Outcomes (1,2,3,4,5,6,7) and Graduate Capabilities (1,2,3,4,5,6) Test assesses Learning Outcomes (1,2,3,4,5,6,7) and Graduate Capabilities (1, 2, 3, 4, 5) Assignment assesses Learning Outcomes (1,2,3,4,5,6,7) and Graduate Capabilities (1, 2, 3, 4, 5, 6) Laboratory work assesses Learning Outcomes (1,2,3,4,5,6,7) and Graduate Capabilities (1, 2, 3, 4, 5, 6) .

RCM6827 Research Perspectives in Computer Science

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: Writing a research proposal, conducting a literature review, writing a thesis, giving presentations, human research ethics, intellectual property.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct a survey of literature; 2. Apply principles of Human Research Ethics; 3. Present research orally; 4. Apply concepts associated with writing a research thesis; 5. Apply principles of intellectual property; and 6. Write a research proposal.
Class Contact: Forty-eight (48) hours for one semester comprising lectures, tutorials and laboratory sessions.
Required Reading: To be advised
Assessment: The assessment consists of 4 assignments, each is equivalent to about 10-15 pages of report (depends on the topics selected). Assignment, Assignment 1 (Literature Review), 25%. Assignment, Assignment 2 (Research Proposal), 25%. Assignment, Assignment 3 (Research Ethics and Intellectual Property), 25%. Assignment, Assignment 4 (Data Analysis), 25%. The assignment 1 assesses: Learning Outcomes 1 & 3 and Graduate Capabilities 2 & 6; The assignment 2 assesses: Learning Outcomes 4 & 6 and Graduate Capabilities 2 & 3; The assignment 3 assesses: Learning Outcomes 2 & 5 and Graduate Capabilities 1 & 3; The assignment 4 assesses: Learning Outcomes 4 & 6 and Graduate Capabilities 1 & 2. .

RCM6841 Software Engineering 2

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM6844 Software Engineering 1.
Description: This unit covers the software engineering knowledge areas of software estimation, software planning and software process improvement. Topics include CoCOMO model, task flow graph, capability maturity models, requirement management, project planning, project tracking and oversight, configuration management and quality assurance.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop solutions applying core body of knowledge in software estimation, planning and software process improvement; 2. Develop software estimation and plan for software projects; and 3. Design and develop software process improvement models and strategies.
Class Contact: Thirty Six (36) hours for one semester comprising lectures, laboratory work and tutorials. Two hours lecture and one hour laboratory/tutorial per week.
Required Reading: Schach, S.R., 2010, 8th edn, Object Oriented and Classical Software Engineering, McGraw Hill.
Assessment: Students must pass all components of assessment to gain a pass in the unit. Assignment, 10-15 page solution to the assignment problem., 30%. Examination, 3 hours written examination, 70%. Assignment assesses Learning Outcomes 1, 2 and 3 and Graduate Capabilities 1-6 Examination assesses Learning Outcomes 1, 2 and 3 and Graduate Capabilities 1, 2, 4,5,6 .

RCM6842 Advanced Topics in Software Engineering

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM6844 - Software Engineering 1
Description: Advanced software engineering topics recently emerged in the research literatures, issues and applications of these software engineering approaches. Example topics including agent oriented software engineering, software as a service (cloud computing), super agile software development and etc.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explore and acquire knowledge and skills of advanced software engineering approaches through research literature and other resources; 2. Evaluate software engineering approaches, including recently emerged software engineering approaches in application context; and 3. Design and develop software applications by applying the newly emerged software engineering models, such as software agent models.
Class Contact: Thirty six (36) hours for one semester comprising lectures and labs. 3 hours per week: Two hour lecture and one hour laboratory.
Required Reading: Research articles and other materials will be provided by the lecturer.
Assessment: Four to six labs on selected advanced SE topics: 50%; assignment: 50%. Laboratory Work, Four to six labs on selected advanced SE topics, 50%. Assignment, Assignment project applying selected advanced SE approach (About 1500 lines of code)., 50%. Laboratory Work assesses Learning Outcomes (1, 2, 3) and Graduate Capabilities (1,2,3,4,5,6) Assignment assesses Learning Outcomes (1,2,3) and Graduate Capabilities (1,2,3,4,5,6) .

RCM6843 Software Engineering Project

Locations: Footscray Park, VU Sydney.

Prerequisites: RCM6844 - Software Engineering 1
Description: This is a project based unit. Each student will work on a project as a member of a software development team, or on a personal software project. Each project will focus on an industrial and business application such as computer games, financial systems, medical information systems, etc. Each project requires the application of knowledge and skills in one or more of the computing and software engineering areas including user interface development, database management systems, networking, wireless/ mobile computing, web based and general application development environments. Each project practices the software engineering process, generating work products of requirement document, design document, testing report, system manual, project plan and progress log.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop and manage software development process for software projects; 2. Design and develop software systems in a systematic approach; 3. Develop one software application with strong industrial background such like computer games, financial systems, medical information systems, etc; and 4. Apply knowledge and skills in the computing and software engineering to the development of software projects, including user interface development, database management systems, networking, wireless/ mobile computing, web based and general application development environments.
Class Contact: Thirty six (36) hours over one 12-week semester comprising of three (3) hours project session per week.
Required Reading: Project guideline.
Assessment: System (project) analysis and design: 50% Final system (project) evaluation: 50% Lecturer will allocate students in either individual projects or group projects. Individual projects are about 500-1000 Lines of Code (LOC); group projects are about 1500-2000 LOC. Project, Development of a software project in a simulated or real industry client's environment ., 100%. Project assesses Learning Outcomes (1, 2, 3) and Graduate Capabilities (1,2,3,4,5,6) .

RCM6844 Software Engineering 1

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5800 - Object Oriented Programming GD1
Description: This unit covers software engineering knowledge in areas of software management, software verification and validation. Review topics including software process and software life-cycle models, software process improvement, requirement, classical analysis and design, object oriented analysis and design. Detailed topics include inspection, review, control flow testing, boundary testing, FSM testing and integration tests.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop proper solutions for software review and inspection, including estimation to the cost effectiveness of reviews; 2. Develop test cases for software applying variety of testing techniques including control flow testing, boundary testing, equivalence class testing and FSM testing; and 3. Develop integration testing strategies.
Class Contact: Thirty six (36) hours for one semester comprising lectures and laboratories/tutorials. 3 hours/week: two hour lectures and one-hour laboratory/tutorial
Required Reading: Materials will be distributed by the lecturer.
Assessment: Students must obtain at least 40% standard in the assignment and at least 40% on the final examination, and obtain an overall mark of 50%. Assignment, Design software review and testing solutions for given software (about 20 pages)., 30%. Examination, Three hour written examination, 70%. Assignment assesses: Learning Outcomes (1,2,3) and Graduate Capabilities (1,2,3,4,5,6) Examination assesses: Learning Outcomes (1, 2, 3) and Graduate Capabilities (1,2,4,5,6) .

RCM6845 Object Oriented Technology

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5824 - Object Oriented Programming GD2
Description: JavaBeans Component Model- Overview, Introspection, Properties of Beans; Networking - InetAddress Class, URL Class, URLEncoder Class, URLConnection Class, Sockets, Server Sockets, Datagram Clients/Servers; Servlet overview and architecture, HttpServlet Class, HttpServletRequest Interface, HttpServletResponse Interface, Handling HTTP get and post Requests, setting up the Apache Tomcat Server, deploying a web application, session tracking; JSP Overview, scripting components, standard actions, directive, custom tag libraries; EJB Overview, session beans, EJB transactions.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop advanced web applications using Java technologies; and 2. Design and develop enterprise wide applications using Enterprise Java Beans.
Class Contact: Thirty six (36) hours for one semester comprising lectures and laboratories/tutorials. 3 hours/week: two hour lectures and one-hour laboratory/tutorial
Required Reading: Deitel, H.M., Deitel, P.J., (2011). (9th ed.). Java How to Program. Prentice Hall.
Assessment: Students must obtain at least 40% standard in the practicals and assignment and at least 40% on the final examination, and obtain an overall mark of 50%. Assignment, Design and development of a software system using advanced Java technologies (about 1000 lines of code), 30%. Examination, Three hour written examination, 70%. Examination assesses: Learning Outcomes (1, 2, 3) and Graduate Capabilities (1,2,4,5,6) Assignment assesses: Learning Outcomes (1,2,3) and Graduate Capabilities (1,2,3,4,5,6) .

RCM6846 Object Oriented Design

Locations: Footscray Park, VU Sydney.
Prerequisites: RCM5824 - Object Oriented Programming GD2Or equivalent unit to be determined by Unit coordinator.
Description: Unified Modeling Language (UML); Introduction to Rational Rose; Unified Method and the design of the domain layer; Concepts of persistence and transactions in an OO context; Interaction layer design considerations; Implementation and deployment models; Packages, subsystems and models; Design patterns and frameworks.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design software systems using the Unified Modelling Language; 2. Apply the different types of models of the Unified Modelling Language to design of software systems; and 3. Apply patterns and frameworks to the design of software systems.
Class Contact: Thirty-six (36) hours for one semester comprising lectures, tutorials and laboratory sessions.
Required Reading: Priestley, M. (2007). (2nd ed.). Practical Object-Oriented Design with UML. McGraw Hill.
Assessment: Students must obtain at least 40% standard in the assignment and at least 40% on the final examination, and obtain an overall mark of 50%. Assignment, Two assignments (6 hours), 30%. Examination, Final examination (3

hours), 70%. Assignments assess: Learning Outcomes 1, 2 and 3 and Graduate Capability 1 & 5. Examination assesses: Learning Outcomes 1, 2 and 3 and Graduate Capability 1 & 5.

RCM8001 Research Thesis 1 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

RCM8002 Research Thesis 2 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

RCM8011 Research Thesis 1 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

RCM8012 Research Thesis 2 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

RCS1110 Chemistry for Biological Sciences A

Locations: Footscray Park, St Albans.
Prerequisites: Nil.
Description: This unit underpins studies in the biological sciences, including biochemistry and molecular biology. Students will learn about basic chemistry properties, actions and reactions. In particular, there will be emphasis on matter and energy, atomic theory and the periodic table, solutions and aqueous chemistry. Students will have the opportunity to conduct basic experiments utilizing a range of chemical formulas, reactions and equations, gas laws and the state of matter, solutions and aqueous chemistry in science labs. In this unit students will learn about basic chemistry including the topics which follow: Matter and energy, measurement, chemical and physical bonding, reactions and equations, solutions and aqueous chemistry.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Define basic chemical principles and practices; 2. Apply the principles of atomic theory, the periodic table and the mole concept to solve basic chemical problems; 3. Demonstrate the skills required to prepare solutions and solve chemical problems as a member of a laboratory team; and 4. Explain the types of bonds (ionic and covalent) using the concept of Lewis structure.
Class Contact: Lab 2.0 hrs Lecture 3.0 hrs Tutorial 1.0 hr
Required Reading: Seager, S. L. and Slabaugh, M. R., (2014) 8th ed. Chemistry for Today: General, Organic and Biochemistry Brooks/Cole, Cengage Learning
Assessment: Other, Three (3) On line tutorial tests (5% each), 15%. Laboratory Work, Ten (10) experiments and associated Laboratory Data Sheets, 30%. Examination, Final Exam (2 hours), 55%.

RCS1120 Chemistry for Biological Sciences B

Locations: Footscray Park, St Albans.
Prerequisites: Nil.
Description: This unit serves as an introduction to chemistry relevant to biological sciences and in particular biological systems. It will cover the principles of basic physical chemistry including chemical equilibrium and kinetics, acids and bases, thermochemistry and nuclear chemistry. The relationship between biological chemistry and organic chemistry will also be investigated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the principles of chemical kinetics and equilibrium to laboratory practices; 2. Determine the concentrations and pH of acids and bases; 3. Identify and understand the principles of organic chemistry, biological, nuclear, and thermo chemistry and how they interact with each other; 4. Apply the principles of organic and biological chemistry to solve problems in laboratory settings; and 5. Reflect on how knowledge and skills in chemistry adds value to career options in the biomedical sciences.
Class Contact: Lab 2.0 hrs Lecture 3.0 hrs Tutorial 1.0 hr
Required Reading: Seager, S. L. and Slabaugh, M. R., (2014) 8th ed. Chemistry for Today: General, Organic and Biochemistry Brooks/Cole, Cengage Learning
Assessment: Other, Three (3) Online tutorial tests (5% each), 15%. Laboratory Work, Ten (10) experiments and associated Laboratory Data Sheets, 30%. Examination, Final Examination (2 hours), 55%.

RCS1123 Foundations of Food Chemistry

Locations: St Albans.
Prerequisites: Nil.

Description: This unit is intended for first year Food Science and Nutrition students. It provides a basic chemical preparation for further studies in the Food and Nutrition sciences. This unit covers the states of matter, atomic and molecular structure , valency, periodic table, chemical symbols and equations, stoichiochemistry, simple reaction types, acids and bases, the mole concept, molarity, pH, gas laws, chemical equilibrium, law of mass action, free radicals, osmosis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the states of matter and atomic structure; 2. Predict the valency of atoms; 3. Predict the properties of elements based on their knowledge of the periodic table; 4. Balance simple chemical equations and predict responses to imposed disturbances through their understanding of the law of mass action; 5. Predict the state of a gas using the universal gas laws and the mole concept; 6. Calculate concentrations of solutions using SI units; 7. Interpret the pH of solutions and predict buffer action; 8. Describe the processes underpinning osmosis.
Class Contact: Forty-eight (48) hours for one semester comprising lectures, tutorials, workshops and demonstrations.
Required Reading: Spencer, L, Seager, Michael R, Slabaugh. (2011). 7th (Ed) Introductory chemistry for today Charles Hartford. Young, P. (2011) 2nd (Ed) Introductory chemistry online. ChemistryOnline Ltd.
Assessment: Assignment, Assignment (1500 words), 40%. Examination, 2 hour examination, 60%.

RCS1601 Chemistry 1A

Locations: Footscray Park.
Prerequisites: Nil.
Description: Chemistry 1A provides studies in fundamental chemical principals and alongside RCS1602 Chemistry 1B serves as a foundation for further studies in chemistry and other sciences. Lectures are supported with tutorials and theory put into practice with complementary laboratory exercises. Study areas include chemistry methods and measurements; atomic theory and the periodic table; structures and properties of ionic and covalent compounds; chemical equations, reactions and solutions; co-ordination chemistry and acids and bases. For students interested in teaching chemistry taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Chemistry 2A and Organic Chemistry 2A adequately prepares students to deliver units 1,2 ,3 and 4 of the VCE chemistry curriculum.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contextualise the underlying fundamental principles on which the chemistry discipline is based so as to build a foundation of knowledge from which to pursue further studies in chemistry and other sciences including educational roles; 2. Explain the periodic table and properties of the elements in relation to their position in the periodic table; 3. Explain the types of bonds (ionic and covalent) using the concept of Lewis structure; 4. Solve various chemical calculations including mole relationships, balancing the different types of chemical reactions and stoichiometric equations in a range of given problems; and 5. Apply analytical methodology in collaborative settings to analyse various chemical samples. This includes assessing the quality of the results and reporting and discussing the results so as to build competency in the experimental aspects of chemistry and chemistry communication.
Class Contact: Lab 2.0 hrs Lecture 3.0 hrs
Required Reading: Seager, S. L. and Slabaugh, M. R., (2014), Introductory Chemistry for Today (8th Ed.), Brooks/Cole, Cengage Learning
Assessment: Laboratory Work, Completion of Laboratory Data Sheets, 30%. Examination, Final Exam (2 hours), 55%. Other, on line tutorial questions (3 @ 5%), 15%.

RCS1602 Chemistry 1B

Locations: Footscray Park.
Prerequisites: Nil.
Description: Chemistry 1B continues on from Chemistry 1A and provides further studies in fundamental chemical principles to give students a solid chemical foundation for further studies in chemistry and other sciences. Lectures are supported with tutorials and theory put into practice with complimentary laboratory exercises. Study areas include states of matter; physical and chemical changes (energy, rate and equilibrium); oxidation-reduction reactions (electrochemistry); the nucleus, radioactivity and nuclear medicine. Organic chemistry: saturated and unsaturated hydrocarbons; alcohol phenols, thiols and ethers; aldehydes and ketones; carboxylic acids and their derivatives; amines and amides; biological chemistry. For students interested in teaching chemistry taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Chemistry 2A and Organic Chemistry 2A adequately prepares students to deliver units 1 ,2 ,3 and 4 of the VCE chemistry curriculum.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contextualise the underlying fundamental principles on which the chemistry discipline is based so as to build a foundation of knowledge from which to pursue further studies in chemistry and other sciences including educational roles; 2. Explain the various states matter (gaseous, liquid and solid) and state the various properties and intermolecular interactions of these states; 3. Explain the relationship between thermodynamics and the energy requirements of chemical reactions; 4. Solve various chemical calculations including calculating equilibrium constants and rates of chemical reactions with regard to a range of complex problems; and write nuclear equations; and 5. Apply analytical methodology in collaborative settings to analyse various chemical samples including assessing the quality of the results and reporting and discussing the results so as to build competency in the experimental aspects of chemistry and chemistry communication.
Class Contact: Lab 2.0 hrs Lecture 3.0 hrs
Required Reading: Seager, S. L. and Slabaugh, M. R., (2014), Introductory Chemistry for Today (8th Ed.), Brooks/Cole, Cengage Learning
Assessment: Other, Three (3) On-line tutorial tests (5% each), 15%. Laboratory Work, Completion of Ten (10) laboratory experiments and associated Lab Data Sheets, 30%. Examination, Final Examination (2 hours), 55%.

RCS2100 Organic Chemistry 2A

Locations: Werribee.
Prerequisites: RCS1602 - Chemistry 1B
Description: This unit builds upon the fundamental Organic Chemistry presented in Chemistry 1B and introduces students to some of the theoretical and practical aspects of synthetic organic chemistry and their use in industrial applications. The theoretical material is presented with an emphasis upon understanding the mechanism of reactions to enable students to predict a range of reaction outcomes. Industrially important reactions such as electrophilic substitution reactions and the preparation and properties of common polymers are integral to this unit. Lectures and complimentary laboratory exercises will link theory with practice and students gain 'hands-on' experience in appropriate laboratory techniques and apparatus, preparation, purification and characterisation of a number of organic products. Spectroscopic and spectrometric techniques introduced in Analytical chemistry 2A are utilised and further explored in this unit. For students interested in teaching chemistry taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Chemistry 2A

and Organic Chemistry 2A adequately prepares students to deliver units 1, 2 , 3 and 4 of the VCE chemistry

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning synthetic organic chemistry and polymer science based upon modern reaction processes to given problems; 2. Employ chemical mechanisms to explain simple organic chemical reactions and explain the factors which influence reactivity in given situations; 3. Disscuss aromaticity and the common reactions of aromatic compounds, clearly expressing ideas and perspectives; 4. Discus the preparation and properties of common polymers; 5. Adapt common practical organic chemistry manipulations and interpret various analytical data including infra-red and nuclear magnetic resonance spectra, in collaboration with others and with responsibility for own output; and 6. Evaluate the quality of their own synthesised products and related analytical data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: McMurry, J.E., 2012, Organic Chemistry, 8th edn, Cengage.

Assessment: Assignment, Short problem solving exercise (200 words equivalent), 10%. Laboratory Work, Laboratory reports (200 words each), 30%. Examination, Final exam (3 hours), 60%. Students must pass the practical component in order to pass this subject. The total word count of these three assessments will be approximately 4000 words.

RCS2503 Forensic Chemistry 2

Locations: Werribee.

Prerequisites: RCS1601 - Chemistry 1A

Description: RCS2503 Forensic Chemistry 2 builds upon the fundamentals of Chemistry introduced in first year chemistry studies and introduces students to forensic chemical techniques as applied to the analysis of physical evidence collected from crime scenes. Students receive training in routine applications in Forensic Chemistry including arson investigation, drug analysis and the examination of other types of physical evidence. Practical exercises provide 'hands-on' experience in a range of forensic chemical techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning qualitative and quantitative forensic analysis; 2. Interpret various data from the examination of physical evidence from a range of forensic scenarios and report findings and draw appropriate conclusions; 3. Articulate fundamental forensic principles behind the examination of physical evidence clearly expressing ideas and perspectives; 4. Apply standard methodology to the analysis of various forensic samples including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific competency in collaboration with peers; and 5. Evaluate the quality of analytical data and review team members' data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: R. Saferstein, 2007 9th ed An Introduction to Forensic Science New Jersey, Pearson Education P. White, 2004 2nd ed Crime Scene to Court: The Essentials of Forensic Science Cambridge, Royal Society of Chemistry A. Langford, J. Dean, R. Reed, D. Holmes, J. Weyers and A. Jones, 2005 1st ed Practical Skills in Forensic Science Essex, Pearson Education

Assessment: Assignment, Written Assignment (1000 words), 20%. Laboratory Work, Portfolio of laboratory work with summary addressing criteria, 40%. Examination, Final Exam (2 hours), 40%. Students must pass the laboratory work assessment item in order to pass the unit.

RCS2601 Analytical Chemistry 2A

Locations: Werribee.

Prerequisites: RCS1601 - Chemistry 1ARCS1602 - Chemistry 1B

Description: Analytical Chemistry 2A builds upon the fundamental principles introduced in Chemistry 1A and Chemistry 1B and introduces students to instrumental analytical chemistry. This unit provides basic training in modern spectroscopic, chromatographic and spectrometric methods of analysis as currently used in the chemical industry. Lectures and complimentary laboratory exercises will link theory with practice and students gain 'hands-on' experience with modern analytical instruments and associated analytical and physicochemical techniques. Assessment includes report writing according to industry standards and includes statistical analysis of analytical data and interpretation of spectroscopic, spectrometric and chromatographic data. For students interested in teaching chemistry taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Chemistry 2A and Organic Chemistry 2A adequately prepares students to deliver units 1, 2 , 3 and of the VCE chemistry curriculum.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning quantitative and qualitative instrumental chemical analysis according to current standard industry protocols; 2. Discuss fundamental principles behind chromatography, spectroscopy and spectrometry and diagrammatically present their basic operating principles, clearly expressing ideas and perspectives; 3. Interpret various analytical data including chromatographic (liquid and gas), spectroscopic (absorption, emission, infra-red and nuclear magnetic resonance) and spectrometric (electron-impact mass spectrometry) as relevant to given problems; 4. Apply standard methodology to the analysis of various real samples (food, pharmaceutical and environmental) including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific instrumental competency in collaboration with peers; and 5. Evaluate the quality of own analytical data and review team members data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: Daniel C. Harris, Quantitative Chemical Analysis, Eighth Edition, (2011). W.H. Freeman Publishing

Assessment: Laboratory Work, Reports on laboratory work (200 words each), 30%. Assignment, Spectral interpretation assingment (1000 word equivalent), 20%. Examination, Final Exam 2 hours, 50%. Students must pass the practical component in order to pass this unit. The total word count of these three assessments will be approximately 4000 words.

RCS2602 Analytical Chemistry 2B

Locations: Werribee.

Prerequisites: RCS1601 - Chemistry 1ARCS1602 - Chemistry 1B

Description: Prinicples of instrumentation. Chromatographic methods including gas chromatography and liquid chromatography. Introduction to electrochemical methods. Analytical separation techniques and processes. Practical exercises will provide substantial 'hands on' experience with modern analytical instruments and will illustrate important analytical and physiocochemical techniques.

Credit Points: 12

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

Required Reading: Students should possess a good basic analytical chemistry text

such as Skoog, D.A., West, D.M. and Holler, F.J., Fundamentals of Analytical Chemistry, Holt Rinehart and Winston. Students are advised to buy one of the following as a reference of enduring value. Bauer, H.H., Christian, C.D.E. and O'Reilly, J.E., Instrumental Analysis, Allyn and Bacon. Skoog, D.A. and Leary, J.J., Principles of Instrumental Analysis, Saunders. Willard, H.W., Merritt, H.G., Dean, J.A. and Settle, F.A., Instrumental Methods of Analysis, Wadsworth.
Assessment: Examination, Examination, 70%. Other, Practical work, 30%. Students must pass the practical component in order to pass this subject.

RCS3601 Analytical Chemistry 3A

Locations: Werribee.
Prerequisites: RCS2601 - Analytical Chemistry 2AOR RCS2602 Analytical Chemistry 2B
Description: Analytical Chemistry 3A has as its foundation the fundamental chemical principles introduced in Chemistry 1A and 1B and underlying basics of instrumental chemical analysis and synthetic organic chemistry studied in Analytical Chemistry 2A and Organic Chemistry 2A, respectively, and provides students with training in laboratory management and presents an overview of current industry laboratory practice. Topics covered include occupational health and safety including chemical handling and storage and waste management; quality systems including accreditation of laboratories and analytical methods and reliability of scientific data; familiarisation with international standards and official methods of analysis; and real world problem solving including instrument optimisation, software training instrument maintenance and trouble shooting. Lectures and complimentary laboratory exercises including instrument training will link theory with practice and students gain 'hands-on' experience with laboratory practice. Assessment includes report writing according to industry standards. For students interested in teaching chemistry this unit along with Analytical Chemistry 3B extends the minimum requirements (see four units mentioned above) and gives a working insight into more advanced chemistry and industry specific practice.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the industry standards in laboratory management and practice both locally and globally; 2. Prepare risk assessments and propose methods of minimising risk and chemical/physical hazards and waste disposal, with creativity and initiative; 3. Review industry quality systems both locally and globally and initiate good laboratory practice and good manufacturing practice in own context; 4. Devise an analytical protocol incorporating method selection, method verification, method validation and measurement uncertainty; 5. Optimise instrument performance and diagnose instrumental problems and propose sustainable solutions; 6. Apply standard methodology to the analysis of various real samples (food, pharmaceutical and environmental) including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific instrumental competency; and 7. Evaluate the quality of their own analytical data and review team members' data and clearly communicate the findings to peers and demonstrators, demonstrating effective interpersonal skills.
Class Contact: Lab 4.0 hrs Lecture 2.0 hrs
Required Reading: Daniel C. Harris, Quantitative Chemical Analysis, Eighth Edition, (2011). W.H. Freeman Publishing
Assessment: Laboratory Work, Reports on laboratory work (200 words each), 40%. Assignment, 1000 words, 20%. Examination, Final exam 2 hours, 40%. In order to obtain a pass or higher in this unit students must pass the laboratory component and attempt all assessment tasks. The total word count of these three assessments will be approximately 5000 words.

RCS3602 Analytical Chemistry 3B

Locations: Werribee.
Prerequisites: RCS2601 - Analytical Chemistry 2AOR RCS2602 Analytical Chemistry 2B
Description: Analytical Chemistry 3B build upon the concepts studied in Analytical Chemistry 2A, Organic Chemistry 2A and Analytical Chemistry 3A and provides advanced studies in instrumental chemical analysis with training in modern hyphenated techniques. Topics covered include gas chromatography-mass spectrometry and liquid chromatography-mass spectrometry. Studies also include an introduction to capillary electrophoresis and carbon 13 NMR. Lectures and complimentary laboratory exercises link theory with practice and students gain 'hands-on' experience with state-of-the-art instruments and techniques including solid phase extraction for sample preparation and the investigation of complex samples including pharmaceutical products and drugs and metabolites in biological fluids. Assessment includes report writing according to industry standards and includes statistical analysis of analytical data and interpretation of spectroscopic, spectrometric and chromatographic data.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review modern advanced methods of analysis as currently used in the chemical industry in Australia and globally; 2. Describe the fundamental principles behind hyphenated techniques including mass spectrometer types and modern capillary electrophoretic techniques including capillary zone electrophoresis and micellar electrokinetic capillary chromatography; 3. Devise methods of analysis for complex samples adopting the analytical process and using modern hyphenated and electrophoretic techniques and review the suitability of their method to a range of situations; 4. Interpret various analytical data including that from liquid chromatography with either electrospray or atmospheric pressure chemical ionisation mass spectrometry and C13 NMR, adapting information to diverse contexts; 5. Devise methods of analysis for complex samples including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific practice in collaboration with others; and 6. Evaluate the quality of their own analytical data and review team members' data and communicate the findings to peers and demonstrators with responsibility and accountability.
Class Contact: Lab 4.0 hrs Lecture 2.0 hrs
Required Reading: Daniel C. Harris, Quantitative Chemical Analysis, Eighth Edition, (2011). W.H. Freeman Publishing
Assessment: Laboratory Work, Reports on laboratory work (200 words each), 40%. Assignment, 1000 words, 20%. Examination, Final exam 3 hours, 40%. In order to obtain a pass or higher in this unit students must pass the laboratory component and attempt all assessment tasks. The total word count of these three assessments will be approximately 5000 words.

RCS3605 Forensic Methods 3A

Locations: Werribee.
Prerequisites: RCS2503 - Forensic Chemistry 2Or equivalent to be determined by Unit coordinator.
Description: Forensic Methods 3A builds upon the concepts introduced in Forensic Chemistry 2 and provides training in sophisticated methods of analysis as currently applied to the examination of materials that have in some way been associated with crime. Topics covered include: firearm investigation, gun shot residue analysis, chemical fingerprinting and the forensic analysis of drugs, paints and pesticides. Practical exercises provide 'hands-on' experience in a range of forensic chemical techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the principles of chemical fingerprinting including identifying oil from oil spills and using isotopic ratios to authenticate foodstuffs; 2. Describe the practice of GSR analysis including sampling, bulk analysis, particle analysis and development of powder patterns; 3. Develop analytical procedures for drugs in forensic samples; 4. Describe the role of modern techniques such as GC, pyrolysis GC and energy dispersive x-ray analysis as applied to samples of forensic interest such as paint and pesticides in foodstuffs; and 5. Perform a number of forensic analyses including GSR on hands using ICPAES, quinine in urine by fluorometry, drugs in white powders by HPLC, forensic applications of LCMS and GCMS, ignitable liquids in fire debris by GC, IR microscopy of fibres, opiates in opium powder by GCMS and refractive index of glass.

Class Contact: Sixty (60) hours per semester comprising lectures and practicals.

Required Reading: R. Saferstein, 2007 9th ed An Introduction to Forensic Science New Jersey, Pearson Education P. White, 2004 2nd ed Crime Scene to Court: The Essentials of Forensic Science Cambridge, Royal Society of Chemistry A. Langford, J. Dean, R. Reed, D. Holmes, J. Weyers and A. Jones, 2005 1st ed Practical Skills in Forensic Science Essex, Pearson Education

Assessment: Laboratory Work, Complete lab data sheet for each experiment, 30%. Examination, Three hour theory examination, 70%.

RCS4201 Honours Coursework

Locations: Werribee.

Prerequisites: Nil.

Description: The major focus of the course component is research methodology and subjects include experimental design, statistics in research, data analysis, computer applications and software, literature analysis and critical appraisal, ethics in research, scientific writing and data presentation.

Credit Points: 24

Class Contact: An average of 10 hours per week

Required Reading: To be advised by the lecturer.

Assessment: The assessment will vary and may be based on written assignments, seminar presentations and a written examination.

RCS4601 Honours Project Part Time

Locations: Werribee.

Prerequisites: Nil.

Description: The program will consist of a research project and a coursework component. The major focus of the course component is research methodology and subjects include experimental design, statistics in research, data analysis, computer applications and software, literature analysis and critical appraisal, ethics in research, scientific writing and data presentation. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.Required Reading To be advised by the lecturer. Normally the coursework component will be conducted in the first two semesters and the research component in the third and fourth semester.

Credit Points: 24

Class Contact: An average of 10 hours per week for four semesters.

Required Reading: To be advised by the lecturer. Normally the coursework component will be conducted in the first two semesters and the research component in the third and fourth semester.

Assessment: The nature of the coursework assessment will vary and may be based on written assignments, seminar presentations and a written examination. The research project assessment will consist of an oral presentation and submission of a thesis.

RCS4602 Honours Project

Locations: Werribee.

Prerequisites: Nil.

Description: This subject, the aim of which is to enable students to competently research an area of study utilising knowledge and skills gained in previous studies, consists of a project carried out by students on an individual basis. The project is expected to be a scientific investigation of an approved topic, followed by the submission of a suitably formatted thesis in which the topic is introduced and formulated; the scientific investigation described in detail; results and conclusions from the study are elaborated; and an extended discussion presented. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.

Credit Points: 48

Class Contact: An average of 30 hours per week for one semester

Required Reading: To be advised by supervisor.

Assessment: The assessment will consist of an oral presentation and submission of a thesis.

RCS4610 Honours Project Part Time

Locations: Werribee.

Prerequisites: Nil.

Description: This subject, the aim of which is to enable students to competently research an area of study utilising knowledge and skills gained in previous studies, consists of a project carried out by students on an individual basis. The project is expected to be a scientific investigation of an approved topic, followed by the submission of a suitably formatted thesis in which the topic is introduced and formulated; the scientific investigation described in detail; results and conclusions from the study are elaborated; and an extended discussion presented. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.

Credit Points: 24

Class Contact: An average of 15 hours per week for one semester

Required Reading: To be advised by supervisor.

Assessment: The assessment will consist of an oral presentation and submission of a thesis.

RCS8001 Research Thesis 1 Full Time

Prerequisites: Nil.

Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 48

RCS8002 Research Thesis 2 Full Time

Prerequisites: Nil.

Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResea

rchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

RCS8011 Research Thesis 1 Part Time

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field; 2. Intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem; 3. Expert cognitive, technical and creative skills to: (a) design, develop and implement a research project/s to systematically investigate a research problem, (b) develop, adapt and implement research methodologies to extend and redefine existing knowledge, (c) manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature; 4. Expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations; 5. Capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. 6. Intellectual independence, initiative and creativity in new situations and/or for further learning; 7. Ethical practice and full responsibility and accountability for personal outputs; and 8. Autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.
Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the College and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

RCS8012 Research Thesis 2 Part Time

Locations: Werribee.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: 1. expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field 2. intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem 3. expert cognitive, technical and creative skills to:

- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature

4. expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. 5. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. 6. intellectual independence, initiative and creativity in new situations and/or for further learning. 7. ethical practice and full responsibility and accountability for personal outputs. 8. autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the College and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

REP1000 Directed Studies in Physics

Locations: Footscray Park.
Prerequisites: There are no prerequisites for this subject but Year 11 or equivalent physics background is preferred.
Description: A selection of topics from the following: Kinematics and MechanicsThermodynamicsElectricity and MagnesismElectronicsOpticsWave Motion and SoundQuantum PhysicsNuclar Physics
Credit Points: 12
Learning Outcomes: To introduce students to the principles and techniques of physics

and their applicability. It is principally designed for students who do not have a strong physics background or those who do not intend to major in physics or the allied technologies. Alternatively it can be used by students seeking a basic knowledge and understanding of physics with a view to examining whether they wish to study physics further. The detailed curriculum for an individual student, or a group of students with a common background, will depend on their prior studies in the area and the prupose to which they wish to put the subject. The detailed content will, therefore, vary but will, in general be taught at a level equivalent to a standard first year physics subject in a technological degree.

Class Contact: Equivalent to 36 hours per semester of lecture/tutorial/demonstration and laboratory experiences per semester.

Required Reading: Giancoli, D.C., Physics for Scientists and Engineers with Modern Physics 3rd Edition Prentics Hall or equivalent.

Assessment: A series of regular assignments and tests as negotiated for each individual student or group of students with a similar background. the assessment regime will be equivalent to that for a first year physics subject in a technological degree.

REP1001 Engineering Physics 1A

Locations: Footscray Park.

Prerequisites: Nil.

Description: Physical Units and Dimensions: Physical quantities, system of units and standards, dimensions, unit conversion, significant figures.Mechanics:Scalars and vectors, displacement, velocity and acceleration, motion in one and two dimensions, force, Newton's laws of motion, friction, work and energy, conservation laws. Momentum and conservation laws, impulse and collisions, rotational motion, moments of inertia, centre of mass, torque, angular momentum, staticsWave Motion & Optics: SHM, damped harmonic motion, forced oscillations and resonance, oscillatory motion, mechanical and acoustic waves, superposition and standing waves, electromagnetic waves, reflection and refraction of light, mirrors and lenses, wave optics, thin films, polarization.Fluids: Density, pressure, Pascal's law, equation of continuity, Bernouill's equation.

Credit Points: 12

Class Contact: Students will be required to use the text book (required reading) extensively.

Required Reading: Giancoli, D.C. Physics for Scientists and Engineers with Modern Physics, 3rd Edition, 2000, Prentice HallEngineering Physics !A Laboratory Manual Victoria University.

Assessment: Class tests conducted throughout the semester (5 x 4% tests), 20%; Laboratory performance (5 x 4% laboratories during the semester), 20%; End of semester examination 60%.

REP1003 Engineering Physics 1C

Locations: Footscray Park.

Prerequisites: REP1001 - Engineering Physics 1A

Description: A selection of topics taken from the following:Thermodynamics: temperature, thermal expansion, heat conduction and insulation, heat capacity, specific and latent heat, ideal gases, work and heat in the thermal process, 1st law of thermodynamics, heat engines and the 2nd law of thermodynamics, thermal radiation.Electrical Devices: Fundamentals of electric circuits, series and parallel circuits, circuit analysis, DC and AC circuits, operation, performance characteristics and selection of motors and generators

Credit Points: 12

Required Reading: Giancoli, D.C. Physics for Scientists and Engineers with Modern Physics, 3rd Edition, 2000, Prentice HallEngineeringPhysics !A Laboratory Manual Victoria University

Assessment: Class tests conducted throughout the semester (5 x 4% tests), 20%; Laboratory performance (5 x 4% laboratories during the semester), 20%; End of semester examination 60%.

REP4100 Data Acquisition

Locations: Footscray Park.

Prerequisites: VEF1002 - Enabling Sciences 1BOR ENF1202 Engineering Physics 2

Description: Experimental data handling: measurements and errors. Types of errors, combining errors. Graphical analysis, statistical distributions.Sensors and transducers: Transducer types, e.g. resistive, voltage, current, capacitive, inductive. Transducer circuits such as bridges and operational amplifiers. Generalised measurement systems.Computer laboratory interfacing: Analogue to digital conversion: Data acquisition, time varying signals and the sampling theorem. Digital to analogue conversion: Generation of DC and AC voltages. Adaptive computer control: Digital input and output. General Purpose Interface Bus (GPIB); description and overview.Graphical programming: Fundamentals of a graphical programming environment for the creation of a 'virtual instrument', e.g. LabVIEW.Project: Students will be assigned projects that will involve the automation of an experiment, both in terms of the hardware and software requirements.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to:
1. Have a sound grasp of experimental measurement and error handling techniques;
2. Use a variety of transducers in appropriate circuits for measurement of physical parameters; and 3. Automate a simple experiment using a graphical programming environment

Class Contact: 48 hours per semester of lecture/tutorial/laboratory sessions.

Required Reading: Kirkup, L, 1994, Experimental Methods, John Wiley & Sons, Qld; ; Bishop, R. H., 2004, Learning with LabVIEW 7 Express, Pearson Prentice Hall, Upper Saddle River, NJ

Assessment: Assignments 20% ; End of semester examination 40%; Project and laboratory reports 40%.

REP4200 Directed Studies in Physics 2

Locations: Footscray Park.

Prerequisites: VEF1002 - Enabling Sciences 1BOR ENF1202 Engineering Physics 2

Description: A selection of topics from the following:Classical Mechanics; Thermodynamics*; Electromagnetism *; Optics*; Quantum Mechanics*; Nuclear Physics*; Relativity; High Energy Physics; Electrical and Electronic Machines.* Advanced studies which extend the material covered in first year subjects.

Credit Points: 12

Class Contact: 60 hours per semester of lecture/tutorial/seminar/laboratory sessions.

Required Reading: No text will be prescribed. Students will be expected to read widely around the topics in the subject.

Assessment: A series of regular group assignments and tests will be negotiated for each individual student or group of students with a similar background. The assessment regime will be equivalent to that for a second year physics subject in a technological degree in the content areas covered by this subject whilst recognising the differing backgrounds of the students undertaking the subject - especially in mathematics.

RMA1001 Engineering Mathematics 1A

Locations: Werribee, Footscray Park.

Prerequisites: Nil.

Description: Basic algebra, including index, log laws, indicial and log equations, algebraic expansions; Functions, straight line, parabola, circle etc. Mod function. Domain, range, inverse functions; Trig. Functions and their graphs, period amplitude, degrees radians. Basic trig identities, Inverse Trig functions. Converting aCosx+-bSinx to single Sin, Cosine terms; Limits, continuity, differentiation, rules, higher derivatives, Implicit differentiation. Tangents and Normals; Parametric differentiation, derivatives of logs and exponentials. Rates of change, maximum and minimum problems. Trig and inverse trig derivatives, logarithmic differentiation; Introduction to integration. Fundamental theorem of Integral Calculus. Substitution rule. Areas, Mean values, Root mean square; Methods of integration, partial fractions, simple integration by parts; Introduction to differential equations, separation of variables, population growth, air resistance; Complex numbers; Vectors.
Credit Points: 12
Class Contact: 60 hours of lectures/tutorials per semester.
Required Reading: D.Hughes-Hallett, A.Gleason, W.McCallum et al. Single and Multivariate calculus. John Wiley and Sons, Inc. New York, 2005.
Assessment: There will be class tests, worth 30%, and an end of semester examination worth 70%. No word length limit applies.

RMA1002 Engineering Mathematics 1B

Locations: Footscray Park.
Prerequisites: RMA1001 - Engineering Mathematics 1A
Description: Descriptive statistics, data, histograms etc. Describing data, mean, median, mode, quantiles, measures of dispersion.Introduction to probability, sample space, mutually exclusive and independent events. Intro to PDF's and intro to Normal distribution.Normal distribution, mean of n variate values, 3,2,1 sigma confidence limits. Binomial, Poisson distributions.Exponential, Hypergeometric distr. Normal approx. to Binomial and Poisson. Sample mean. Central limit theorem.Determinants, matrices, Cramer's rule, inversion.Solution of systems of algebraic equations. Row operation, Gaussian elimination, echelon form, ranks.Newton Raphson, numerical integration. Midpoint, Trapezoidal and Simpsons rules.Introduction to series and some convergence tests.Simple power series and the Maclaurin series.Partial differentiation, algebraic, trig, exp, and log functions. Rules.Partial differentiation, conditions for max/min. Simple problems.Intro to second order constant coefficient, homogeneous D.E's. Three types of solutions via the auxiliary equation.
Credit Points: 12
Class Contact: 60 hours of lectures/tutorials per semester.
Required Reading: D.Hughes-Hallett, A.Gleason, W.McCallum et al. Single and Multivariate calculus, John Wiley and Sons, Inc. New York, 2005.
Assessment: There will be class tests, worth 30% and an end of semester examination worth 70%. No word length limit applies

RMA1110 Mathematics for the Biological and Chemical Sciences 1

Locations: Werribee, St Albans.
Prerequisites: Nil.
Description: Revision of basic algebra and logarithms. Discussion of units, accuracy, precision and significant figures in experimental work. An introduction to matrices and matrix manipulation. Functions and graphs. Solutions of polynomial equations and the general concept of an equation and its solution. Introduction to the methods and applications of differential calculus - local and global max/min. Fitting functions to points and the method of least squares.
Credit Points: 12
Class Contact: Four hours per week for one semester consisting of one, one hour lecture and three hours of practice classes.
Required Reading: Bittinger, M.L., Calculus and Its Applications, 7th Edition, Addison Wesley.
Assessment: Test 1 (week 3), 15%; Test 2 (week 10), 25%; Final Examination, 60%.

RMA1120 Statistics for the Biological and Chemical Sciences 2

Locations: Werribee, St Albans.
Prerequisites: Nil.
Description: Representing data graphically and standard summary statistics. Elementary notions of probability and random variable (discrete and continuous). The binomial and normal variables. Point and interval estimation and testing hypotheses on proportions, means and variances.
Credit Points: 12
Class Contact: Four hours per week for one semester consisting of one, one hour lecture, one, two hour tutorial and one, one hour computer laboratory.
Required Reading: Samuels, M.L., Witmer, J.A., Statistics for the Life Sciences, 3rd Edition, Prentice Hall
Assessment: Tutorial test (15%), computer test/assignment (15%) examination (70%).

RMS3010 Bioprocessing Applications

Locations: Werribee, Footscray Park.
Prerequisites: RBF1310 - Biology 1
Description: Topics include enzyme production and applications, algal biotechnology, bioremediation, bioleaching of metals from low grade ore, commercial and domestic wastewater treatment, biomass conversion and microbial fuel production. The ethical issues associated with these topics will be discussed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the key approaches and techniques used in bioprocess applications; 2. Perform laboratory techniques for protein expression, in collaboration with others while being accountable for one's own output; 3. Critically evaluate various biological production processes and what key steps are necessary as relevant to a range of audiences; 4. Apply the knowledge of bioprocessing utilising internet databases and programs to initiate new ideas and solve complex problems; and 5. Critically review a contemporary biological production process and present it both in written and oral formats.
Class Contact: Lab4.0 hrsLecture3.0 hrs
Required Reading: Mitchell, R. (1993) Environmental Microbiology Wiley-Liss Inc. Shuler, M.L and Kargi, F., (2002) 2nd ed Bioprocess Engineering: Basic Concepts Prentice-Hall Inc.
Assessment: Assignment, 2000 word assignment with oral presentation, 20%. Laboratory Work, 4 laboratory reports, 30%. Test, three hour exam, 50%.

RMS3020 Genomics, Proteomics and Bioinformatics

Locations: Werribee.
Prerequisites: RBF2520 - Biochemistry 1Or equivalent
Description: This unit of study provides a comprehensive overview of the fields of genomics, proteomics and bioinformatics as they have been emerging and continue to develop. Also, to provide an overview of the various types of databases and analysis tools available in these areas on the internet. The unit explores applications of bioinformatics including accessing internet resources such as GenBank and EMBL, data mining, and using programs such as BLAST and FASTA. Examples of applications in a range of settings including forensics, drug design and medical research will be considered. The theory underpinning a range of analytical techniques used in nucleic acid and protein analysis will also be covered, such as next-generation sequencing, 2-

dimensional gel electrophoresis, and Mass-Spectrometry. Ethical issues concerning the ownership of and access to information in databanks will also be covered This unit will be supported by a laboratory component including various protein separation techniques as well as computer based training using relevant bioinformatic databases for sequence analysis and applications to various molecular biological techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the key approaches used in genomics and proteomics; 2. Perform laboratory techniques for protein separation, including one dimensional and two-dimensional gel electrophoresis in collaboration with others while being accountable for ones own output; 3. Critically evaluate the various online databases and what information is found within as relevant to a range of audiences; 4. Apply the knowledge of bioinformatics utilising internet databases and programs to initiate new ideas and solve complex problems; 5. Critically review a contemporary bioinformatic topic and present it both in written and oral formats; and 6. Evaluate the various next-generation sequencing platforms and hypothesise on their future use.

Class Contact: Lab 4.0 hrs Lecture 3.0 hrs PC Lab 4.0 hrs five hours per week, including three hours of lectures and two hours of laboratory classes (8 x 3 hours).

Required Reading: Lesk AM 2013 4 ed Introduction to Bioinformatics Oxford University Press Nawin C. Mishra 2010 Introduction to Proteomics: Principles and Applications Wiley

Assessment: Assignment, Assignment, students will submit a written 2000 word assignment on a topic related to the unit of study as well as delivering an oral presentation, 20%. Practicum, Practical classes, students will attend 8 practical classes and submit laboratory reports., 30%. Examination, Written examination, students are required to pass a written exam of 3 hours duration., 50%.

RMS3030 Genetic Engineering

Locations: Werribee.

Prerequisites: RBF2520 - Biochemistry 1 RBF2390 - Molecular Genetics

Description: This unit provides students with knowledge of and experience in using many of the techniques that facilitate research and diagnostics in modern molecular biological laboratories. In addition, many applications of this technology in medical, agricultural and environmental biotechnology will be explored. This unit utlitises the theoretical foundations established in the units RBF2520 Biochemistry 1 and RBF2390 Molecular Genetics to provide students with knowledge of the research methods used in genetic engineering and molecular biology and how these have been applied in various fields of biotechnology. Major topics to be explored include recombinant DNA technologies and vectors, nucleic acid hybridisation based assays, the polymerase chain reaction and its variations and uses, DNA sequencing, RNA interference, DNA profiling, plant and animal genetic engineering methods and applications, identifying the genetic basis of disease, molecular diagnostics and gene therapy. Group discussions revolving around the risks and benefits of these technologies and ethical considerations will also be undertaken. Students will receive practical experience in nucleic acid purification, plasmid cloning, PCR and DNA sequence analysis in the laboratory setting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contrast the methods of gene cloning using different vectors and construct and assess a recombinant plasmid in a laboratory setting; 2. Summarise the RNA interference pathway and its uses as a tool in molecular biology and medicine; 3. Work collaboratively and summarise the requirements and principles of the polymerase chain reaction and employ this technique in a laboratory setting; 4. Employ techniques to isolate genomic and plasmid DNA in a laboratory setting and assess the success of these techniques; 5. Contrast the techniques used to sequence DNA and evaluate DNA sequencing data in a laboratory setting; 6. Contrast the methods used in plant and animal biotechnology and summarise the current applications of these techniques; 7. Summarise the basis of common genetic diseases, devise methods of diagnosis and evaluate current gene therapy strategies; and 8. Propose an experimental plan to address a scientific problem associated with genetic engineering in an ethical, sustainable and responsible manner.

Class Contact: Lab 4.0 hrs Lecture 1.0 hr

Required Reading: Brown, T.A. (2010) 6th Gene cloning & DNA analysis. An introduction. Wiley-Blackwell

Assessment: Assignment, 2000 words, 20%. Laboratory Work, 4 reports (total 2000 words), 25%. Examination, 3 hours, 55%.

RMS3113 Comparative Immunobiology

Locations: Werribee, Footscray Park.

Prerequisites: RBF2300 - Microbiology 1 RBF2330 - Cell Biology

Description: This unit of study examines strategies of disease resistance and internal defence in prokaryotes and eukaryotes and their importance in the field of biotechnology. The specific aims of this unit of study are: to develop an understanding of the nature of immunity and resistance; to develop an understanding of the mechanisms underlying internal defence in organisms; to develop an understanding of the evolution of defence mechanisms in prokaryotes and eukaryotes. Topics covered include: the molecular and cellular components of the vertebrate immune system; innate and adaptive responses to pathogens; the evolution of metazoan immunity; the restriction modification system and other defence mechanisms of prokaryotes; hypersensitive response and systemic acquired resistance in plants; immunology-related advances in biotechnology.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to:

- Critically review the adaptive and innate immune response to pathogens in vertebrates;
- Deduce and discriminate strategies of defence against pathogens in prokaryotes and eukaryotes;
- Experiment with several immunology-based laboratory techniques including the ELISA assay, Western Blot and Immuno-diffusion assay;
- Appraise and synthesise relevant scientific literature.
- Investigate the principles of biosafety and bioethics within the context of cell biology practice.

Class Contact: Lab 3.0 hrs Lecture 1.0 hr

Required Reading: Janeway, CA, Travers, P, Walport, M, Shlomchik, MJ. (2014) 8th Immunobiology: the immune system in health and disease. Blackwell.

Assessment: Examination, Written Examination (3 hours duration), 50%. Practicum, Laboratory reports, 30%. Assignment, Assignment, 20%.

ROP8001 Conceptualising and Contextualising Research

Locations: Footscray Park, City Flinders.

Prerequisites: Nil.

Description: This unit provides postgraduate researchers with the opportunity to conceptualise and contextualise their proposed research within appropriate disciplinary discourses and paradigms as they develop their candidature proposal. It

will develop their capacity to recognise and contextualise research questions or hypotheses within those disciplinary frameworks, and provide them with the opportunity to explore theoretical frameworks and research methodologies and techniques in relation to their particular research area. Topics Include: disciplines and paradigms, engagement with the literature, epistemologies and the application of knowledge, and choosing theories and methods.

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate an original and significant research question or problem that their research will address; 2. Demonstrate an understanding of the epistemological basis of their research discipline(s); 3. Identify and specify how they will apply key theories and methodologies that relate to their area of research; 4. Locate their research project within existing knowledge as represented in the literature; and 5. Justify their choice of theories and research methods and techniques within their chosen disciplinary framework(s).

Class Contact: Weekly seminar x10 weeks

Required Reading: Steve Fuller, 2005, Kuhn vs. Popper: The Struggle for the Soul of Science, Columbia Uni Press. Harry Collins and Robert Evans, 2009, Rethinking Expertise, Uni Chicago Press.

Assessment: Research Paper, Paper to outline location of the research problem/issue in relation to existing knowledge and research approaches in the discipline/field., 50%. Other, Abstract outlining proposed research project. 150 words., 10%. Presentation, 12 minute oral presentation on research problem., 20%. Other, Web postings - Thirteen webCT posts of own findings and drafts as well as comments on findings and drafts by others., 20%.

ROP8002 Research Integrity and Ethics

Locations: Footscray Park, City Flinders.

Prerequisites: Nil.

Description: This unit of study provides postgraduate researchers with the opportunity to gain advanced level understandings of integrity and ethics in relation to the conduct of research in a range of disciplinary contexts. It will develop the postgraduate researchers' capacities to engage in current debates about research ethics and integrity, and to identify and develop positions on critical issues in research integrity and ethics in relation to their own research project area. Topics include research governance and community ethics, research conduct, authorship and intellectual property, research limits, consent and confidentiality, animal research and commercialising research.

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an advanced understanding of fundamental principles and current debates about ethics and integrity in research; 2. Demonstrate familiarity with relevant national codes and university policies that impact on research practice and appropriate conduct in various research environments; 3. Identify key areas of ethics and integrity that relate to thir own area of research practice; 4. Demonstrate ability to critically evaluate options and approaches to resolve issues in research integrity and ethics that may arise in their field of research; and 5. Argue to defend a position in relation to research ethics and integrity as it relates to their own area of research practice and design of their own research project.

Class Contact: Weekly seminar x 10 weeks

Required Reading: Macrina, F.L. 2005, 3rd edn, Scientific integrity: Text and cases in responsible conduct of research, Washington D.C.: ASM Press. Oliver, P. 2010, The Student's Guide to Research Ethics, Maidenhead: McGraw-Hill International, UK. Universitas 21 Program in Global Research Ethics and Integrity - online course resources.

Assessment: Portfolio, Reflective portfolio on ethics and integrity in research. 1000-2000 words., 20%. Research Paper, Paper on research ethics and integrity in relation to proposed research area. 2000-3000 words., 60%. Presentation, Poster presentation on an ethical or integrity issue in own field, 20%.

RPH4411 Physics 4 (Honours)

Locations: Footscray Park.

Prerequisites: Eligibility for entry to the Bachelor of Science (Honours) in Physics program.

Description: This unit consists of advanced coursework and a research thesis. Coursework: Compulsory core units of quantum mechanics, statistical mechanics and research methods, plus elective units from the following areas: optical waveguides and sensors, relativity, surface physics, ion beam techniques, optics of materials, laser physics, lasers and optoelectronics, fibre optics, solid state physics, diffraction from crystals, nuclear physics. Other electives may be approved, including those offered at other universities. All electives must be approved by the Course Co-ordinator. Research Thesis: A research project will be undertaken in one of the Physics research areas, under the supervision of a member of academic staff. Subject to approval, research may be undertaken at a laboratory outside the University.

Credit Points: 48

Class Contact: Average of 20 hours per week for two semesters.

Required Reading: Messiah, A. 1961, Quantum Mechanics Vols 1 and 2, North Holland, Amsterdam. Kittel, C., Thermal Physics, John Wiley and Sons.

Assessment: is based on coursework, 50%; research thesis, 50%. The research project will consist of oral presentation and a thesis of approximately 5,000-10,000 words.

RPH4412 Physics 4 (Honours)

Locations: Footscray Park.

Prerequisites: Nil.

Description: Coursework: Compulsory core units of quantum mechanics, statistical mechanics and research methods, plus elective units from the following areas: optical waveguides and sensors, relativity, surface physics, ion beam techniques, optics of materials, laser physics, lasers and optoelectronics, fibre optics, solid state physics, diffraction from crystals, nuclear physics. Other electives may be approved, including those offered at other universities. The Course Co-ordinator must approve all electives.Research Thesis: A research project will be undertaken in one of the Physics research areas, under the supervision of a member of academic staff. Subject to approval, research may be undertaken at a laboratory outside the University.

Credit Points: 48

Learning Outcomes: Advanced coursework:To gain a deeper understanding of quantum mechanics and statistical mechanics, and in addition undertake further studies in areas of physics related to the thesis.Research thesis:To gain experience in the conduct of a research project.

Class Contact: Average of 20 hours per week for one semester

Required Reading: Messiah, A. 1961, Quantum Mechanics Vols 1 and 2, North Holland, Amsterdam. Kittel, C., Thermal Physics, John Wiley and Sons.

Assessment: The grade for RPH4411 shall be either "S" or "U". An "S" grade will be awarded for satisfactory progression in both the coursework and research thesis components, for which the overall result for 2 semesters will be provided under RPH4412.

RPH8001 Research Thesis 1 Full Time

Prerequisites: Nil.

Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:

http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

RPH8002 Research Thesis 2 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

RPH8011 Research Thesis 1 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

RPH8012 Research Thesis 2 Part Time

Prerequisites: Nil.
Credit Points: 24

RSS3000 Industry Project

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: Successful completion of Years 1 and 2 of NBSC Bachelor of Science
Description: Industry Project provides third year students with an opportunity to select and undertake either (a) a brief research project in an area of interest with staff members of Chemical Sciences or an established research institution; or (b) a work-based placement in the industry he/she intends to enter. Both the research and work-based placements enable the student to undertake a structured work experience program as an integral part of their degree course. Gaining practical experience in their chosen field enables students to test interest and ability in these areas.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and solve problems with intellectual independence and demonstrate time management and project-related organisational skills in a work-based or laboratory project; 2. Articulate and justify research questions/project objectives and methods; 3. Demonstrate proficiency in writing a research/work-based project final report, including a rationale and a summary of strengths and limitations; and 4. Communicate clear, coherent findings and ideas of a research/work-based project to peers and supervisors.
Class Contact: Projects will involve work conducted at Victoria University or within industry, the community or both. Projects can range from reports or practical work to fieldwork or industry placements. Contact hours are dependent on the type of project undertaken and will be arranged by negotiation with the student's approved Industry Project unit supervisor(s).
Required Reading: Material appropriate to the students project will be provided by the supervisor
Assessment: Portfolio, e-Portfolio, 80%. Presentation, Oral presentation (20 min), 20%.

VAA2002 Electrical Power Systems 1

Locations: Footscray Park.
Prerequisites: ENF1202 - Engineering Physics 2
Description: This unit is taught in two distinct parts by separate academic and sessional academic staff. Part A - Electrical Circuits. Provides students with a sound knowledge of elementary electrical circuits and introduces students to various circuit analysis methods. Operating principles and performance characteristics of motors and generators will be introduced in addition to three-phase circuits and their analysis. An overview of electrical transformers will be given. Part B - Power Distribution. Overview of power generation and distribution in Australia. The role of a specialist electrical services system design engineer. Regulations, standards and codes of practice. High, medium and low voltage distribution practices. An introduction to the range of transformers used in power distribution systems. System 'fault' capacity and calculation. Cable properties and cable selection based on current, temperature, voltage drop and fault levels. An introduction to switchboard design and construction.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the Node-Voltage and Mesh-Current methods to the solution of linear DC circuit analysis; 2. Apply the Principle of Superposition to circuit analysis, and be aware of those circuits where it is not applicable; 3. Locate the Thevenin and Norton equivalents of complex circuits; 4. Describe the concepts of frequency, impedance and admittance and to be able to analyse linear AC circuits; 5. Describe three phase electric circuits and analyse balanced three phase systems; 6. Describe a single-phase transformer, its equivalent circuit model, as well as transformer performance calculations; 7. Describe the operating principles of motors and generators, understand their equivalent circuit models, and calculate the operating and performance characteristics (power, torque, efficiency, power factor, and etc.) of these machines using their equivalent circuit models; 8. Describe the role of a specialist building electrical services system design engineer; 9. Identify regulations, standards and codes of practice used in the building industry for electrical installations; 10. Calculate building electrical system fault levels; and 11. Select electrical power cables based on current, temperature, voltage drop and fault levels.
Class Contact: Sixty (60) hours for one semester; comprising of lectures, tutorials, and laboratory work.
Required Reading: Wildi, T. 2005, 6th Edition, Electrical Machines, Drives and Power Systems, New Jersey: Prentice Hall. Australian Standards AS 3000, AS 30088, and AS 3439.1.
Assessment: Laboratory Work, Part A: Two Laboratory Group Reports (Team of four, 1000 words each), 25%. Project, Part B: Project Group Report (Team of four, 2000 words), 25%. Examination, 3 Hour Examination to Cover Parts A and B., 50%.

Laboratory Work: Learning Outcomes 5,6, and 7 and Graduate Capabilities 1,2,3,4, and 5. Project: Learning Outcomes 9,10,11 and Graduate Capabilities 1,2,4 and 6. Examination: Learning Outcomes 1-11, and Graduate Capabilities 1,2,4 and 6. .

VAA2031 Architectural History & Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: Architects are recognised as the primary Design Professionals in the Building Industry. This subject acquaints students with insight into the Architectural process by discovering the historical evolution of buildings technically and aesthetically and how they relate to the culture and time in which they were built. A selection of design skills are explored to promote conceptual thinking and visual communication. Group workshops are used to promote research and problem solving techniques as well as basic three dimensional visualisation through model making.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. An appreciation of the historical evolution of Architecture and Building; 2. Skills in visual communication through freehand drawing techniques; 3. An appreciation of basic architectural design skills, both technical and conceptual; 4. An awareness of designing in consideration of environmental conditions; and 5. An awareness of the Architectural design process and have developed an understanding and a vocabulary to relate to and communicate with other professionals.
Class Contact: Sixty (60) hours for one semester comprising of a mix of group activities, lectures, site work and workshops.
Required Reading: Nil.
Assessment: Individual portfolios and reports which provide evidence demonstrating that the learning outcomes for the subject have been achieved. The assessment material will include three major section as listed below that demonstrate an appreciation of Architecture in History, skills in abstract thinking and visual communication and skills in three dimensional 'spatial' problem solving and model making. Report, History of Architecture, 30%. Portfolio, Architecture Design Theory, 30%. Portfolio, Architectural Workshop, 40%.

VAA2082 Building Construction and Control 1

Locations: Footscray Park.
Prerequisites: VAC2011 - Engineering Materials & ConstructionVAA2031 - Architectural History & Design
Description: This unit of study aims to give students an understanding of the various forms of building construction and building technology, and an understanding of the standards relevant to the control of buildings in general, in Australia. The focus of this subject will be domestic housing and small commercial / industrial buildings and as such will be taught in two sequential sections, the first for 'domestic housing' and the second for 'small commercial/industrial buildings'.Domestic housing Common forms of construction. Foundation conditions and earthworks. Floor systems. Damp-proofing. Wall and roof cladding. Balconies and stairways. Construction techniques and sequence of work. Thermal insulation. Lighting and ventilation. Drainage. Linings and internal finishes. Establishment of building sites. Builders' plant and equipment. Site safety. Building schematic documentation and detailing. Building regulatory systems and building codes. (Small) commercial/industrial buildings Structural frames. Load-bearing and non-load-bearing walls. Pre-caste construction. Alternative building structural systems. Building thermal, electrical, lighting and hydraulic services requirements. Emergency evacuation exits. Building maintenance. Establishment of building sites. Builders' plant and equipment. Site safety. Building schematic documentation and detailing. Building regulatory systems and building codes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appreciate the fundamentals of conventional and innovative forms of construction for both domestic housing and (small) commercial industrial buildings; 2. Communicate with other professionals in the building process using appropriate building terminology; 3. Assess the involvement of various building trades, professions and authorities; 4. Interpret and apply evolving building standards and statutory requirements; 5. Identify the causes of common building problems, and devise effective treatments; and 6. Formulate building schemes and details appropriate to the type of construction, and organize the planning of construction works for both domestic housing and (small) commercial industrial buildings.
Class Contact: Sixty (60) hours for one semester comprising briefings, workshops, individual work, site visits, team meetings and team work.
Required Reading: Wilkie, G, 2003, Completely revised edition, Building your own home: a comprehensive guide for owner-builders, New Holland Publishers (Australia) Pty Ltd, Sydney. Ching, FDK, 2008, Fourth edition, Building construction illustrated, John Wiley & Sons, Inc, Hoboken, New Jersey. Australian Building Codes Board (ABCB), 2010, Code of Australia (BCA) 2010 Volume One, ABCB Publications, Canberra. Australian Building Codes Board (ABCB), 2010, Building Code of Australia (BCA) 2010 Volume Two, ABCB Publications, Canberra.
Assessment: Assignment, individual tutorial exercise work and team take-home assignment work, 50%. Portfolio, individual portfolio, 50%. The portfolio is to feature work done in tutorials and at home, including graphical and written designs and specifications detailing creative building solutions appropriate to various property development scenarios, a reflective journal, and self and peer assessment.

VAA3001 Electrical Power Systems 2

Locations: Footscray Park.
Prerequisites: VAA2002 - Electrical Power Systems 1
Description: This unit introduces and examines topics that will enhance career prospects for students undertaking this unit in concert with other units prescribed in the course. These topics include: Configuration of low voltage distribution systems, Standby power generation systems, Uninterruptible power supplies (UPS), Battery systems for UPS's, Power distribution system protection and High voltage switchgear. In addition Transformers and their specification, Energy management in electrical power systems and Power factor correction will be studied. A general introduction is given to Common electric motor types, Electric motor starting, Motor protection and Motor control circuits.. The unit develops a link between Circuit protection devices, Earthing of buildings, Electrically hazardous areas and Lightning protection of buildings. Material relating to Vertical transportation is specified in addition to Methods of achieving reliability in building electrical power supply. The unit concludes with Harmonics within power distribution systems, Electronic security systems, Exit and emergency lighting systems and Operational planning and maintenance of building power systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate the electrical power supply needs of residential, commercial and light industrial buildings; 2. Select and determine the size of all electrical power cables, their circuit protection and distribution control devices for a range of proposed residential, commercial and light industrial buildings; 3. Understand the process of electrical power supply to buildings and the interaction(s) applicable with power supply authorities to ensure a safe and secure supply to buildings; 4. Evaluate the range of solutions for the supply of emergency electrical power to buildings and be able to select appropriate system(s) for buildings and interface systems with the

supply authority provided power to a building; 5. Determine the electrical power needs of building vertical and horizontal transportation systems, and be able to provide power as needed by these systems; 6. Appraise a range of potential problems and maintenance requirements (and their solutions) that could be experienced by a modern building electrical power distribution system; 7. Be familiar with the general 'architecture' of modern building electrical power distribution systems; and 8. Develop a deeper insight and ability to solve problems by undertaking building electrical power distribution analyses and writing technical reports.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and site visits.

Required Reading: J.R.Cogdell, 2003 Foundations of Electric Circuits Prentice Hall J.R.Cogdell, 2003 Foundations of Electric Power Prentice Hall Australian Standards AS3000, AS30088 and AS3439

Assessment: This is unit is run in full VU PBL mode. Although projects are done in groups, it is expected that each individual will have to defend her/his participation through the peer review system. Marks will be awarded on merit to individuals in the group not on just being a member of a group. Presentation, Based on Six (6) projects, 20%. Report, Group Project reports (x 6), 60%. Exercise, Tutorial exercise(s), 20%. A Pass must be achieved in each assessed item in order to complete the unit.

VAA3031 Environmentally Sustainable Design 1

Locations: Footscray Park.

Prerequisites: VAN2041 - Thermofluids

Description: This unit of study aims to give students a basic understanding, problem solving skills and design skills in the areas of sustainable design of buildings. Major topics covered include: climate change, basic principles of ecological buildings; buildings of tomorrow: examples and ideas, including natural ventilation in buildings, thermal storage, façade design for daylighting and solar energy transmission, air quality improvement; active measures of renewable energy usage, use of rainwater and organic matter.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Attain an overview of theories relating to climate change and ozone layer depletion; 2. Develop an understanding of the current issues in relation to energy, water, waste, materials and IEQ, especially in the context of the built environment; 3. Appraise government policies at federal, state and local levels; 4. Explain the role of government bodies and other organisations in promoting sustainable development; 5. Recognise interactions between buildings and their surroundings; 6. Explain the principles governing building design to achieve adequate levels of IEQ; 7. Predict consequences of alternative design approaches that designers can take to achieve desired outcomes in relation to IEQ; 8. Identify the common tools designers use to evaluate alternative approaches and their capabilities; 9. Demonstrate an ability to work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 10. Demonstrate good communication skills, based on technical reports and oral presentations.

Class Contact: Sixty (60) hours for one semester comprising of small group work, team meetings, lectures, workshops, seminars, practical work and site visits.

Required Reading: Class notes as distributed.Daniels, K., 1997 The Technology of Ecological Building Birkhauser

Assessment: For each assessment component, 50% of available marks must be achieved in order to pass the subject. Assignment, Two different assignments, 40%. Portfolio, Inclusive of ongoing work/ oral presentations, 30%. Examination, Final, 30%.

VAA3032 Environmentally Sustainable Design 2

Locations: Footscray Park.

Prerequisites: VAA3071 HVAC Systems 1, VAA3031 Environmentally Sustainable Design 1.

Description: This unit of study aims to give students a basic understanding, problem solving and design skills in the areas of building heat transfer and ventilation. It covers the following topics:Heat and its transmission through building structures. Convective-conductive heat flow. The U-value. Condensation in the façade cavity. Surface temperatures and thermal comfort. Glazing systems. Single and double skin facades. Wind pressures. Natural ventilation. Thermal modelling using computer packages. Steady-state one-dimensional conduction in building-elements. Discretised form of the continuous form of the governing equation and its solution. Convergence of solutions. Steady-state conduction in composite materials - analytical and numerical solutions. Estimation of heat flows into building enclosures. Numerical determination of transient heat transfer in two-dimensional systems. Studies of heat transfer by convection in fluids.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Show an understanding of the fundamental principles of heat transfer in buildings; 2. Demonstrate the ability to locate and effectively interpret information/data relevant to these areas; 3. Identify, formulate and solve related problems, and carry out associated mathematical analyses; 4. Evaluate solutions against technical, environmental, economic and social criteria; and 5. Demonstrate good communication skills, based on technical reports and oral presentations.

Class Contact: Sixty (60) hours for one semester comprising of small group and individual work, team meetings, lectures, workshops, seminars and reading assignments. In addition, students are expected to devote at least the same amount of time for private and/or group study.

Required Reading: Kreider, J.F., Curtiss, P.S. and Rabl, A., 2002 Heating and Cooling in Buildings McGraw Hill

Assessment: Report, Report on thermal conductivity of building elements such as walls, roofs, floors and how they are used in buildings, 4%. Report, Report on solar geometry as a prelude to calculating temperatures on the surfaces of buildings, 4%. Report, Report on calculating the effect of solar loads on building surfaces and the effects of glazing, 4%. Report, Report on calculating heating and cooling loads on a daily cycle at any geographical location at any time of day, 4%. Report, Final report that integrates all of the aspects of the design of a low energy beach house, 24%. Presentation, Production of poster and oral presentation, 30%. Examination, Three (3) hour skills audit on the main topics of the unit, 30%.

VAA3042 Hydraulic Services Systems

Locations: Footscray Park.

Prerequisites: VAC2042 - Hydraulics

Description: This unit of study aims to give students a basic understanding, problem solving and design skills in the areas of building water supply, sanitary plumbing and stormwater management. It covers the following topics. Types and components of building water supply systems. Assessment of demands and flows. Design criteria, head losses in pipes and fittings. Analysis and design of hot and cold pipework systems. Pumps-pump and pipeline selection. Pressure systems. Selection and arrangement of mains pressure commercial hot water units to supply to hot water fixture outlets. Theory and design of roof drainage, storm water systems and sewer

drainage systems including materials, fixtures and fittings, and the general requirements for fully vented and modified, single stack and modified sewage plumbing systems, all for building sites, residential and multi storied commercial buildings. Introduction to wastewater treatment processes and building water harvesting/recycling systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of key issues and design principles involved in hydraulic services systems in buildings; 2. Locate and effectively use information / data relevant to these areas; 3. Identify, formulate and solve related problems, and to carry out associated design work; 4. Evaluate solutions against technical, environmental, economic and social criteria; 5. Work effectively as a member and/or leader of a team; and 6. Demonstrate good communication skills, based on technical reports and/or oral presentations.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorials.

Required Reading: Ng, A. et al (20**) Building Hydraulic Services Class Notes, Sem 2. Victoria University Australian Standards 3500 (2003) National Plumbing and Drainage Code Parts 0-4 Australian Standards (VU; 20** indicates current year edition)

Assessment: Examination, Final, 60%. Assignment, Semester, 40%.

VAA3071 HVAC Systems 1

Locations: Footscray Park.

Prerequisites: VAN2041 - ThermofluidsVAC2042 - Hydraulics

Description: Module1: Refrigeration What is air conditioning? The concept of enthalpy. Reverse Carnot cycle. Vapour compression and absorption cycles. Refrigeration systems and components. COP. Refrigerants. Air conditioning and the environment.Module 2: Psychrometry Thermodynamic properties of air and water. Psychrometry and psychrometric processes. Psychrometric chart and its uses. Thermal comfort.Module 3: Load estimation Basic mechanisms of heat transfer. Heat transfer through composite walls. Heating load estimation. Solar heat gains. Room and system heat gains/losses. Cooling load estimation. Program Camel. Energy conservation in buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply principles of thermodynamics to explain how refrigeration and air conditioning systems work; 2. Explain basic psychrometric processes and show how they apply in various types of air conditioning systems; 3. Categorise the components of cooling and heating loads in buildings, and carry out cooling and heating load estimation; and 4. Explain the impact of air conditioning systems on the environment and suggest ways of minimising it.

Class Contact: Sixty (60) hours for one semester comprising of lectures and tutorials.

Required Reading: Paks, M., 1997 Design of Building Air Conditioning Systems, Part 1: Psychrometry AS&TP Jones, WP, 2001 Air Conditioning Engineering Butterworth Heinemann AIRAH, 1997 Air Conditioning: Load Estimation AIRAH Murray, M., Hamilton, T. and Kingston, T., 2002 User Guide for the Computer Program Camel ACADS-BSG Notes provided by the lecturer Class notes on WebCTBlackboard

Assessment: For each assessment component, 50% of available marks must be achieved in order to pass the subject. Assignment, Two assignments, 65%. Examination, End-of-semester, 35%.

VAA3072 HVAC Systems 2

Locations: Footscray Park.

Prerequisites: VAA3071 - HVAC Systems 1

Description: Module 4: Air and water systems in buildings. Flow of fluids in pipes and ducts. Open and closed water systems in buildings. Design of condenser, chilled and hot water systems. Demand-based water systems. Domestic cold and hot water system design. Measurement of flow and pressure in building water and air systems. Pressure distribution and cavitation. Fan and pump selection. Design of ducted systems. Fan laws and applications. Types of air conditioning systems. Constant and variable volume systems.Module 5: System components and selection. Air handling plant. Thermal plant. Methods of heat rejection. Packaged and built-up air handling units. System design for full-load and part-load operation. Energy efficiency in equipment selection and operation. Duct and pipe configurations to accommodate controls requirements. Multiple unit installations. Smoke management systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principles and operation of air and water systems in buildings; 2. Compare alternative configurations applicable to duct and pump design in order to minimise pressure losses; 3. Carry out an estimate of duct and pipe pressure losses applicable to building HVAC systems, and select an appropriate fan or pump; 4. Assess options available to HVAC designers in selecting main types of plant; and 5. Explain an impact of design decisions on equipment performance under full-load and part-load operation, and on system energy efficiency.

Class Contact: Sixty (60) hours for one semester comprising of lectures and tutorials.

Required Reading: Paks, M., 1995 An Introduction to the Design of Building Air Conditioning Systems AS&TP Standards Australia, 1998-2002 Australian Standards AS1668 Pt. 1, 2 and 3 Wang, SK., 2001 2nd ed. Handbook of Air Conditioning and Refrigeration McGraw Hill

Assessment: For each assessment component, 50% of available marks must be achieved in order to pass the subject. Assignment, Two assignments, 65%. Examination, End-of-semester, 35%.

VAA3081 Building Construction and Legislation 1

Locations: Footscray Park.

Prerequisites: VAA2031 Architectural History and Design

Description: This unit of study aims to give students an understanding of various forms of construction and applicable standards relevant to building generally: Common forms of construction. Foundation conditions and earthworks. Formwork. Floors in single-storey and low-rise buildings. Structural frames. Load-bearing and non-load-bearing walls. Tilt-up construction. Wall and roof cladding. Balconies and stairways. Lighting and ventilation. Exits. Lining and internal finishes. Services requirements. Damp-proofing. Thermal insulation. Drainage. Alternative structural systems. Builders' plant and equipment. Use of explosives in construction. Recycling, rehabilitation and renovation of buildings. Building maintenance. Concept of intelligent buildings. Establishment of building sites. Site safety. Workmanship. Building regulatory systems and building codes. Building schematic documentation and detailing. Specifications and standards. Construction techniques and sequence of work.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. An understanding of the fundamentals of conventional and innovative forms of construction; 2. Familiarity with building terminology; 3. An appreciation of the involvement of various building trades, professions, and authorities; 4. Knowledge in relation to building standards and statutory requirements; 5. An understanding of the causes and treatment of common building problems; and 6. Skills in the formulation of building schemes and details and the planning of construction work.

Class Contact: This unit will be delivered in PBL mode, and will comprise 60 hours (5 hours equivalent per week) of sessions made up of small group work, team

meetings, lectures, workshops, seminars, practical work and site visits. In addition, students are expected to devote at least the same amount of time for private and/or group study. The unit is worth 12 credit points.

Required Reading: Australian Building Codes Board (ABCB) (2005), Building Code of Australia (BCA) 2005 Volume Two, CanPrint Communications Pty Ltd; Class Notes

Assessment: Based 100% on an individual portfolio which documents evidence that the learning outcomes have been achieved. The portfolio may include skills audit results, assignment / project reports including graphical and written designs and specifications detailing creative building solutions appropriate to various property development applications, a reflective journal, workbook(s), and self and peer assessment. Further details on portfolio components will be issued to students during the first week of classes.

VAA3181 Building Construction and Control 2

Locations: Footscray Park.

Prerequisites: VAA2082 - Building Construction and Control 1

Description: This unit aims to give students an understanding of the specialist forms of construction and complex statutory controls that are relevant to: Multi-unit residential development and high-rise commercial buildings. Medium-density residential development. Common structural forms employed eg. column and beam construction, reinforced flat slabs, post-tensioned floors and their formwork systems. Spandrel walls and curtain walls. Heavy and light weight building façade systems. Structural/services cores. Spread footings, beam and pile footings. Basements and their water-proofing. Ground support systems. Protection of adjoining property during excavation and construction. Selection of building cranes and hoists for construction. Construction temporary scaffolding. Construction sequence applicable to high-rise buildings. Temporary site services and amenities. Occupational health and safety codes of practice for construction. Fire protection during construction. Schematic documentation and detailing specific to high-rise building. Design and construction standards and statutory requirements. Specification writing and contracts applicable to these types of building works. Examples of best professional practice in Building Construction and Control of multi-unit residential development and high-rise commercial buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appreciate the fundamentals of conventional and innovative forms of construction for multi-unit residential and high-rise commercial buildings; 2. Appreciate the nature of building construction in heavily-developed urban environments; 3. Appraise the common structural features and services installations specific to tall buildings; 4. Assess the involvement of principal consultants and contractors; 5. Develop further and apply their knowledge of urban development and building regulatory procedures, codes and standards; 6. Assume a leadership role in space and amenity planning; and 7. Identify major plant and equipment, techniques and practices typically employed in high-rise construction work.

Class Contact: Sixty (60) hours for one semester comprising briefings, workshops, individual work, site visits, team meetings and team work.

Required Reading: State of Victoria Department of Sustainability and Environment, 2004, Guidelines for higher density residential development, Victorian Government Department of Sustainability and Environment, East Melbourne. Ching, FDK, Onoye, BS, Zuberbuhler, D, 2009, Building structures illustrated: patterns, systems, and design, John Wiley & Sons, Inc, Hoboken, New Jersey. Australian Building Codes Board (ABCB), 2010, Building Code of Australia (BCA) 2010 Volume One, ABCB Publications, Canberra. Australian Building Codes Board (ABCB), 2010, Building Code of Australia (BCA) 2010 Volume Two, ABCB Publications, Canberra.

Assessment: Assignment, individual tutorial work and team take-home assignment work, 50%. Portfolio, Individual Portfolio, 50%. The portfolio is to feature work done in the tutorials and at home, including graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios, a reflective journal, and a self and peer assessment.

VAA4032 Environmentally Sustainable Design 3

Locations: Footscray Park.

Prerequisites: VAA3032 - Environmentally Sustainable Design 2VAA4001 - Architectural Lighting and Communications SystemsVAA3071 - HVAC Systems 1VAA3072 - HVAC Systems 2

Description: Introduction to building performance analysis tools (software as used by architects and engineers in compliance with energy efficiency provisions of the Building Code of Australia). Computer simulation modelling of buildings including thermal and solar performance, natural ventilation, natural and artificial lighting and computational fluid dynamics (CFD). Analysis of alternative design scenarios to optimise the thermal and lighting performance of buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Model and simulate complex integrated building designs in the area of thermal performance, natural ventilation, air conditioning, solar penetration, thermal comfort, and natural/artificial lighting; and 2. Analyse alternative building design scenarios to achieve optimised building thermal and lighting performance.

Class Contact: Lecture3.0 hrsTutorial4.0 hrs

Required Reading: Szokolay, S.V. (2008) 2nd Edition uction to Architectural Science: the Architectural Press, Oxford, UK

Assessment: Portfolio, Portfolio, 100%. An individual portfolio which provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio will include two major parts: a skills audit and an assignment set which focuses on an existing building (nominally the student's residence). The assignment set includes benchmarking, simulation and exploration of a series of possible renovations. The skills audit is conducted in a series of standardized tasks comprising a short course in Building Thermal Performance Assessment (Residential) that can result in a Statement of Attainment if performance is at least 80% on each in-class skills audit.

VAA4042 Building Fire Safety Systems

Locations: Footscray Park.

Prerequisites: VAA3042 - Hydraulic Services SystemsVAA3181

Description: This unit aims to give students an introduction to building fire safety engineering (FSE). Includes, fire safety and protection provisions in building regulations and building codes. deemed-to-satisfy design, design to standards, and performance based design. Stakeholders in the FSE design process. Fire design briefs, design, certification, fires safety system commissioning, and maintenance. Performance methods of design including equivalence, absolute evaluation of performance requirements, use of qualitative and quantitative methods, scientific (phenomenological) and risk approaches. Fire initiation and development, smoke control, fire spread, detection, warning, suppression, evacuation, and fire brigade intervention. Pre-flashover fire growth. Smoke spread. Post-flashover fire modelling. Occupant response in fires. Active sprinkler protection systems and ancillary equipment. Classes of hazard, design criteria and code requirements. System requirements for Ordinary Hazard (OH) systems. Full hydraulic calculation method for design of OH systems. Assumed area of operation. Design density of discharge. Design of fire hydrant and fire hose reel systems. Residential and domestic sprinkler systems. Portable fire extinguishers. Fire risk statistics, event and fault trees, and

overall fire risk management.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appreciate the fundamentals of fire safety engineering in building design; 2. Participate in the fire safety design process using correct fire safety terminology; 3. Assess the involvement of fire safety authorities and the need for specialist fire safety consultants and contractors; 4. Interpret and apply existing fire safety standards and related statutory requirements in an 'evolving' area of the building industry. Appraise the applicability of research and fire safety standards from overseas, to Australian conditions; 5. Specify fire safety features and installations appropriate to various sizes / uses of a range of residential, light industrial and commercial buildings; and 6. Formulate fire safety schemes and details, and organise the planning of system installation and maintenance.
Class Contact: Lab 1.0 hr Lecture 1.0 hr Sixty (60) hours for one semester comprising briefings, workshops, individual work, site visits, team meetings and team work.
Required Reading: Buchanan, AH, 2001 Fire Engineering Design Guide ntre for Advanced Engineering, University of Canterbury Australian Building Codes Board (ABCB), 2010 Volume One Building Code of Australia (BCA) 2010 Australian Building Codes Board (ABCB), Canberra
Assessment: Other, individual tutorial work and team take-home assignment work, 50%. Portfolio, Portfolio, 50%. The portfolio is to feature work done in tutorials and at home, including a graphical and written record of fire safety system design(s), specifications detailing creative solutions appropriate to the given building design brief, a reflective journal, and a self and peer assessment.

VAA4051 Building Quantities and Costs

Locations: Footscray Park.
Prerequisites: VAN3052 Engineering Management.
Description: The project development process, the parties and the trades involved in the process. Bill of Quantities. Quantity surveyor's role. Introduction to schedule of rates of the bill of quantities and components, measurements of quantities. Estimating principal trades, contractors' cost estimates and standard method of measurement. Computer applications for estimating process. The feasibility of construction projects. Life cycle costing (LCC) analysis, theory of LCC optimization, practical application of LCC to engineering projects. Project cash flows, budgeting and cost control. Cost control during project development and construction phase. Value engineering. Building maintenance and associated costs.
Credit Points: 6
Class Contact: two hrs of lectures and 1hr of tutorial and computer lab session per week
Required Reading: Lecture Notes; Marsden, Paul K. (1998) Basic Building Measurement, 2nd Edition, New South Wales University Press, Sydney, Australia; Kirk & Dell'Isolla (1999) Life Cycle Costing for Design Professionals, 2nd Edition
Assessment: Assignment 1: based on weeks 1-5 (calculations, sketches, computer applications, max word limit of 1000), 15%; Assignment 2: based on weeks 6-11 (calculations, sketches, computer applications, max word limit of 1000), 15%; Class Tutorial Exercises Based on Weeks 1-11 (calculations, sketches, computer applications, max word limit of 500),10%; three hour examination, 60%.

VAA4071 HVAC Systems 3

Locations: Footscray Park.
Prerequisites: VAA3072 HVAC Systems 2.
Description: Module 6: Operation of controls in building services systems. Fundamentals of controls theory. Sensors and their responses. Operation of dampers and control valves. Control strategies applicable to air conditioning systems and equipment. Direct digital controls. Energy management in air conditioning. Module 7: Fundamentals of sound. Noise criteria and assessment. Sound in rooms. Sound insulation. Noise sources in buildings: fans and fan systems. Noise control in ducts.
Credit Points: 6
Class Contact: Lecture 3.0 hrs
Required Reading: Bies, D. and Hansen, C., 2003, Engineering Noise Control: Theory and Practice, 3rd ed., E & FN Spon, London; Coffin, MJ., 1998, Direct Digital Control for Building HVAC Systems, 2nd ed., Kluwer Academic Publishers; Notes provided by the lecturers; Class notes.
Assessment: Assignment 1: (Group assignment; up to 3000 words), 30%; Assignment 2: (Group assignment; up to 3000 words + calculations + diagrams, 35%; three hour examination, 35%.

VAA4082 Building Construction and Legislation 2

Locations: Footscray Park.
Prerequisites: Nil.
Description: Column-and-beam construction. Fire-resistance of structural members. Structural/services cores, suspended slabs and associated formwork systems. Construction sequence applicable to high-rise buildings. Spandrel walls and curtain walls. Atriums. Fire-isolated stairways. Basements and damp-proofing. Ground support systems. Protection of adjoining property. Exterior finishes. Partitioning. Artificial lighting and mechanical ventilation. Emergency lighting and exit signs. Sanitary facilities. Access and facilities for people with disabilities. Lifts and escalators. Essential services for fire safety. Temporary site services and amenities. Occupational health and safety codes of practice. Use of cranes and hoists. Scaffolding. Temporary overhead protection. Fire protection during construction. Demolition work. Schematic documentation and detailing specific to high-rise building. Design and construction standards and statutory requirements. Medium-density residential development.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Developed an understanding of the nature of building construction in heavily-developed urban environments; 2. Become familiar with structural features and services installations specific to tall buildings; 3. Gained an appreciation of the involvement of principal consultants and contractors; 4. Enhanced their knowledge of urban development and building regulatory procedures, codes and standards; 5. Become more skilled in space and amenity planning; and 6. Gained an appreciation of major plant and equipment, techniques and practices typically employed in high-rise construction work.
Class Contact: This unit will be delivered in PBL mode, and will comprise 36 hours (3 hours equivalent per week) of sessions made up of small group work, team meetings, lectures, workshops, seminars, practical work and site visits.
Required Reading: Australian Building Codes Board (ABCB) (2005), Building Code of Australia (BCA) 2005 Volume One, CanPrint Communications Pty Ltd; Burnell, R., VAA4082 Class Notes
Assessment: Based 100% on an individual portfolio which documents evidence that the learning outcomes have been achieved. The portfolio may include skills audit results, assignment / project reports including technical calculations, site visit reports, a reflective journal, workbook(s), and self and peer assessment. Further details on portfolio components will be issued to students during the first week of classes

VAA4091 Structural Dynamics 1

Locations: Footscray Park.

Prerequisites: RMA 1002 Engineering Mathematics 1B & REP 1003 Engineering Physics 1C.
Description: Introduction to structural vibrations. Degree of freedom of a system - vibrations of undamped and damped systems, harmonically excited vibration of systems, response systems to harmonically forced excitation, general forcing functions. Eigenvalue for a system, determination of natural frequencies and mode shapes, structural vibration simulation using computer software.
Credit Points: 6
Class Contact: two hrs of lectures and one hrs of tutorials per week
Required Reading: Rao S.S. (1995), Mechanical Vibrations, Third Ed., Addison-Wesley Publishing Company; Inman D.J. (2001) Engineering Vibration, Second Ed., Prentice Hall; Class Notes.
Assessment: Computer based assignment (3000 words equiv.), 25%; Mid-semester test (1 hr), 15%; Tutorial presentation (15 mins), 5%; three hour examination, 60%.

VAA4092 Building Systems Design and Construction

Locations: Footscray Park.
Prerequisites: VAA3072 HVAC Systems 2 or VAC3092 Structural Design
Description: This unit aims to provide students with an overview of key concepts involved in the integration of building services with building structure, during the design and construction stages. Students are exposed, through a range of lectures and site visits, to constructability/buildability and co-ordination aspects of building services, as well as to compliance with building codes and regulations. Issues involving integrated building design to minimise construction costs and achieve sustainable construction methods are also introduced.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand problems and procedures involved in co-ordination of individual building services; 2. Understand principles of successful integration of all building services during the design and construction stages; 3. Conceptualise solutions to construction technology tasks and problems, logistical planning and assembly; and 4. Enhance their report writing and oral presentation skills.
Class Contact: This unit will be delivered in PBL mode, and will comprise 36 hours (3 hours equivalent per week) of sessions made up of small group work, team meetings, lectures, workshops, seminars, practical work and site visits.
Required Reading: Paks, M. et al, VAA4092 Class Notes.
Assessment: Based 100% on an individual portfolio which documents evidence that the learning outcomes have been achieved. The portfolio may include skills audit results, assignment / project reports including technical calculations, site visit reports, a reflective journal, workbook(s), and self and peer assessment. Further details on portfolio components will be issued to students during the first week of classes

VAA4121 Structural Dynamics

Locations: Footscray Park.
Prerequisites: VAC3021 - Structural AnalysisVAC3092 - Structural Design
Description: This unit of study aims to provide an insight into the analysis and design of structures subject to dynamic loads. The following topics would be covered: Degrees of freedom, undamped and damped systems, response of systems to harmonic excitations, general forcing functions. Eigen value for a system, natural frequencies and mode shapes. Introduction to earthquake resistant design, response spectra, seismic behaviour of structures, basis of seismic design codes. Introduction to blast and impact forces. Response of multi degree of freedom systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the response behaviour of systems subjected to harmonic excitations and general forcing functions; 2. Calculate natural frequencies of systems and draw or develop mode shapes; 3. Develop response spectra of single degree of freedom systems; 4. Use earthquake codes of practice; 5. Use commercially available software in the analysis and/or design of structures subjected to dynamics loads; and 6. Interpret data collected from the instrumentation of structures under natural vibration and or forced excitation.
Class Contact: Sixty (60) hours for one semester comprising a mixture of lectures, tutorials, workshops, site visits (including inquiry based laboratory sessions) and group activities.
Required Reading: Class Notes and additional resources on WebCT
Assessment: Examination, Closed book examination, 40%. Portfolio, Inclusive of 2 or 3 projects, 60%. The portfolio provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio may include reports based on laboratory activities, site visits, software applications and/or other assigned tasks. .

VAA4182 Building Systems Design & Costing

Locations: Footscray Park.
Prerequisites: VAN3052 - Engineering ManagementVAC3192 - Structural Engineering Design 1
Description: Module 1: Building Systems Design This module aims to provide students having background in building services or in structural design with an overview of the main issues involved in the integration of these elements, during the design and construction stages. It intends to develop in the student a systematic, analytical and critical approach to the constructability issues and explains how buildability can be implemented within the procurement process. Students are exposed, through a range of lectures and site visits, to buildability and coordination aspects of building services, as well as to compliance with building codes and regulations. It further aims to develop students' ability to think laterally in order to select the most suitable option during the design stage resulting in services and structural system integration, aiming to minimise construction costs and impact on the environment. Module Two: Costs The project development process, the parties and the trades bill of quantities; quantity surveyor's role; schedule of rates; measurements of quantities; estimating principal trades, contractors' cost estimates; computer applications for estimating process; construction projects feasability; life cycle costing (LCC) analysis, theory of LCC optimization, LCC application in engineering projects; project cash flows, budgeting and cost contro; cost control in development and construction phases; value engineerin; building maintenance.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify problems and procedures involved in co-ordination of individual building services; 2. Assess principles of successful integration of all building services into building structure during the design and construction stages; 3. Conceptualise solutions to problems involving construction technology tasks, logistical planning and assembly; 4. Describe the methodology applied in the measurement and estimating of building works, including computer applications; 5. Describe the roles of bills of quantities and the pricing of unit rates in the tendering process; 6. Discuss the role of cost control frameworks in the design and construction phases of capital works; 7. Explain the principles and methodology for life cycle economic evaluation and management of building-related assets; 8. Apply appropriate software for estimating and life cycle cost modelling; and 9. Develop advanced report-writing and oral presentation skills.
Class Contact: Sixty (60) hours or equivalent for one semester comprising of a mix of

lectures, small group work and workshops.

Required Reading: Marsden, Paul K. (1998) 2nd Edition Basic Building Measurement New South Wales University Press, Sydney, Australia Kirk & Dell'Isolla (1999) 2nd Edition Life Cycle Costing for Design Professionals Notes and handouts provided by the lecturers.

Assessment: For each assessment component, 50% of available marks must be achieved in order to pass the subject. Assignment, Integrated building design, 35%. Assignment, Estimating and life cycle cost analysis, 30%. Presentation, Oral presentation, 5%. Examination, End-of-semester examination, 30%.

VAC2011 Engineering Materials & Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit covers the behaviour, properties, performance and limitations of the most widely used construction materials such as concrete, steel, timber as well as other construction materials such as polymers and composites. In addition, the unit gives an introduction to construction equipments, techniques and OH&S requirements used by the Civil or Building Engineering industry .

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the types, properties and applicability of materials; most commonly used in civil and building engineering construction work (i.e. concrete, steel and timber); 2. Demonstrate an appropriate knowledge of other construction and building materials masonry, aluminium, glass, polymers and composites; 3. Select the types and applications of plants, equipments and construction processes for variety of civil and building engineering construction processes; 4. Investigate materials, equipment and construction techniques for a specific project; and 5. Describe the importance of the OH&S and environmental requirements for working in a construction site with specific material, plant or project.

Class Contact: Sixty (60) hours for one semester comprising a mixture of lectures, PBL workshops (including inquiry based laboratory sessions) and group activities.

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. There is no required text for this unit.

Assessment: Examination, End of semester 2 Hour Exam, 50%. Project, PBL1: Group technical report with 2000 words approximately, 25%. Case Study, PBL2: Group technical report with 2000 words approximately, 25%. Examination covers all Learning Outcomes and Graduate Capabilities 1, 2 & 3 Project covers Learning Outcome 1, 2 & 5 and all Graduate Capabilities and the 50% LiWC Case study covers Learning Outcomes 3, 4 & 5 and all Graduate Capabilities.

VAC2022 Building Materials and Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: Sand and crushed rock: excavation, drilling, blasting, conveyance, crushing, screening, washing, storage, use. Concrete: constituents, mix design, laboratory tests and standards for strength, workability, etc (cylinders, slump), properties of fresh and hardened concrete (strength, serviceability, creep, shrinkage, durability), concrete plant arrangements, concrete transport, placing, reinforcement, curing, pumping, spraying, cement grouting. Formwork for concrete. Steel: types and applications, material standards, fabrication, paints / coatings and corrosion protection, delivery and erection. Timber: strength and serviceability properties, effects of microstructure and moisture content (hardwoods, softwoods, grain, gum, chemical constituents, etc), decay / weathering and protection, typical applications, fire resistance. Other materials: overview of properties and applications of masonry, aluminium, glass and selected plastics. Introduction to construction equipment/ techniques including use of excavators, dredges, shoring, pumping and dewatering plant, piledrivers, scaffolding and falsework, winches, cranes, cableways and haulage units. Construction sites: site establishment and facilities required, introduction to OH&S issues. Many of the topics above will be related to case studies on projects such as buildings, bridges, roads, tunnels and dams.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the types, properties and applicability of materials most commonly used in civil and building engineering construction work; 2. Gain broad knowledge of the type, properties and applications of plant and equipment which could typically be used in a variety of civil and building engineering construction processes; 3. Gain broad knowledge of construction techniques which could be used in a variety of projects; 4. Make a reasonable choice of materials, plant, equipment and construction techniques for one or more specific projects; and 5. Within the context of the subject areas above, to find and use relevant information, to formulate and solve specific problems, to work both autonomously and as a member of a team.

Class Contact: 5 hrs equivalent per week of sessions made up of small group work, team meetings, workshops, seminars, laboratory sessions and site visits. In addition, students are expected to devote at least this much time for private and/or group study.

Required Reading: None Required

Assessment: An individual portfolio which providesevidence that demonstrates that the learning outcomes have been achieved. The portfolio may include skills audits, laboratory reports, site visit / project reports, reflective journals, workbooks, self and peer assessment.

VAC2032 Civil Project

Locations: Footscray Park.

Prerequisites: VAC2011 - Engineering Materials & Constructionvac2171

Description: This unit aims (i) to develop students' ability to apply skills learned in other year 1 and 2 units to (one or more of) the investigation, planning, design, construction and costing of facilities which might be of benefit to groups within the community, and (ii) to further develop a range of more generic skills including teamwork and communication. Students will work in small teams on projects generally derived from local councils, community groups, schools, companies or government agencies. Projects might typically relate to water conservation, parkland / school / playground development, OH&S issues, small scale construction works and the like, and develop further skills / knowledge in such areas as surveying, mapping and drawing, hydraulics, materials and basic construction, and roadwork elements. Output will typically consist of one or more reports including problem analysis, calculations, engineering drawings and recommendations, and an oral presentation on the project.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Investigate, plan, design and/or construct elements of a relatively simple but real civil engineering project; 2. Identify, formulate and solve specific design problems associated with the project; 3. Locate and effectively use information / data relevant to the project; 4. Reasonably consider technical, environmental, economic and social issues relevant to the project; 5. Work effectively as a member and/or leader of a team; and 6. Demonstrate good communication skills, based on technical reports, team discussions and an oral presentation.

Class Contact: Sixty (60) hours for one semester comprising sessions made up of

design workshop / seminars and student team investigation, design and/or construction work.

Required Reading: Jensen, J.N. (2006), A User's Guide to Engineering, Pearson Prentice Hall

Assessment: Portfolio, Portfolio, 100%. The portfolio documents evidence that the learning outcomes have been achieved. The portfolio will normally include skills audit results and design reports including technical calculations, but may also include a reflective journal, workbook(s), and self and peer assessment. Further details on portfolio components will be issued to students during the first week of classes.

VAC2042 Hydraulics

Locations: Footscray Park.

Prerequisites: VAN2041 - Thermofluids

Description: Fluid resistance and boundary layers; Development of pipe friction equations and their use. Fluid flow through pipelines; inter-reservoir- pipeline flow, branching pipelines, parallel pipelines; Dimensional analysis – Rayleigh's method and Buckingham pi method, hydraulic models and similarity; Pumps - positive displacement and rotodynamic systems. Pump performance equations, affinity laws and specific speed. Pump selection for particular duties; Flow in open channels - fundamentals (continuity, energy and momentum equations), discharge equations, specific energy and critical depth relationships, flow transitions and weirs and flumes. Gradually varied flow and water surface profiles. Introduction to unsteady flow condition.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify concepts of hydraulics, complemented with practical laboratory based experiments (on pipe flow and open channel flow); 2. Apply continuity, momentum and energy equations to inter-reservoir pipe flow; 3. Use dimensional analysis to develop relationships and also for hydraulic model similitude studies; 4. Identify types of pumps, affinity laws and pump selection for particular duty; and 5. Apply concepts of open channel flow to practical engineering related problems.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and laboratory sessions.

Required Reading: Hamill, L. (2001) 2nd edition Understanding Hydraulics MacMillan Press Class notes uploaded on WebCT

Assessment: Assignment, Based on self selected site visit in week 9 (Report, photographs, sketches, max word limit of 1500), 10%. Test, Three (3) tests throughout semester, 30%. Examination, End-of-semester examination, 60%.

VAC2071 Surveying

Locations: Footscray Park.

Prerequisites: Nil.

Description: Surveying Reference and Basic Computations, Mapping, Vertical Measurement and Note Keeping, Angular Measurement and Note Keeping, Circular Curves, Contours and Contouring, Area Computations for Polygons, Rectangular co-ordinates, Computations for Earth Works, Digital Terrain Models, Geographic Positioning Systems, Victorian Land Title System.

Credit Points: 12

Required Reading: Class notes.

Assessment: Field work/tutorials 1: Basic Survey Computations (Max. 500 words), 5%; Field work/tutorials 2: Mapping (Max. 500 words), 5%; Field work/tutorials 3: Transferring a level to determine RL of a point (Max. 500 words), 5%; Field work/tutorials 4: Level traverse to determine RL of many points (Max. 500 words), 5%; Field work/tutorials 5: Determining angles in horizontal plane (Max. 500 words),5%; Field work/tutorials 6: Circular curve set out (Max. 500 words), 5%; Field work/tutorials 7: Grid leveling and contouring (Max. 500 words), 5%; Field work/tutorials 8: Area and perimeter computations using co-ordinates (Max. 500 words), 5%; two hour examination, 60%; Students are required to pass both Field Work and Examination to receive a pass in the subject.

VAC2072 Highway Engineering

Locations: Footscray Park.

Prerequisites: VAC2171 - Engineering Surveying

Description: Earthworks including equipment, determination of quantities and costs; preparation and use of mass haul diagrams. Route location factors, route selection, horizontal alignment including circular curves and transition curves and superelevation, determination of sight distance; vertical alignment including grades and vertical curves. Pavement design methods for both flexible and rigid pavements, determination of number of equivalent standard axles, use of California Bearing Ratio. Road construction equipment capabilities. Introduction to road drainage methods, surface and subsurface drainage. Road maintenance issues and programs.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply appropriate geometric standards to the design of rural roads; 2. Demonstrate understanding of methods to determine efficient earthworks operations; 3. Demonstrate understanding of the process for designing road pavements; 4. Identify, formulate and solve related problems, and carry out associated design work; 5. Use a system approach to design, and evaluate solutions against technical, environmental, economic and social criteria; 6. Work effectively as a member and/or leader of a team; and 7. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and one field trip.

Required Reading: Austroads (1993), 7th edn; Rural Road Design Austroads Evans, G. (20**), VAC2072 Highway Engineering Notes, sem 2, 20** Victoria University (VU; 20** indicates current year addition)

Assessment: Assignment, Assignment 1: site investigations, 10%. Assignment, Assignment 2: geometric standards and super elevation (calculations & drawings), 10%. Assignment, Assignment 3: pavement design (calculation & drawings), 10%. Examination, Final, 70%.

VAC2092 Introduction to Structural Engineering Design

Locations: Footscray Park.

Prerequisites: VAC2121 - Solid Mechanics

Description: This unit of study aims to provide a basic introduction into the design principles of structural elements. The following topics would be covered: Steel: Load calculation, dead and live loads, design loads rationale, calculation of specific loads. Design of simple structural members in tension, compression, bending and shear. Design of bolted and welded connections in simple shear or tension. Timber: Design of timber beams, columns. Nailed and bolted connections in simple shear. Other materials: Review of fundamental concepts based on Solid Mechanics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design steel elements in tension, compression, bending and shear; 2. Design steel connections consistent with the above outcome; 3. Design timber beams and columns and appropriate connection details; 4. Demonstrate a basic understanding of design fundamentals; and 5. Formulate and solve specific problems, and work both autonomously and as a member of a team.

Class Contact: Sixty (60) hours for one semester comprising a mixture of lectures, tutorials, workshops, site visits (including inquiry based laboratory sessions) and group activities.
Required Reading: Class Notes and additional resources on WebCT
Assessment: Portfolio, Portfolio, 100%. The portfolio provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio may include skills audits, laboratory activities, project reports, reflective journals, self and peer assessment.

VAC2121 Solid Mechanics

Locations: Footscray Park.
Prerequisites: ENF1102 - Engineering Physics 1ENF1201 - Engineering Mathematics 2
Description: Engineers are required to design or analyse a variety of elements, components or structures that are often exposed to a variety of loading conditions. Therefore an abstract understanding of statics, equilibrium and the mechanics of materials used is required. In particular, the abstract concepts of the equivalent states of equilibrium and the compatibility of external and internal deformation must be understood. It is widely recognised that “Statics” and “Solid Mechanics” is a fundamental subject area in engineering.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate states of statical equilibrium for objects subjected to forces/couples in two/three dimensions, including external 'freebody' force/couple diagrams; 2. Assess internal forces in simple pin-jointed trusses, beams and frames including axial force, bending moment and shearing force diagrams; 3. Determine elastic normal and shearing stresses in objects subjected to force systems; 4. Evaluate properties of cross-sections (including centroids and moment of inertia) and stiffness and strength properties of engineering materials; 5. Evaluate deflection of simple beams, failure modes of simple compression members, and internal/external forces in simple two dimensional rigid frames; and 6. Solve problems, undertake basic Engineering analysis and design and write technical reports.
Class Contact: Sixty (60) hours for one semester comprising lectures and tutorial/practice classes. Includes a mix of individual and small group work.
Required Reading: Hibbeler, RC 2010, 12th edn in SI units, Engineering mechanics: statics, Pearson/ Prentice Hall, Singapore. Recommended Reading - Texts Hibbeler, RC 2004, "Statics and mechanics of materials", SI Units, Pearson/ Prentice Hall, Singapore. Hibbeler, RC 2011, "Mechanics of materials", 8th edn in SI Units, Pearson/ Prentice Hall, Singapore
Assessment: Test, Mid Semester Test (1.5 hours), 20%. Examination, End of Semester Examination (3 hours), 50%. Assignment, Homework Problems (fortnightly), 15%. Project, Project Report (10 pages approx.), 15%. Assessment Item 1 addresses graduates capabilities 1 and 2; and learning outcomes 1, 2, and 6. Assessment Item 2 addresses graduates capabilities 1 and 2; and learning outcomes 2 to 6. Assessment Item 3 addresses graduates capabilities 1,2 and 5; and learning outcomes 1 to 6. Assessment Item 4 addresses graduates capabilities 3,4 and 5; and learning outcome 6. .

VAC2171 Engineering Surveying

Locations: Footscray Park.
Prerequisites: ENF1201 - Engineering Mathematics 2
Description: This unit of study covers the application of a range of surveying instruments and the techniques to be adopted. The following topics would be covered: Surveying reference and basic computations, Mapping, Vertical measurement and note keeping, Angular measurement and note keeping, Circular curves, Contours and Contouring, Area computations for polygons, Rectangular co-ordinates, Computations for earth works, Digital terrain models, Geographic positioning systems and Victorian land title system.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use a range of surveying instruments; 2. Observe measurements in the field and keep records; 3. Set out circular curves; 4. Produce contour maps of different terrains; 5. Operate with rectangular co-ordinates and compute areas of polygonal shapes; and 6. Formulate and solve specific problems and work both autonomously and as a member of a team.
Class Contact: Sixty (60) hours for one semester comprising a mixture of lectures, tutorials, field work and group activities.
Required Reading: Class Notes and additional resources on WebCT.Ghilani, C D & Wolf, P R. (2011) 13th Ed. Elementary Surveying: An Introduction to Geomatics New York: Pearson Education
Assessment: Practicum, Fieldwork (6 practicals at max two pages each), 30%. Assignment, One assignment (1000 words), 20%. Examination, 2 hour end of semester exam, 50%. LiWC component is the fieldwork reports valued at 30% Fieldwork components assess Graduate capabilities 1 to 5 and Learning Outcomes 1 to 6 Assignments assess Graduate Capabilities 3 to 6 and Learning Outcomes 2,4,& 6 Exam assesses all Graduate Capabilities and Learning Outcomes.

VAC3021 Structural Analysis

Locations: Footscray Park.
Prerequisites: VAC2121 Solid Mechanics
Description: Engineers are required to design or analyse a variety of structures that are often exposed to a variety of loading conditions. Therefore an understanding of key analysis methods for statically determinate and indeterminate trusses, beams and frames should be mastered. These include, the method of virtual work for determination of deflections and rotations, the 'stiffness' method of analysis (including the equations of slope deflection and numerical approximation by moment distribution) for beams and rigid frames, the matrix representation of the stiffness method for solution by digital computation and the flexibility method of analysis for statically indeterminate trusses, beams and rigid frames. Experience in approximate analysis of structures and in structural 'modelling' and analysis using commercial linear finite element analysis computer program(s). An introduction to stability analyses of rigid frames and frame buckling.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate structural deflections and rotations for a range of structures (modelled as connected linear elements), which behave in a linear and elastic manner; 2. Evaluate internal axial forces, shearing forces and bending moments for a range of determinate and indeterminate structures (modelled as connected linear elements), which behave in a linear and elastic manner; 3. Create and analyse structure models using a commercial computer program, where structures are modelled as connected linear elements which behave in a linear and elastic manner; 4. Create and analyse structure models using a commercial computer program, where structures are modelled as connected linear elements within which, at ultimate load, compression members may buckle; 5. Compare solutions obtained by analysing structures using commercial computer programs to those obtained by classical (manual) methods of analysis, and to understand the limitations of both approaches to structural analysis. 6. Appraise a range of approximate solutions for common structures; and 7. Solve problems, undertake standard structural Engineering

analyses and write technical reports.
Class Contact: Sixty (60) hours for one semester comprising lectures and tutorials.
Required Reading: Hibbler R.C., 2005 6th edition Structural Analysis Pearson International
Assessment: Examination, Mid-semester test, 30%. Examination, Final Exam, 35%. Assignment, Portfolio of computer analyses, 20%. Assignment, Structural model project, 15%.

VAC3031 Civil Engineering Design 1

Locations: Footscray Park.
Prerequisites: VAC2072 - Highway EngineeringVAC2042 - Hydraulics
Description: This unit of study aims to give students design skills in several areas of civil engineering, and to further develop a range of more generic skills including teamwork and communication. Students will work in small design teams to carry out (typically) four designs drawn mainly from the areas of water and road engineering. Each design will involve analysis, calculations and preparation of engineering drawings. Two designs will have associated with them an individual writing task of about 800 words on aspects relating to the design. Students must also prepare and deliver one oral presentation on one of the designs or associated written tasks performed during the semester.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Respond to a range of simple civil engineering design problems; 2. Perform preliminary designs in a number of civil engineering disciplines; 3. Evaluate design solutions against a range of technical and other criteria; and 4. Demonstrate problem identification / formulation / solution, effective communication, an ability to work as a member and/or leader of a small team, the ability to use a system approach to design, and a capacity to undertake life-long learning.
Class Contact: Sixty (60) hours for one semester comprising sessions made up of design workshop / seminars and student team design work.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.
Assessment: Portfolio, The portfolio will normally include skills audit results and design reports including technical calculations,, 100%. The portfolio may also include a reflective journal, workbook(s), and self and peer assessment. Further details on portfolio components will be issued to students during the first week of classes.

VAC3041 Hydrology and Water Resources

Locations: Footscray Park.
Prerequisites: VAC2042 - Hydraulics
Description: This unit is designed to enable students to acquire an understanding of the theoretical principles in engineering hydrology and water resources engineering. This unit will enable students to acquire theoretical knowledge and critical thinking skills and apply these to problems. This unit also provide students an opportunity to enhance their oral and written communication skills as well as other Engineers Australia professional capabilities. Topics include; Hydrologic cycle, rainfall and runoff routing, Urban Drainage design, Floodplain management, Water resources development, Computer software including RORB/MiRORB, and SOURCE.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and synthesise a range of numerical problems in urban hydrology, rainfall/runoff routing, flood frequency, urban drainage, flood plain, and water resources management; 2. Conceptually map and design urban drainage networks and to recommend and justify computations; 3. Integrate the concepts in rainfall/runoff routing using RORB/MiRORB; 4. Simulate water supply system using SOURCE; and 5. Initiate, coordinate and manage team projects in water resources management and to recommend and present the optimum solutions professionally.
Class Contact: Forty-eight (48) hours for one semester comprising small group work, team meetings, lectures, workshops and computer labs.
Required Reading: The Lecturer will provide notes and information on other textbooks that can be used in conjuction with other units, aswell as those available by online subscription. Students please check with the Main library.
Assessment: Students must achieve: 1. at least 40% in assessments 1 - 3 in order to pass the subject, and; 2. at least 50% in assessment 4 in order to pass the subject. Assignment, Drainage design and presentation, 10%. Assignment, RORB/MiRORB, 15%. Assignment, SOURCE, 15%. Examination, End of Semester Exam (3 hours), 60%. The total combined assessment word equivalence is approximately 4,000 words. 1. Drainage design assignment assess Learning outcomes 1,2 and 5 and Graduate capabilities GC1 a-c and meet Engineers Australia PE 1 competencies 1.1, 1.3, 3.2, 3.3, 3.5 and 3.6. 2. RORB/MiRORB assignment assess Learning outcomes 1,3 and 5 and Graduate capabilities GC1 a-c and meet Engineers Australia PE 1 competencies 1.1, 1.3, 2.2, 3.3, 3.5 and 3.6. 3. SOURCE assignment assess Learning outcomes 1,4 and 5 and Graduate capabilities GC1 a-c and meet Engineers Australia PE 1 competencies 1.1, 1.3, 2.2, 3.3, 3.5 and 3.6. 4. End of Semester Exam assess Learning outcomes 1-4 and Graduate capabilities GC1 a-c and GC 2 a-c and meet Engineers Australia PE 1 competencies 1.1, 1.3.

VAC3042 Hydraulic Engineering

Locations: Footscray Park.
Prerequisites: VAC2042 - Hydraulics
Description: This unit of study aims to give students a basic understanding, problem solving and design skills in the areas of water supply and irrigation engineering. It covers the following topics:Urban Water Supply Schemes: Demand assessment and management, supply sources, dam types/spillways/outlet works/construction and safety issues, groundwater development works, water quality requirements and various types of treatment to satisfy these, service storage, pumping stations, reticulation system arrangements/layout and manual/computer analysis, pipeline design and construction.Irrigation: Purpose and principles of irrigation, irrigation water quality, channel design and structures, flood, furrow, sprinkler and trickle irrigation layout and design principles
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate understanding of key issues and design principles involved in urban water supply / treatment systems and irrigation works; 2. Locate and effectively use information / data relevant to these areas; 3. Identify, formulate and solve related problems, and carry out associated design work; 4. Evaluate solutions against technical, environmental, economic and social criteria. 5. Work effectively as a member and/or leader of a team; and 6. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.
Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and (usually) one field trip.
Required Reading: Lechte, P. (20**), VAC3042 Hydraulic Engineering - Course Notes and Tutorial Problems, Sem 2, 20** Melbourne; Victoria University (VU; 20** indicates current year edition)
Assessment: In order to be eligible for either a pass or supplementary assessment, students must get at least 40% on the end-of-semester examination Test, Class Test, 10%. Assignment, Field &/or problem-based team assignment, in 2-3 parts, 30%.

Examination, 3 hr end-of-semester exam, 60%. Test assesses: Graduate capability 4, Learning outcome 1 Assignment assesses: Graduate capabilities 1-5, Learning outcomes 2-5 (assignment is normally split into 2-3 parts, with total max no. of pages / student ~ 10 (may include text, diagrams, photos, calculations/computer output, etc, so straight word limit cannot be given) Examination assesses:Graduate capabilities 1-3, Learning outcomes 1-3 LIWC linked to simulated work environment & field investigation part of assignment.

VAC3061 Geomechanics

Locations: Footscray Park.

Prerequisites: VAC2121

Description: Importance of geology in engineering. Earth history, rock formation and basic structural geology. Geological maps and their interpretation. Erosion/transportation/deposition processes and soil formation. Geology and soils of Melbourne and related case studies. Classification, description and engineering properties of soil and rock, soil phase relationships, clay behaviour. In-ground stress due to gravity loads, principle of effective stress. Permeability, seepage of water through soil, flow nets and applications. Shear strength, friction angle and cohesion in various soil types under differing moisture conditions, Mohr-Coulomb strength criterion. Slope failure mechanisms and related stability analyses, stability charts and methods of slope stabilisation. Earthworks and compaction of soils and crushed rock including methods, specification and field evaluation. Geotechnical site investigation including desk studies, boring/sampling/testing methods, soil/rock profile logging and reporting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate understanding of processes and key issues related to the areas of geology, soil and rock classification systems and water behaviour, water seepage through soils, soil shear strength, slope stability, compaction and geotechnical site investigations; 2. Locate and effectively use information / data relevant to these areas; 3. Solve a range of numerical problems and carry out design tasks related to these areas; 4. Work effectively as a member and/or leader of a team; and 5. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and laboratory work.

Required Reading: Smith, I, (2006) 8th edn Elements of Soil Mechanics Blackwell Science Lechte, P. (20**) VAC3061 Geomechanics - Supplementary Notes and Tutorial Sheets, Sem 1, 20** Victoria University (VU; 20** indicates current year edition)

Assessment: In order to be eligible for either a pass or supplementary assessment, students must get at least 40% on the end-of-semester examination Test, Class test, 10%. Assignment, Field & problem-based team assignment, in 2-3 parts, 30%. Examination, 3 hour end-of-semester exam, 60%. Test assesses: Graduate capability 4, Learning outcome 1 Examination assesses: Graduate capabilities 1-3, Learning outcomes 1-3 Assignment assesses: Graduate capabilities 1-5, Learning outcomes 2-5 (assignment is normally split into 2-3 parts, with total max no. of pages / student ~ 9-10 (these may include text, diagrams, photos, calculations, graphs, etc, so straight word limit can't be given) LIWC linked to field investigation part of assignment.

VAC3062 Geotechnical Engineering

Locations: Footscray Park.

Prerequisites: VAC3061 - Geomechanics

Description: Introduction to foundation design. Bearing capacity of shallow pad and strip foundations on fine and coarse-grained soils. In-ground stress distribution due to applied loads. Foundations on reactive soils. Pile foundations including types and loading conditions. Load capacity of single driven and bored piles, and of pile groups. Immediate settlement. Consolidation theory and consolidation settlement of foundations on fine-grained soils. Settlement rates and allowable settlement. Lateral stresses in the ground. Active and passive stress states. Analysis and design of gravity, cantilever, propped and anchored retaining walls. Intro to structural design of foundations and construction issues including ground stabilisation and dewatering. Types and uses of geosynthetic materials. Identification and remediation of contaminated soils.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate understanding of key issues related to analysis and design of both shallow and deep foundations and earth retaining structures, foundation construction, geosynthetic materials, and contaminated soil identification / remediation; 2. Locate and effectively use information / data relevant to these areas; 3. Identify and/or solve a range of related problems and carry out associated design tasks; 4. Work effectively as a member and/or leader of a team; and 5. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorials.

Required Reading: Smith, I. (2006) 8th edn, Elements of Soil Mechanics, Blackwell Science Lechte, P. (20**), VAC3062 Geotechnical Engineering - Supplementary Notes and Tutorial Problems, Sem 2, 20** Victoria University (VU; 20** indicates current year edition)

Assessment: In order to be eligible for either a pass or supplementary assessment, students must get at least 40% on the end-of-semester examination Test, Class test, 10%. Assignment, Field & problem-based team assignment in 2-3 parts, 30%. Examination, 3 hr end-of-semester exam, 60%. Test assesses: Graduate capability 4, Learning outcome 1 Assignment assesses: Graduate capabilities 1-5, Learning outcomes 2-5 (assignment is normally split into 2-3 parts, with total max no. of pages / student ~ 10 (these may include text, diagrams/plans, photos, calculations, computer printout, etc, so straight word limit cannot be given) Examination assesses: Graduate capabilities 1-3, Learning outcomes 1-3 LIWC linked to field trip / observations at foundation construction sites.

VAC3092 Structural Design

Locations: Footscray Park.

Prerequisites: VAN2032 - Engineering Design

Description: This unit of study aims to give students a basic understanding, problem solving and design skills in the areas of structural design using timber, steel and reinforced concrete. It covers the following topics: Dead and live loads. Timber beams and columns. Nailed and bolted connections in timber members in simple shear. Steel beams, steel girders with high shear forces, steel columns, bolted and welded connections in steel members. Reinforced concrete design for simple and continuous beams. Beam bending, deflection and shear. Single and double reinforcement in beams. Reinforced concrete column design.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand key issues and design principles involved in basic structural design using timber, steel and reinforced concrete; 2. Locate and effectively use information / data relevant to this area; 3. Identify, formulate and solve related problems, and to carry out associated design work; 4. Evaluate solutions against technical, environmental, economic and social criteria; 5. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 6.

Communicate well, based on technical reports and oral presentations.
Class Contact: This unit will be delivered in PBL mode, and will comprise 60 hours (5 hours equivalent per week) of sessions made up of small group work, team meetings, lectures, design workshops, seminars, practical work and site visits.
Required Reading: Gorenc, B. Tinyou, R. and Syam, A. (1996), Steel Designers Handbook, 7th edition, UNSW Press; AS4100 Steel Structure Code (2002), Standards Association of Australia; Warner, R.F., Rangan, B.V., Hall, A.S. and Faulkes, K.A. (1998) Concrete Structures Longman; AS3600. Concrete Structures Code (2002), Standards Association of Australia; AS1720.1 - 1997, 'Australian Standard - Timber Structures - Part 1: Design Methods,' Standards Australia; Class Notes.
Assessment: Based 100% on an individual portfolio which documents evidence that the learning outcomes have been achieved. The portfolio may include skills audit results, design assignment / project reports including technical calculations, site visits, a reflective journal, workbook(s), and self and peer assessment. Further details on portfolio components will be issued to students during the first week of classes.

VAC3192 Structural Engineering Design 1

Locations: Footscray Park.
Prerequisites: VAC2092 - Introduction to Structural Engineering DesignVAC3021 - Structural Analysis
Description: Structural Engineering is a key stream in most civil engineering courses. Engineers are required to design a variety of structures under various loading regimes using simplified codes methods or alternatively more accurate techniques. More specifically this unit of study aims to give students a fundamental understanding in the design of reinforced concrete structural elements. The following topics are covered: Design of reinforced concrete simply supported and continuous beams in bending, shear and torsion. Serviceability design of beams including deflection and crack control. Design of one-way and two-way slabs using method of coefficients. Analysis of Flat slabs using simplified strip and equivalent frame methods, including punching shear. Reinforced concrete column and wall design. Introduction to strut and tie method, pre-stressed concrete and footing design.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design reinforced concrete beams in both strength and serviceability states (for bending, shear, torsion, deflection and crack control); 2. Analyse and design reinforced concrete one-way and two-way slabs (including flat plates); 3. Analyse and design members in combined compression and bending (i.e. columns and walls); 4. Demonstrate an in-depth understanding of relevant Australian codes of practice in the design of concrete structures; 5. Exercise critical thinking and judgement in formulating and solving specific concrete design problems; and 6. Work both autonomously and as a member of a team.
Class Contact: Forty-eight (48) hours for one semester comprising a mixture of lectures, tutorials and design workshop activities.
Required Reading: The prescribed text 1 is supplemented by resource material placed on WebCT.1. Loo, Y.C. and Chowdhury, S.H. 1st Ed Reprinted 2011 Reinforced & Prestressed concrete: Analysis and design with emphasis on the application of AS3600-2009 Cambridge Press 2. Standards Australia 2009 AS3600-2009 Concrete structures Standards Australia 3. Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. 1998 Concrete structures Longman, Melbourne Texts 2 and 3 are recommended reading materials.
Assessment: Test, Mid-semester skills audit (1.5hrs), 20%. Examination, End of Semester Examination (3hrs), 40%. Assignment, Homework Problems (weekly), 20%. Project, PBL project (10 pages,1500 words plus figures/tables), 20%. Assessment Item 1 addresses Learning Outcomes 1 and 4; VU Graduate Capabilities GC1a and GC1b; EA Competencies 1.1, 1.2, 1.3, 2.1 and 2.3. Assessment Item 2 addresses Learning Outcomes 1 - 5; VU Graduate Capability GC1a and GC1b; EA Competencies 1.1, 1.2, 1.3, 2.1 and 2.3. Assessment Item 3 addresses Learning Outcomes 1 - 5; VU Graduate Capability GC1a, GC1b and GC2d; EA Competencies 1.1, 1.2, 1.3, 2.1, 2.3, 3.2, 3.5 and 3.6. Assessment Item 4 addresses Learning Outcomes 1 - 6; VU Graduate Capability GC1a, GC1b, GC1c, GC2b, GC2c and GC2d. EA Competencies 1.1, 1.2, 1.3, 2.1, 2.3, 3.2, 3.5 and 3.6. .

VAC4021 Structural Engineering Analysis and Design 1

Locations: Footscray Park.
Prerequisites: VAC3092 Structural Design
Description: Analysis: Plastic Analysis/Design of Steel Frames - Stress-strain curve for steel, moment-curvature relationship, plastic modulus of section. Mechanisms for failure of beams and frames, yield and equilibrium conditions. Load factor. Upper and lower bound theorems. Combined bending and axial loads.Buckling of elastic structures - Introduction, Euler load, buckling modes, long and short columns, effective length, slenderness ratio; theoretical and practical columns, secant formula; tangent modulus and secant modulus methods. Practical techniques for solving buckling problems. Australian standards relavant for design of columns. Buckling of plates.Design: Wind loads. Design of a steel portal frame building: cladding, secondary 'cold formed' members, framing systems for low-rise buildings, roof and wall bracing, computer analysis,rafters, columns, connections, knee and splice connections, and 'plastic' design of steel frames. Reinforced concrete elements: continuous beams, slender columns, slabs: method of coefficients, yield line analysis and design, strip method, equivalent frame.
Credit Points: 12
Class Contact: Lecture3.0 hrsTutorial2.0 hrs
Required Reading: Hibbler R.C., 2005, Structural Analysis. (6th edition). Pearson International; Gorenc, B. Tinyou, R. and Syam, A., (1996), Steel Designers Handbook 6th edition, UNSW Press; AS4100 Steel Structure Code (2002), Standards Association of Australia; Warner, R.F., Rangan, B.V., Hall, A.S. and Faulkes, K.A. (1998), Concrete Structures Longman; AS3600. Concrete Structures Code (2002), Standards Association of Australia; 'WebCT' VU web site for this subject and class notes.
Assessment: Analysis Part:Stage test: Based on weeks 1-6, 25%; Assignment 1: Structural model design/making/testing/reporting (Calculations, sketches, max equivalent word limit of 1000), 20%; Assignment 2: Computer structural analysis (Calculations, sketches, max equivalent word limit of 1000), 15%; one hour examination, 40%Design Part: three hour mid-semester supervised assignment. This assessment will be largely open-book, 40%;The assignment will be done under supervision to control plagiarism (Calculations, sketches, max word limit of 1500)2 hour examination, 60%; Subject final result derived from weightings = 60% to Design part and 40% to Analysis part.

VAC4022 Structural Engineering Analysis and Design 2

Locations: Footscray Park.
Prerequisites: VAC4021 Structural Engineering Analysis & Design 1.
Description: Design topics: introduction to prestressed concrete, deflections of prestressed concrete beams, loss of prestress, flexural strength, strength at transfer, design for shear, anchorage zones, continuous prestressed concrete beams, prestressed concrete slabs, strut-and-tie modelling of structural concrete, reinforced concrete footings. Analysis topics: basic concepts of finite element analysis, rod finite element, beam finite element, triangular finite element, analysis of 2D and 3D

structures using the commercial finite element analysis system Strand7.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design prestressed concrete beams for strength and serviceability; 2. Analyse and design prestressed concrete slabs for strength and serviceability; 3. Analyse and design non-flexural concrete members using the strut-and-tie model approach; 4. Analyse and design reinforced concrete footings; 5. Identify the basic concepts of finite element analysis; and 6. Analyse 2D and 3D structures using a commercial finite element analysis package.

Class Contact: Lecture 3.0 hrs Tutorial 2.0 hrs

Required Reading: Cook, R.D., Malkus, D.S., Plesha, M.E. and Witt, R.J. (2001), Concepts and Applications of Finite Element Analysis, 4th edition, John Wiley & Sons, New York. Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998). Concrete structures, Longman, Melbourne. Standards Australia. (2003). Australian standards for civil engineering students: AS HB 2.2 structural engineering, Standards Australia.

Assessment: Assignment, Assignment 1, 20%. Assignment, Assignment 2, 20%. Examination, Final Exam (3 hours), 60%.

VAC4032 Civil Engineering Design 2

Locations: Footscray Park.

Prerequisites: Student must have NEC3102 OR VAC3062; NEC3201 OR VAC3042; NEC3202 OR VAC3031; NEC4101 OR VAC4081

Description: Graduate Civil Engineers in industry are expected to undertake an increasing range of complex design tasks that require a comprehensive range of skills often with minimal training and assistance. To prepare students for this challenge this unit provides practical experience in design of two to four (2-4) civil engineering design projects related to water/wastewater/stormwater treatment, pumping and gravity reticulation systems (hydraulics), hydrology & water resources, roads, geotechnical, and transportation engineering. External Civil Engineering Organisations and Consultants are invited to present authentic and contemporary engineering design project to enhance student learning and confidence. Students will apply engineering fundamentals and project management concepts learnt during the course to complete the design modules. The unit also covers the development of professional engineering skill-attributes such as communication and interpersonal skills, teamwork, Internet research skills, formulating databases and technical report writing. Depending on the project, students will get the opportunity to gain effective use of common engineering software such as AutoCAD, numerical modelling, project planning, budgeting/costing, and scheduling and resource allocating techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of how to approach a civil engineering design problem or project; 2. Identify / formulate / solve design problems, and complete associated design work in a number of civil engineering disciplines; 3. Locate and effectively use information / data relevant to these areas; 4. Use a system approach to design, and evaluate solutions against technical, environmental, economic and social criteria work effectively as a member and/or leader of a team; and 5. Demonstrate good communication skills, based on technical reports, team discussions and oral presentations.

Class Contact: Lecture 1.0 hr Workshop 3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: Report, Two to Four Group Design Project Reports (One to Two Reports due in end of first six weeks) - Each student should contribute 1500 words per report, 50%. Presentation, Two to Four Oral group presentations on above Design Projects - Each student should present 5 minutes per project, 10%. Examination, Two hours, 40%. Examination is the hurdle assessment component of this unit. Examination is important to assess the student knowledge and learnings of the unit individually. Other assessments except oral presentations are group assignments. .

VAC4071 Transportation Engineering

Locations: Footscray Park.

Prerequisites: Nil.

Description: Demand for transport and the significance of transport and freight movement to the economy; road safety issues; transport planning techniques including trip generation, trip distribution, mode split and trip assignment models. Traffic engineering aspects - flow theory; road capacity; headways; gaps; speed analysis. Intersection analysis; use of SIDRA program to aid design and analysis of signalised intersections; traffic survey methods and analysis; local area traffic management studies; travel demand management.

Credit Points: 6

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Austroads (1988) Traffic Engineering Practice Vols. 1-12; Class Notes.

Assessment: Assignment 1: Site Investigations Report (2000 words), 15%; Assignment 2: Trip generation and trip distribution (Calculations & analysis equivalent to approx. 6 pages), 15%; three hour examination, 70%.

VAC4072 Environmental Planning and Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: This subject covers areas of sustainable rural and urban land development including biophysical and socio-economic data collection and inventories, environmental sensitivity mapping and land capability analysis, green city/urban forest concepts, planning permit issues and processes including meeting procedure, open space concepts and energy and water conservation, residential subdivisions and appropriate street designs.

Credit Points: 6

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Victoria, Dept. of Infrastructure , 2001, Victoria Planning Provisions (incorporating Rescode.); Class Notes.

Assessment: Assignment 1: Land development suitability report 1500 words plus sketches, 16%; Assignment 2: Planning meeting report - 1200 words, 10%; Assignment 3: Subdivision and street design - calculations and engineering drawing equivalent to approx.12 pages, 24%; 1.5 hour examination, 50%.

VAC4081 Environmental Engineering 1

Locations: Footscray Park.

Prerequisites: VAC3042 - Hydraulic Engineering Some of the material covered in VAC3042 is now considered essential knowledge for successful completion of VAC4081

Description: Wastewater characteristics and estimation of wastewater flows. Types, design, maintenance and rehabilitation of collection systems. Wastewater treatment plant types and applications, unit processes involved and design of components. Land treatment methods and wastewater reuse. On-site wastewater treatment. Water pollution and quality changes in rivers, estuaries and lakes, including erosion and siltation problems. Point and non-point source water pollution and control. Urban runoff quality and its management. Water quality modelling and overview of available models. Causes of land degradation and methods of control/ rehabilitation.

Principles and design of surface and subsurface land drainage systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate understanding of processes and key issues relating to wastewater management, water quality and pollution control, and land degradation / rehabilitation; 2. Locate and effectively use information / data relevant to these areas; 3. Identify, formulate and solve related problems, and carry out associated design work; 4. Evaluate solutions against technical, environmental, economic and social criteria; 5. Work effectively as a member and/or leader of a team; and 6. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs Workshop 1.0 hr
Required Reading: Lechte, P. (20**) VAC4081 Environmental Engineering 1 - Notes and Problem Sheets, Sem 2, 20** Victoria University (VU; 20** indicates current year edition)
Assessment: In order to be eligible for either a pass or supplementary assessment, students must get at least 40% on the end-of-semester examination Test, Class test, 10%. Assignment, Field & problem-based team assignment, in 2-3 parts, 30%. Examination, 3 hr end-of-semester exam, 60%. Test assesses: Graduate capability 4, Learning outcome 1 Assignment assesses: Graduate capabilities 1-5, Learning outcomes 2-5 (assignment is normally split into 2-3 parts, with total max no. of pages / student ~10 (may include text, diagrams / plans, photos, calculations / computer output, etc, so straight word limit cannot be given)). Examination assesses: Graduate capabilities 1-3, Learning outcomes 1-3 LIWC linked to simulated work environment and field investigation part of assignment.

VAC4082 Environmental Engineering 2

Locations: Footscray Park.
Prerequisites: N/A
Description: This unit is designed to enable students to (i) achieve sound knowledge and understanding of general environmental issues and the ability to develop and implement systems and procedures to ensure compliance with legal environmental requirements, and (ii) appreciate the importance of risk management and sustainable development. Specifically, this unit provides students with specialised skills and expertise in solid and hazardous waste management, air and noise pollution management, and coastal engineering. It also requires students to engage in critical evaluation and debate on broader sustainability and risk management issues. Assignments will help students to practice their skills, and communicate their ideas and results in a clear and concise manner. Students are required as part of the unit to undertake a site visit and inspection of coastal structures in order to develop understanding of complex real world issues in coastal engineering, and to demonstrate possible solutions for particular related problems. Topics include: Part A: Overview of a range of environmental problems and introduction to Basic Ecology. Solid and Hazardous Waste Management: sources, types/quantity of wastes, hierarchy of management options, collection methods and transfer stations, disposal by landfill and other methods. Air Pollution: types, causes and effects, clean up and control. Noise Pollution: sources and effects, solutions to noise problems. Also, Environmental Management including auditing, risk assessment and sustainable development issues. Part B: Coastal Engineering: coastal forms, wave generation and height prediction, wave phenomena, sediment transport and impact, beach erosion/rehabilitation, marinas and fixed or floating breakwaters, coastal management.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically assess and discuss key issues relating to ecology, energy and general environmental management, solid / hazardous waste management, air and noise pollution management, and coastal engineering; 2. Based on science and engineering principles, identify problems related to the areas above, taking account of the likely multi-faceted components of such problems; 3. Develop and evaluate solutions to a range of such problems, using a systems approach and recognising the integrated nature of engineering responsibilities; 4. Work effectively as a member and/or leader of a small team; and 5. Demonstrate good oral and written communication skills;
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: No required text books, but several recommended in detailed unit guide. Lecture notes and other study materials will be available on Collaborate.
Assessment: Test, 0.5 hour class test covering materials from weeks 1-4, 10%. Assignment, All students to participate as team members in a series of formal in-class debates on issues of environmental importance, 15%. Report, Coastal Engineering site visit report - Maximum of eight A4 pages, 15%. Examination, Three hour end-of-semester examination, 60%.

VAC4091 Structural Engineering Design 1

Locations: Footscray Park.
Prerequisites: VAC3092 Structural Design.
Description: Wind loads. Design of a steel portal frame building: cladding, secondary 'cold formed' members, framing systems for low-rise buildings, roof and wall bracing, computer analysis, rafters, columns, connections, knee and splice connections, and 'plastic' design of steel frames. Reinforced concrete elements: continuous beams, slender columns, slabs: method of coefficients, yield line analysis and design, strip method, equivalent frame.
Credit Points: 6
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr
Required Reading: Gorenc, B. Tinyou, R. and Syam, A. (1996) Steel Designers Handbook 6th edition, UNSW Press; AS4100 Steel Structure Code (2002), Standards Association of Australia; Warner, R.F., Rangan, B.V., Hall, A.S. and Faulkes, K.A. (1998) Concrete Structures Longman; AS3600. Concrete Structures Code (2002), Standards Association of Australia; Class Notes.
Assessment: three hour mid-semester supervised assignment (This assessment will be largely open-book), 40%; two hour examination, 60%.

VAC4092 Structural Engineering Design 2

Locations: Footscray Park.
Prerequisites: VAC4091 Structural Engineering Design 1.
Description: Introduction to prestressed concrete, deflections of prestressed concrete beams, loss of prestress, flexural strength, strength at transfer, design for shear, anchorage zones, continuous prestressed concrete beams, prestressed concrete slabs, strut-and-tie modelling of structural concrete, reinforced concrete footings.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design prestressed concrete beams for strength and serviceability; 2. Analyse and design prestressed concrete slabs for strength and serviceability; 3. Analyse and design non-flexural concrete members using the strut-and-tie model approach; and 4. Analyse and design reinforced concrete footings.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr
Required Reading: Standards Australia. (2003). Australian standards for civil engineering students: AS HB2.2 structural engineering, Standards Australia. Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998). Concrete structures,

Longman, Melbourne.
Assessment: Assignment, Assignment 1, 40%. Examination, Final Exam (2 hours), 60%.

VAC4172 Urban Development and Transportation

Locations: Footscray Park.
Prerequisites: Nil.
Description: This subject covers areas of sustainable urban land development and transportation systems including biophysical and socio-economic data collection and inventories, land capability analysis, planning processes and issues including population density, city infill vs peripheral development, infrastructure and servicing requirements, open space/green city/urban forest concepts, energy and water conservation issues, residential subdivisions and appropriate street designs. It also focuses on demand for transport and the significance of transport and freight movement to the economy; road safety issues; transport planning techniques including trip generation, trip distribution, mode split and trip assignment models; traffic engineering aspects including flow theory, road capacity, headways,gaps, and speed analysis; intersection analysis and use of SIDRA program to aid design and analysis of signalised intersections; traffic survey methods and analysis; local area traffic management studies; travel demand management.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate understanding of key issues and principles relevant to the design of sustainable urban areas and related transportation systems; 2. Locate and effectively use information / data relevant to such design work; 3. Identify, formulate and solve related problems, and carry out associated design work; 4. Evaluate solutions against technical, environmental, economic and social criteria; 5. Work effectively as a member and/or leader of a team; and 6. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Evans, G. (20**), VAC4172 Urban Development and Transportation Notes, sem 2, 20** Victoria University (VU; 20** indicates current year addition)
Assessment: Assignment, 1 x Field-based and 1x Design/modelling, 40%. Examination, Final, 60%.

VAC4191 Structural Engineering Design 2

Locations: Footscray Park.
Prerequisites: VAC2092 - Introduction to Structural Engineering DesignVAC3192 - Structural Engineering Design 1
Description: This unit introduces the analysis and design of steel and steel-concrete composite structures. Topics include: wind loads, steel webs in shear and bearing, steel members under axial load and bending, steel connections, computer analysis, plastic analysis of steel beams and frames, composite slabs, composite beams, and composite columns.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compute wind loads; 2. Analyse and design steel members under combined actions and steel connections; 3. Analyse frames and trusses using computer software; 4. Analyse steel beams and simple frames using the plastic method; and 5. Analyse and design composite slabs, composite beams and composite columns.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrsTutorial2.0 hrs
Required Reading: Liang, Q. Q. (2014). Analysis and Design of Steel and Composite Structures, Boca Raton and London: CRC Press, Taylor and Francis Group. Recommended reading: Patel, V. I., Liang, Q. Q. and Hadi, M. N. S. (2015). Nonlinear Analysis of Concrete-Filled Steel Tubular Columns, Germany: Scholar's Press.
Assessment: Important assessment information: 1. Late submission of assignments after the due date without the prior approval of the examiner will incur a penalty of 10% of the total marks for the assignment for each working day. 2. To obtain a passing grade in this unit, a student must obtain at least 50% of the total weighted marks for the unit and 40% of the total marks for the final exam. 3. The final grades for students will be given based on the weighted aggregate of the marks achieved for each of the assessment items in the unit. 4. The final exam is a restricted exam. The only allowable materials that students may use in the restricted exam for this unit are: the textbook entitled "Analysis and Design of Steel and Composite Structures" by Qing Quan Liang; non programmable calculators. Students are not allowed to take into the exam room any form of notes or information other than the stated allowable materials. Assignment, Assignment 1 (Report maximum 35 A4 pages), 25%. Assignment, Assignment 2 (Report maximum 35 A4 pages), 25%. Examination, Final Exam (3 hour restricted exam), 50%. Notes: 1. Assignment 1 - EA Competencies 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.2, 3.3, 3.4, 3.5. 2. Assignment 2 - EA Competencies 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.2, 3.3, 3.4, 3.5. 3. Final Exam - EA Competencies 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.2, 3.3, 3.5. .

VAC4192 Structural Engineering Design 3

Locations: Footscray Park.
Prerequisites: VAC3192 - Structural Engineering Design 1VAC4191 - Structural Engineering Design 2
Description: This unit introduces the analysis and design of prestressed concrete structures. Topics include: introduction to prestressed concrete, deflections of prestressed concrete beams, loss of prestress, flexural strength, strength at transfer, design for shear, anchorage zones, continuous prestressed concrete beams, prestressed concrete slabs, strut-and-tie modelling of structural concrete, and reinforced concrete footings.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design prestressed concrete beams for strength and serviceability; 2. Analyse and design prestressed concrete slabs for strength and serviceability; 3. Analyse and design non-flexural concrete members using the strut-and-tie model approach; and 4. Analyse and design reinforced concrete footings.
Class Contact: Lecture2.0 hrsTutorial2.0 hrs
Required Reading: Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998). Concrete Structures, Melbourne: Longman. Recommended reading: Liang, Q. Q. (2005). Performance-Based Optimization of Structures: Theory and Applications, London: Spon Press, Taylor and Francis Group.
Assessment: Assignment, Assignment (Report maximum 35 A4 pages), 40%. Examination, Final Exam (2 hour closed book exam), 60%. Important assessment information: 1. Late submission of assignments without the prior approval of the examiner will incur a penalty of 10% of the total marks for the assignment for each working day. 2. To obtain a passing grade in this unit, a student must obtain at least 50% of the total weighted marks for the unit and 40% of the total marks for the final exam. 3. The final grades for students will be given based on the weighted aggregate of the marks achieved for each of the assessment items in the unit. 4. The final exam is a closed book exam. The only allowable materials that students may use in the closed book exam for this unit are: non programmable calculators.

Students are not allowed to take into the exam room any form of notes or information in the closed book exam for this unit.

VAM2011 Computations and Engineering Analysis

Locations: Footscray Park.

Prerequisites: RMA1002 Engineering Mathematics 1A, and VAN1011 Experimentation and Computing.

Description: Solving engineering problems numerically. Computer programming. Keywords in a computer language. Variables and data types. Operators and flow control. Structured programming. Functions in programming. Visualisation of data. Advanced graphics - mesh and surface plots. Handles and properties of graphic objects. Integration of programs into software. Event driven programs. Creating a Graphical User's Interface (GUI). Analysis of engineering systems. Examples of first and second order systems in engineering. Initial and boundary value problems. Numerical simulation of the time response of engineering systems by solving ordinary differential equations. Frequency domain. Transformation from the time to the frequency domain by Fourier transform. Characteristics of a system: impulse response and frequency response functions.

Credit Points: 12

Class Contact: Sixty (60) hours in one semester comprising lectures/tutorials/computer laboratory.

Required Reading: Palm W.J. (2001) Introduction to Matlab 6 for Engineers, McGraw-Hill; Magrab E.B et al (2005) An Engineer's Guide to MATLAB ® 2nd edition, Pearson Prentice Hall (ISBN 0-13-145499-4); Class notes and on-line material

Assessment: Computing test 1: two hours based on weeks 1–5, 30%. Computing test 2: two hours based on weeks 7-11, 30%; Theory test - two hours, 30%; On-going lab assignments (Word limit of 1000), 10%

VAM2111 Introduction to Engineering Materials

Locations: Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENF1202 - Engineering Physics 2

Description: Introduction to mechanical behaviour of solids under static and dynamic conditions. Atomic structure and bonding and its effect on mechanical and physical properties of solids. Introduction to microstructures of polymers, metals and ceramics. Fundamentals of cement and concrete microstructure- property relationships; classification of cementitous materials for engineering design. Deformation mechanisms in crystalline solid. Mechanism of strengthening of metals; phases in alloys. Introduction to phase diagrams and their application to ferrous alloys. Phase transformations through time-temperature- transformations and their applications to heat treatment of plain carbon steels and cast irons. Structure-property relationship in alloy and stainless steels.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Display an understanding of microstructure- property relationship of solid materials; 2. Show an appreciation of limitations of basic materials in engineering design; 3. Display cognitive skills in decision-making process for areas of optimum engineering design; and 4. Cognisance of the role materials play in maintaining a sustainable environment.

Class Contact: Sixty (60) hours or equivalent for one semester comprising of a mix of lectures, small group work, workshops and laboratory exercises.

Required Reading: Rojter, J., 2010 Introduction to Engineering Materials, Lecture notes Victoria University Callister, D.W. Jr., 2009 Materials Science and Engineering- An Introduction John Wiley & Sons

Assessment: Examination, Skills audit of tacit knowledge, 45%. Report, Problem-Project group assignment, 35%. Report, Laboratory - enquiry based, 12%. Presentation, Oral presentation and reflective journals, 8%.

VAM2112 Thermodynamics 1

Locations: Footscray Park.

Prerequisites: VAN2041 - Thermofluids

Description: Second law of thermodynamics, heat engines, thermal efficiency, heat pumps, coefficient of performance, reversible and irreversible processes, Carnot cycle, Carnot principles, Thermodynamics temperature scale, quality of energy, Carnot heat engine, Carnot refrigeration and heat pump. Entropy, increase of entropy principle, entropy of pure substance, isentropic processes, the T-s relations, the entropy change of ideal gases, reversible steady-flow work, isentropic efficiencies of steady-flow devices, entropy balance. Availability analysis, reversible work and irreversibility, second law efficiency, availability transfer by heat, work and mass, availability balance: closed and open systems. Refrigeration cycles, refrigerators and heat pumps, the ideal vapour-compression refrigeration cycle, actual vapour-compression refrigeration cycle, and multistage compression refrigeration systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the various concepts related to the Second Law of Thermodynamics and their engineering applications; 2. Define the entropy and its application in determining the quality of energy; 3. Explain the availability and its applications in determining possible regeneration and energy recovery in engineering devices; 4. Determine the irreversibility of engineering processes; and 5. Define the refrigeration process and calculate the coefficient of performance of ideal and actual vapour-compression refrigeration systems.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorial/laboratory sessions.

Required Reading: Comprehensive class, laboratory and activity notes. On-Line material; Cengel, Y. A. and Boles, M. A. 2008 6th Edition, Thermodynamics- An Engineering Approach, McGraw.

Assessment: Test, Class test; calculations, sketches, max.1000 words, 10%. Test, Class test; calculations, sketches, max.1000 words, 10%. Assignment, Laboratory on Refrigeration unit; calculations, sketches, max.1000 words, 10%. Examination, Final, 70%.

VAM2121 Mechanics of Engineering Materials

Locations: Footscray Park.

Prerequisites: ENF1102 - Engineering Physics 1ENF1202 - Engineering Physics 2

Description: Revision of: Concepts of internal forces: axial force, shear force, bending moment, torsion; Young's modulus and Poisson's ratio; Hooke's law. Internal forces diagrams; Bending stress and shear stress in beams;Mechanical behaviour of engineering materials; Structures and Mechanisms. Three dimensional forces and moments. Different types of structures, supports and reactions; Modes of failures. Deflection in beams; Shear stress and angle of twist in shafts. Buckling phenomenon. Complex loading; Two dimensional stress; Mohr's circles of stresses and strains; Theories of failures for ductile and brittle material behaviour. Statically indeterminate structures. Energy methods to find displacements of structures; strain energy; virtual work; Castigliano's theorems; Unit force method.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Characterise general behaviour of engineering materials and different modes of failure under effects of forces, moments, change of temperatures and humidity; 2.

Evaluate effects of three dimensional and complex loading of forces and moments on one-dimensional structures commonly found in mechanical engineering (links, ties, struts, beams, shafts) in terms of stresses, strains and displacements; and 3. Apply the principles of mechanics engineering materials to the analysis and design of structures and machinery components in mechanical engineering.

Class Contact: Sixty (60) hours for one semester comprising lectures, laboratory, seminars and group activities.

Required Reading: Lecture Notes by Danh Tran.

Assessment: Examination, Final, 50%. Assignment, Team Report and Individual Portfolio, 30%. Laboratory Work, Individual Reports, 20%.

VAM2122 Stress Analysis

Locations: Footscray Park.

Prerequisites: VAM2121 - Mechanics of Engineering Materials

Description: Three dimensional stress analysis. Three dimensional strain analysis. Stress-strain relationship. Plane stress and plane strain problems. Photoelasticity. Strain gauge. Polar coordinate problems. Thick cylinder and rotating disc. Theory of plate and shell. Advanced composite materials. Inelastic problems of plasticity, creep and stress relaxation and applications in mechanical engineering.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and solve general three dimensional problems of stress-strain analysis especially fundamental problems of elasticity in mechanical engineering; 2. Apply experimental techniques of stress analysis, especially photoelasticity and strain gauges; and 3. Apply the principles of stress analysis to advanced problems involving composite materials and inelasticity.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials, laboratory.

Required Reading: Lecture Notes by Danh Tran.

Assessment: Examination, Final, 60%. Test, Test and Assignment, 20%. Laboratory Work, Individual Reports, 20%.

VAM2131 Engineering Analysis

Locations: Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENF1202 - Engineering Physics 2

Description: This Unit of Study introduces students to the methodology of application of fundamentals laws of physics, mathematical concepts and computer programming tools in the process of systematic analysis of behaviour of engineering systems. It exposes students to generic analytical skills and methods relevant to contemporary engineering practice and illustrates their practical application in the analysis of various generic engineering systems. It covers the following topics: Introduction to the analysis of engineering systems. Formulation of simple numerical predictive models of mechanical systems. Transfer function. Familiarisation with and the application of a modern environment for numerical simulations involving Ordinary Differential Equations. Graphical presentation of complex sets of results. Instrumentation and sensors for mechanical processes. Signals. Measurement and collection of experimental data such as sound and vibration, and internal combustion engine cylinder pressure and dynamometer data. Processing and analysis of experimental data, e.g. calculation of p-V diagram and indicated work, engine overall efficiency, room sound reverberation time, vibration level, signal power and RMS. Fourier theorem, the frequency domain and frequency spectrum. Application of Fast Fourier Transform.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify approaches in engineering system analysis; 2. Formulate models of simple engineering systems with Ordinary Differential Equations and transfer functions; 3. Numerically simulate behaviour of these systems; 4. Acquire and process large sets of experimental data and derive dependent parameters through computer programming; 5. Produce frequency spectra using Fast Fourier Transform and interpret them; and 6. Produce written technical reports as part of a team.

Class Contact: Sixty (60) hours for one semester comprising lectures, team project activities, field and laboratory experimentations and computer laboratories.

Required Reading: Palm W.J. (2003) Introduction to MATLAB® 7 for Engineers, McGraw-Hill. Magrab E.B et al (2005) 2nd edition, An Engineer's Guide to MATLAB® Pearson Prentice Hall (ISBN 0-13-145499-4)

Assessment: Formative assessment in the form of group reports. These will be assessed as satisfactory (0) or unsatisfactory (1). Other, Progress quizzes and diary, 10%. Examination, Final, weighted by the average score for group reports, 90%.

VAM2132 Manufacturing Materials

Locations: Footscray Park.

Prerequisites: VAM2111 - Introduction to Engineering Materials

Description: This subject will aim to extend the knowledge of materials science in alloy steels, leading edge non-ferrous alloys, polymers, ceramics and glasses and composites and integrate it into issues of sustainable engineering product design and manufacturing technologies. This subject gives students an understanding of the engineering practice through an introduction to problem solving methodology and knowledge of the responsibilities of the professional engineer. The content will include: - Merit matrices for material selection for economic and sustainable design and manufacture; - Diffusion in solids and the application of mathematical diffusion models to surface treatments of alloys; - Thermo- mechanical strengthening treatments of metal alloys; - Structure and properties of aluminium, magnesium, zinc, nickel, copper and titanium alloys, and their applications in engineering design; - Structure, properties and heat treatment of ceramics and glasses; - Introduction and structure to polymers, elastomers,foams and polymer composites; - Casting processes metals and polymers; - Introduction to surface physics and its application to powder metallurgy and joining processes; and, - The application of introductory plasticity theory to solid foerming processes

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Display understanding of processes and key issues related to engineering science in manufacturing and environment; 2. Solve a range of numerical engineering problems found in engineering practice and engineering design; and 3. Display an improvement in a number of generic skills including problem identification / formulation / solution, effective communication, ability to use a system approach to design, and capacity to undertake life-long learning.

Class Contact: Sixty (60) hours or equivalent for one semester comprising of a mix of lectures, small group work, workshops and laboratory exercises.

Required Reading: Rojter, J., 2005 Manufacturing Materials, Class Notes Victoria University Kalpakjian, S., 2002 Manufacturing Engineering and Technology Addison-Wesley Higgins, R.A., 2005 Engineering Metallurgy Edward Arnold

Assessment: Examination, Skills audit of tacit knowledge, 45%. Report, Problem-Project group assignment, 35%. Report, Laboratory - enquiry based, 12%. Presentation, Oral presentation and reflective journals, 8%.

VAM2142 Mechanical Engineering Design

Locations: Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENF1202 - Engineering Physics 2ENF1204 - Introduction to Engineering DesignVAM2121 - Mechanics of Engineering Materials

Description: During this unit students will work as individuals and in groups to develop broad skills in designing a range of machine elements in mechanical engineering systems. It covers the following topics: Load and stress analysis, Load and stress analysis, Failures resulting from static loading, Failures, resulting from static loading, Design of power screws and bolted joints, Welded joints, Spring design for static conditions, Graphical optimisation; Introduction to linear programming: standard form, Simplex: linear programming, Sequential linear programming, Introduction to Taylor series expansion, Review of linear programming and introduction to search methods. Computer aided drawing software will also be used to design and generate solid models of mechanical elements.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental mechanics and scientific skills to the design and selection of mechanical elements; 2. Identify, formulate and solve engineering design problems in a systematic way; 3. Use computing methods to solve mechanical engineering design problems; 4. Work effectively as a member and/or leader of a team and to time manage multiple tasks; and 5. Use mechanical engineering design skills to solve real world design problems.

Class Contact: Sixty (60) hours for one semester comprising team workshops, including supporting lectures and labs.

Required Reading: K. Nisbett & R. Budynas (2010) 9th Shigley's Mechanical engineering design. McGraw Hill

Assessment: Portfolio, Individual drawing portfolio, 5%. Assignment, Group design & analysis task, 15%. Assignment, Graphical optimisation (homework) problem (mathematical solutions), 7.5%. Portfolio, CAD challenge (group assignment), 15%. Assignment, Linear programming (homework) problem (mathematical solutions), 7.5%. Examination, Final examination, 50%. It is compulsory to pass the examination to pass the unit. Team assignments will be in pairs or groups of three. .

VAM3071 Dynamics

Locations: Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENF1202 - Engineering Physics 2

Description: This unit of study aims to give students an understanding of principles of engineering dynamics including particle dynamics and rigid body dynamics (kinematics and kinetics) in two and three dimensional space, as well as to develop problem solving, computing and design skills in the areas of mechanism design and analysis. It covers the following topics. Introduction to dynamics, Kinematics of particles - rectilinear and plane curvilinear motion co-ordinates systems, 3-D curvilinear motion and relative motion. Plane kinematics of rigid bodies - rectilinear and plane curvilinear motion, relative velocity, instantaneous centre of zero velocity, relative acceleration, space curvilinear motion. Kinetics of particles - Newton's law, work and energy, impulse and momentum. Plane kinetics of rigid bodies - moments and products of inertia, Newton's law, work and energy, impulse and momentum. Three-dimensional dynamics of rigid bodies - kinematics, kinetics, gyroscopic motion.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental knowledge to solve problems related to particle dynamics and rigid body dynamics in two and three-dimensional space; 2. Solve a wide range of problems and carry out design tasks using kinematics of particles, plane kinematics of rigid bodies, kinetics of particles, plane kinetics of rigid bodies and three-dimensional kinematics and kinetics of rigid bodies; 3. Communicate effectively (both written and oral) and work as effective members of a team; and 4. Apply experimental techniques and computer skills to real world engineering problems.

Class Contact: Sixty (60) hours per semester comprising lectures, tutorials, laboratories and workshops.

Required Reading: Meriam J.L., & Kraige L.G. (2008). (6th SI ed.). Engineering mechanics: Dynamics John Wiley and Sons.

Assessment: Assignment, Laboratory report (approx. 1000 words). Group submission., 10%. Assignment, Laboratory report (approx. 1500 words). Group submission., 20%. Assignment, Short answer mathematical problems (weekly), 10%. Examination, End-of-semester examination (3 hours), 60%. Assignments 1, 2, & 3 assess: All Learning Outcomes and Graduate Capabilities Examination assesses: Learning Outcomes 1 & 2 and Graduate Capabilities 1, 3, 4 & 5 .

VAM3072 Mechanical Vibrations

Locations: Werribee, Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENF1202 - Engineering Physics 2

Description: This unit of study aims to give students a basic understanding of problem solving and design skills in Mechanical Vibrations. It covers the following topics: Introduction to mechanical vibrations and vibratory elements; Single Degree of Freedom Systems - free vibrations of undamped systems, free vibrations with viscous, coulomb and hysteretic damping, harmonically excited vibrations of undamped systems, response of damped systems to harmonically forced excitation and base motion, response of damped systems, equivalent viscous damping, general forcing functions; Two Degree of Freedom Systems - free vibrations of undamped systems, co-ordinate coupling, forced vibrations; Multi Degree of Freedom Systems - influence coefficients, Eigenvalue problem, determination of natural frequencies and mode shapes; vibration measurement, vibration control and random vibration analysis.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. An understanding of key issues involved in the vibratory analysis of mechanical systems as described in the unit despriptor; 2. An ability to identify, formulate and solve problems related to mechanical vibrations and to carry out design work for controlling and managing mechanical vibrations; 3. An ability to evaluate solutions against technical, environmental, economic and social criteria; 4. An ability to work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 5. Good communication skills, based on technical reports, discussions and debates.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials, workshops, field work and laboratory experiments.

Required Reading: Rao S.S. (1995) Third Ed. Mechanical Vibrations Addison-Wesley Publishing Company Inman D.J. (2001) Second Ed. Engineering Vibration Prentice Hall Class Notes

Assessment: Formative assessment in the form of group reports. Each project report will be assessed as 0 (unsatisfactory) or 1 (satisfactory) and every team member receives the same mark. As these are designed to assist the learning process, unsatisfactory reports may be re-submitted after feedback has been obtained from the facilitator. Test, Weekly test, 10%. Examination, Final examination - 3 hours, 90%. The final examination will be weighted by the results of the group reports. See unit co-ordinator for further information.

VAM3111 Design of Mechanical Systems

Locations: Footscray Park.

Prerequisites: VAM2142 - Mechanical Engineering Design

Description: During this unit students will work as individuals and in groups to develop broad skills in designing a range of machine elements in mechanical engineering systems. It covers the following topics: Design of clutches and brakes, Failures resulting from fatigue loading, Bolted joints and welds in fatigue, Design of helical springs for fatigue loading, Gear design, Belt and chain drives, Introduction to shaft design, Bearing design and selection, Material selection. Computer aided drawing software will also be used to design and generate solid models of mechanical elements.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental mechanics and scientific skills to the design and selection of mechanical elements; 2. Identify, formulate and solve engineering design problems in a systematic way; 3. Use computing methods to solve mechanical engineering design problems; 4. Work effectively as a member and/or leader of a team and to time manage multiple tasks; and 5. Use mechanical engineering design skills to solve real world design problems.

Class Contact: Sixty (60) hours comprising small group work, lectures, tutorials and workshops.

Required Reading: K. Nisbett & R. Budynas (2010) 9th metric Shigley's Mechanical engineering design. McGraw Hill.

Assessment: Assignment, Design report and presentation (approx. 2500 words). Group submission., 20%. Assignment, Design report and Oral presentation (approx. 2500 words). Group submission., 20%. Examination, End of semester examination (3 hours), 60%. It is compulsory to pass the examination to pass the unit. Team assignments will be in pairs or groups of three.

VAM3112 Electrical Engineering

Locations: Footscray Park.

Prerequisites: ENF1202 - Engineering Physics 2

Description: The unit aims to provide students with a sound knowledge of electrical circuits, circuit analysis techniques, transformers, motors, generators as well as digital electronic circuits. The unit is taught in two distinct parts by separate academic staff. Part A- Electrical Circuits. Part A begins with a revision of basic fundamentals including Direct-Current (DC) circuits. The concept of nodal-analysis (node-voltage method) for the analysis of DC circuits is introduced. The principle of Superposition, derivation of Thevenin and Norton equivalent circuits are discussed in detail as well as the maximum power transfer theorem. Alternating-Current (AC) circuits are explored and the analysis of these circuits using complex numbers is covered. Three-phase AC systems are studied and the concept of power factor correction is introduced. An overview of electrical transformers is given. Finally, DC and AC motors are examined as well as synchronous generators. Part B - Digital Electronics. Part B begins with a discussion of number systems including the binary system and hexadecimal numbers. Arithmetic operations and Boolean expressions and their reduction techniques are explored. The design of combinational digital circuits using NAND/NOR design techniques/gates, latches, and flip-flops is introduced and studied in detail. These are done through Karnaugh Maps and Boolean Algebra. Special emphasis is given to the study of sequential digital circuits and their design techniques. Finally, asynchronous and synchronous counter circuits, analogue to digital conversion and microprocessor interface devices are introduced

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and solve DC and AC circuits using a range of circuit simplification techniques and nodal analysis; 2. Apply the Principle of Superposition to circuit analysis; 3. Derive the Norton and Thevenin equivalents of complex circuits; 4. Differentiate the concepts of frequency, impedance and admittance as they relate to AC circuits; 5. Analyse balanced three-phase systems; 6. Appraise the significance of transformers in electric circuits and how they operate, and perform transformer operational and performance calculations; 7. Summarise the operational principles of motors and generators, and use their equivalent circuits; 8. Estimate the operating and performance characteristics such as power, torque, and efficiency of motors and generators using their equivalent circuits; 9. Distinguish a range of number systems including the binary system, octal and hexadecimal systems. Convert between these different number systems; 10. Identify different Logic Gates, truth tables and summarise their use; 11. Develop and simplify Boolean expressions using Boolean laws and in sum of products and/or product of sums expressions from logic truth tables; 12. Design and optimise combinational and sequential digital circuits using NAND/NOR design techniques; 13. Design asynchronous counters for a given count sequence; and 14. Assess the significance of analogue to digital conversion in electronic circuits.

Class Contact: Sixty (60) hours per semester comprising lectures/tutorials/laboratory work.

Required Reading: Tocci, R.J. & Widmer, W.D (2010). 11th edition. Digital Systems: Principles and Applications. Prentice-Hall Rizzoni, G (2006). 5th edition. Principles and Applications of Electrical Engineering. McGraw Hill.

Assessment: Test, 2 One-Hour Class Tests, 20%. Laboratory Work, 2 Laboratory Group Reports (1000 words each), 20%. Examination, 3-Hour Final Examination, 60%. Laboratory Work: Learning Outcomes 4, 5, 10, 11, 12, 13 and Graduate Capabilities 1,2,3,4, and 5. Tests: Learning Outcomes 1-5 and 9-12, and Graduate Capabilities 1,2,4 and 6. Examination: Learning Outcomes 1-14, and Graduate Capabilities 1,2,4 and 6.

VAM3121 Thermodynamics 2

Locations: Footscray Park.

Prerequisites: VAM2112 - Thermodynamics 1

Description: Gas power cycles - the Otto cycle, Diesel cycle, gas-turbine cycle, and jet-propulsion cycle. Vapor and combined power cycles - Rankine cycle, using reheat and regeneration to improve the efficiency of the Rankine cycle. Gas mixture, mass and mole fraction, and properties of gas mixtures. Air-conditioning, specific humidity and relative humidity, dew-point temperature, wet bulb temperature, psychometrics chart, human comfort and air-conditioning. Combustion, type of fuels, theoretical and actual combustion processes, enthalpy of formation and enthalpy of combustion, first-law analysis of combustion systems, adiabatic flame temperature.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Define the various cycles related to petrol engines, diesel engines, gas turbine, and jet engines and determine their performance; 2. Define the various cycles related to steam power cycles and determine their performance in large power stations; 3. Determine the various thermodynamic properties of mixtures; 4. Describe basic concepts of air-conditioning, and determine the energy and mass balance in air-conditioning systems; and 5. Describe the basic concepts of combustion; determine the air to fuel ratio and flame temperature.

Class Contact: Sixty (60) hours for one semester comprising lectures and tutorial/laboratory sessions.

Required Reading: Comprehensive class, laboratory and activity notes. On-Line material; Cengel, Y. A. and Boles, M. A. 2008 6th Edition Thermodynamics- An

Engineering Approach, McGraw Hill
Assessment: Test, Class test; calculations, sketches max. 1000 words, 10%. Test, Class test; calculations, sketches max. 1000 words, 10%. Laboratory Work, Laboratory on Air Conditioning; calculations, sketches max. 1000 words, 10%. Examination, Final, 70%.

VAM3122 Fluid Mechanics 2

Locations: Footscray Park.
Prerequisites: VAM3131 - Fluid Mechanics 1
Description: Brief review of conservation laws in integral form. Conservation equations in differential form (covering continuity and Navier-Stokes equations). Exact solutions. Wall bounded shear flows, boundary layers, pipe and channel flows. Free shear flows, jets and wakes. Introduction to turbulent flows. Measurements in fluid mechanics, error analysis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss conservation laws to differential form; and 2. Think and reason with applied physics.
Class Contact: Sixty (60) hours for one semester comprising interactive lectures and tutorial/laboratory/discussion sessions.
Required Reading: White, F.M. 2008 6th edition Fluid Mechanics McGraw Hill.
Assessment: Portfolio, Portfolio, 100%. Portfolio consisting of 10% weekly assignments, two tests 10% each, two experiments with brief laboratory reports 10% each, and final examination, 50% (3hrs). The assignments and experiments to be chosen by students with guidance. The experiments can be carried out in groups of up to four, provided the reports identify individual contributions to the team. All reports to be submitted via turn-it-in. .

VAM3131 Fluid Mechanics 1

Locations: Footscray Park.
Prerequisites: VAN2041 - Thermofluids
Description: Brief review of fluid statics. Flow properties. Dimensional analysis, dimensionless numbers and introduction to modelling principles. Conservation laws in integral form (Reynolds transport theorem). Conservation of mass, linear momentum and energy. Bernoulli's equation. Conservation of angular momentum. Basic hydraulic machinery. Measurements in fluid mechanics, error analysis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe flow basics and conservation laws in integral form; and 2. Think and reason with applied physics.
Class Contact: Sixty (60) hours for one semester comprising interactive lectures and tutorial/laboratory/discussion sessions.
Required Reading: White, F.M. 2008 6th edition, Fluid Mechanics, McGraw Hill.
Assessment: Portfolio, Portfolio, 100%. Portfolio consisting of 10% weekly assignments, two tests 10% each, two experiments with brief laboratory reports 10% each, and final examination, 50% (3hrs). The assignments and experiments to be chosen by students with guidance. The experiments can be carried out in groups of up to four, provided the reports identify individual contributions to the team. All reports to be submitted via turn-it-in.

VAM4111 Advanced Mechanics 1

Locations: Footscray Park.
Prerequisites: Completion of at least half of all 3rd year units and any unit of study relevant to the selected topic (to be determined by the Topic Supervisor).
Description: Students will select one project from a list of advanced topics aligned with the engineering and research expertise of academic staff and learn in the PBL mode under advice of their academic mentors. The topics offered in this UoS will be of interest to local and/or international research community in fields such as: Automotive engines. Computational fluid dynamics. Energy, environment and sustainability. Design of distribution packaging. Design optimisation. Environmental shocks and random vibrations. Finite element analysis. Heat transfer. Manufacturing and polymer technologies. Modal analysis. Modelling and computer simulation. Signal analysis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an established knowledge in a specialist aspect of a mechanical engineering discipline under the academic mentorship; 2. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 3. Produce technical reports and participate effectively in discussions and debates.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Journal and conference papers related to the literature review of projects.
Assessment: Report, Written report in Scientific Conference Paper format, 100%.

VAM4112 Advanced Mechanics 2

Locations: Footscray Park.
Prerequisites: COMPLETION OF ALL 3RD YEAR SUBJECTS
Description: Students will select one project from a list of advanced topics aligned with the engineering and research expertise of academic staff and learn in the PBL mode under advice of their academic mentors. The topics offered in this UoS will be of interest to local and/or international research community in fields such as: Automotive engines. Computational fluid dynamics. Energy, environment and sustainability. Design of distribution packaging. Design optimisation. Environmental shocks and random vibrations. Finite element analysis. Heat transfer. Manufacturing and polymer technologies. Modal analysis. Modelling and computer simulation. Signal analysis. Topic selection must differ from the selection made for Advanced Mechanics 1.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an established knowledge of a specialist aspect of a mechanical engineering discipline under the academic mentorship; 2. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; 3. Produce technical reports and participate effectively in discussions and debates.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs
Required Reading: Journal and conference papers related to the literature review of projects.
Assessment: Report, Written report in the format of a scientific conference paper, 100%.

VAM4121 Finite Element Analysis

Locations: Footscray Park.
Prerequisites: VAM2122 - Stress Analysis VAM3072 - Mechanical Vibrations
Description: Finite element analysis is a numerical technique that was originally developed to find solutions related to the mechanics of solids. Today, it is widely used by engineers to predict the behaviour of a broad range of systems including structural components, fluid mechanics, heat transfer and electromagnetism. The unit will introduce students to the finite element method and use a commercial software application to allow students to create their own Finite Element Model and compute solutions. Topics to be studied will include: node-element generation, solid

modelling, top-down and bottom up approach, Static stress analysis, solution convergence and stability, linear modal analysis, non-linear transient analysis, harmonic analysis, random vibration analysis, parametric design and optimisation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the fundamentals of Finite Element Method; 2. Model and solve static, dynamic and non-linear problems of Mechanical Engineering by Finite element; and 3. Apply Finite Element Method to advanced problems of design and optimisation and problems in other areas of Mechanical Engineering.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Notes to be provided by the Lecturer.
Assessment: Assignment, Assignment 1, 10%. Assignment, Assignment 2, 15%. Assignment, Assignments 3, 4 and 5, 75%.

VAM4132 Advanced Engineering Analysis

Locations: Footscray Park.
Prerequisites: VAM2131 - Engineering Analysis VAM3072 - Mechanical Vibrations
Description: Advanced Engineering Analysis introduces students to advanced methods of signal and system analysis and systematic analysis of behaviour of engineering systems, including their automatic control. It continues to expose students to generic analytical skills and methods relevant to contemporary engineering practice and illustrates practical applications in the analysis of various generic engineering systems. It covers the following topics: Instrumentation and sensors for mechanical processes. Data acquisition for signal and system analysis. Classification of signals. Digital signal processing. Signal noise minimisation techniques. Digital filters. Random signals. Signal statistical estimates. Advanced signal and dual channel system analysis in the frequency domain. Scaling of FFT spectra. Power Spectral Density. Measurement of Frequency Response Function (FRF). Bode and Nyquist plots. Spectral averaging. Auto- and cross spectra. The time domain equivalents: impulse response function, auto- and cross correlation, synchronous averaging. Coherence and signal-to-noise ratio. Simulation of dynamic response of systems using the FRF and transfer functions. Adaptive filters. Control system theory. Application of FRF in feedback control. PID control. Control system design. Stability. Root locus. Applications of advanced analysis in various branches of mechanical and civil engineering, such as: the measurement of structural modes and structural damping, the validation of results of Finite Element Method, the Noise-Vibration-Harshness analysis, analysis of noise contaminated signals, acoustic signals and sensor response, automatic feedback controllers.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and perform digital signal processes relevant to mechanical and structural engineering; 2. Identify and participate in measurement of Frequency Response Function, other aspects of dual channel analysis techniques of systems and their applications; 3. Describe fundamentals of control theory; 4. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 5. Produce technical reports and participate effectively in discussions and debates.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs
Required Reading: Randall R.B. (1987) Frequency Analysis Bruel & Kjaer, Demnark. Dorf R.C. and Bishop R.H, (2004) 10th ed Modern Control Systems Prentice Hall
Assessment: Formative assessment in the form of group reports. These will be assessed as satisfactory (0) or unsatisfactory (1). Other, Progress quizzes and diary, 10%. Examination, Final. Weighted by the average score for group reports., 90%.

VAN1011 Experimentation and Computing

Locations: Footscray Park.
Prerequisites: Nil.
Description: Experimentation and measurement: The use of instrumentation, laboratory and technical procedures, work-place safety requirements, report writing and oral presentation. Data analysis and presentation: Algorithm development, Introduction to Data types, Data file reading and writing, Graphing and analysis of experimental data, curve fitting. Statistical and error analysis of experimental data, Solutions of equations.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate engineering project and time management skills; 2. Develop independent, self reflective learning and evaluation skills; 3. Research and analyse engineering problems and identify a range of appropriate solutions; 4. Demonstrate an ability to work effectively as a member of a team and to manage multiple tasks; 5. Acquire skills and knowledge related to small and large scale measurements with use of instrumentation and laboratory equipment; 6. Become familiar with laboratory procedures and work-place safety requirements, experimental techniques and methods of presentation; 7. Demonstrate appropriate professional written and oral communication skills; 8. Acquire skills in the analysis, simulation and presentation of engineering data measured in the laboratory, using computing techniques; and 9. Use the knowledge gained from this subject to conduct effective project-based, laboratory and measurement activities and report presentations for subjects at higher years of the course.
Class Contact: 5 hrs equivalent per week of sessions made up of small group project work, team meetings, workshops, seminars and presentations. In addition, students are expected to devote at least this much time for private and/or group study.
Required Reading: Comprehensive project , laboratory and activity notes. On-line material. Kirkup, Les., 2001 'Experimental Methods - An Introduction to the Analysis and Presentation of Data', Wiley. Palm, William, J., 2001, 'Introduction to Matlab 6 for Engineers', McGraw-Hill.
Assessment: An individual portfolio which providesevidence that demonstrates that the learning outcomes have been achieved. The portfolio may include skills audits, project reports, reflective journals, workbooks,self and peer assessment.

VAN1022 Solid Mechanics 1

Locations: Footscray Park.
Prerequisites: Nil.
Description: Concept of force. Equilibrium of coplanar forces. Resultant forces, components of forces. Levers and moments. 2D statical equilibrium. Free body force diagrams. Pin jointed trusses. Beams, loads and reactions. Internal forces in beams. Bending moment and shearing force diagrams for beams. 3D statical equilibrium. Direct stress and strain. Elastic modulus. Simple bending stress and strain. Shear stress and strain. Shear modulus, Poisson's ratio.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop an understanding of forces and moments; 2. Use Free Body Diagrams and equilibrium equations to determine forces and reactions of simple structural systems such as two-dimensional trusses and beams; 3. Develop an understanding of sectional properties, of stress and strain, and of bending and shear stresses in beams; 4. Think independently and develop and exercise imagination and insight to solve statically a given structure; 5. Demonstrate an ability to work effectively as a member of a team, to write technical reports and to manage time effectively; and 6. Use the knowledge obtained from this subject to undertake

later engineering subjects.
Class Contact: 5 hrs equivalent per week made up of a mix of small group work, lectures, and workshops. In addition, students are expected to devote at least this much time for private and/or group study.
Required Reading: Hibbler, R.C (2004), Statics and Mechanics of Materials, Fifth Edition - SI Units, Pearson International·University, "WebCT" web site for the subject.
Assessment: An individual portfolio which provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio will include two major parts: a skills audit and an assignment set which includes structural model making, drawings and project reports.

VAN1032 Introduction to Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: the design process and the history of Engineering design creative thinking in design, generating and evaluating design alternatives technical, environmental, human, economic, legal criteria for evaluation of design alternatives making the final decision in design professional Engineering drawing practice, projections and views, dimensioning, layout, assembly, detailed drawings and sketching computer generated drawings utilizing the commercial industry standard software AutoCAD.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify apparent and real design problems and identify alternatives for a given design problem; 2. Evaluate various alternatives against various design criteria, such as environmental, economical, technical, human and legal; 3. Think independently and develop and exercise imagination and insight to solve a given engineering project; 4. Demonstrate an ability to work effectively as a member of a team, to write technical reports and to time manage multiple tasks; 5. Understand graphic procedures appropriate to Engineering design and achieved a basic level of engineering graphic skills; 6. Prepare and use computer generated drawings as a means of communicating Engineering design to others; and 7. Use the knowledge gained from this subject to conduct effective project-based, laboratory and measurement activities and report presentations for subjects at higher years of the course.
Class Contact: 5 hrs equivalent per week made up of small group work, team meetings, workshops, seminars and presentations. In addition, students are expected to devote at least this much time for private and/or group study.
Required Reading: Fogler, H.S. and LeBlanc, S.E., 1995, Strategies for Creative Problem Solving, Prentice Hall PTR.
Assessment: An individual portfolio which provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio will include skills audits, design project reports, design drawings and models, reflective journals, design notebooks, self and peer assessment, oral presentations.

VAN1051 Engineering Profession

Locations: Footscray Park.
Prerequisites: Nil.
Description: This subject gives students an understanding of how society has developed as a result of science and engineering, exploring the need for and the responsibilities of the professional engineer. Professional written and oral communication skills, time management and teamwork skills, self reflection and evaluation skills will be developed in the context of engineering issues. Topics considered include the role of an engineer, ethics, approaches to problem solving and design, the environment and sustainable development. Content is divided equally between consideration of these engineering issues and the development of written and oral communication skills.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Make effective oral presentations; 2. Produce written text in a variety of genres; 3. Articulate at a fundamental level the "language of engineering"; 4. Develop independent, self reflective learning and evaluation skills; 5. Understand the importance of science and engineering in a civilised society; 6. Demonstrate a knowledge of appropriate ethical behaviour in professional engineers; 7. Research and analyse engineering problems and identify a range of appropriate solutions; 8. Demonstrate an understanding of environmental issues and sustainable development; 9. Demonstrate an ability to work effectively as a member of a team and to manage multiple tasks; and 10. Demonstrate time management skills to complete a project in a specified time.
Class Contact: 5 hrs equivalent per week of sessions made up of small group work, team meetings, workshops, seminars and site visits. In addition, students are expected to devote at least this much time for private and/or group study.
Required Reading: Engineering in Society 2006, Class Notes.VU, Faculty of Arts 2006, Handbook of Communication Skills for first year students in the Faculty of Science, Engineering and Technology, 7th edn.
Assessment: An individual portfolio which providesevidence that demonstrates that the learning outcomes have been achieved. The portfolio may include skills audits, project reports, reflective journals, workbooks,self and peer assessment.

VAN2021 Solid Mechanics 2

Locations: Footscray Park.
Prerequisites: VAN1022 - Solid Mechanics 1VAN1022 Solid Mechanics 1
Description: Properties of sections, including area, centroids, first and second 'moments' of area. Polar moment of area. Principal axes of sections. Parallel axis theorem. Deflection of simple determinate beams. Deflections by Macaulay's method and superposition. Failure modes and loads for compression members, includes squashing / elastic buckling and combined effect of direct and bending stresses. Stresses and strains in two dimensions, Mohr's circle, principal stress. Elastic bending stresses and shear stress distribution in beams. Unsymmetrical bending. Shear centre. Principal axes. Torsion in solid and thin-wall tubes. Open and closed sections. Simple frames under bending.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Calculate centroids, centre of gravity, moment of inertia for simple and composite elements; 2. Calculate the deflection of beams; 3. Calculate shear stresses in beams and sketch shear flow distribution; 4. Define failure modes of compression members; 5. Explain the concepts of principal stress and Mohr's circle; and 6. Describe twist and torsion in structures and determine shear stress and angle of twist in simple structures.
Class Contact: Sixty (60) hours or equivalent for one semester comprising of a mix of small group work, lectures, and workshops.
Required Reading: Hibbeler, R.C (2004) SI Units Statics and Mechanics of materials Pearson International Hibbeler, R.C (2008). Seventh (SI) edition Mechanics of materials Pearson international
Assessment: An individual portfolio which provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio will include two major parts: a skills audit and an assignment set which includes structural model making, drawings and project reports. Report, Based on

PBL activites, 40%. Examination, Written - Closed book, 40%. Presentation, Oral, 10%. Test, Open book, 10%.

VAN2032 Engineering Design

Locations: Footscray Park.

Prerequisites: VAN 1022 Solid Mechanics 1

Description: The structural design covers: Static dead and live loads, The fundamental rationale in choosing design loads and the calculation of specific loads.Design of simple structural steel beams and columns. Design of bolted and welded connections in simple shear or tension.The mechanical design covers: Design uncertainties and reliability, Theories of Static Failure, Low and High cycle fatigue failure, Linear and torsional impact failure.Many of the topics will be related to case studies such as building components and mechanical elements.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the concepts for static and dynamic and structural actions; 2. Apply concepts in the appropriate determination of design loads to an introductory level; 3. Apply concepts in the design of simple structural and mechanical elements; 4. Critically evaluate the sensibility of design outcomes; 5. Present design outcomes in a professional manner; 6. Formulate and solve specific design problems within the context of the subject areas; and 7. Work both autonomously and as a member of a team, and effectively communicate design investigations by a variety of means.

Class Contact: 5 hrs equivalent per week of sessions made up of small group work, team meetings, workshops, seminars and presentations. In addition, students are expected to devote at least this much time for private and/or group study.

Required Reading: Nil.

Assessment: An individual portfolio, which provides evidence that demonstrates that the learning outcomes have been achieved. The portfolio may include skills audits, project reports including technical calculations, reflective journals, workbooks, self and peer assessment.

VAN2041 Thermofluids

Locations: Footscray Park.

Prerequisites: ENF1202 - Engineering Physics 2

Description: Basic concepts of thermodynamics and fluid mechanics. Thermodynamic properties of gases, liquids and solids. The ideal gas law. Energy transfer by heat, work and mass. The first law of thermodynamics for closed and open systems. Fluid statics-forces on submerged planes, Archimedes' principle, and stability of floating bodies. Fluid dynamics - basic concepts of fluid flow. Continuity, momentum and energy equations in control volume forms. Application of these equations to pipe flows.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts of Thermodynamics and Fluid Mechanics; 2. Determine phase changes of pure substances; 3. Use First Law of Thermodynamics to solve engineering related problems; 4. Calculate hydrostatic force on submerged bodies; and 5. Use continuity, momentum and energy equations to solve engineering related problems.

Class Contact: Sixty (60) hours for one semester comprising lectures, tutorials and laboratory experiments.

Required Reading: Cengel, Y. A. and Boles, M. A. 2011 7th Edition Thermodynamics-An Engineering Approach McGraw Hill Hamill, I. 2001 2nd Edition Understanding Hydraulics Palgrave Presses White, F., 2010 7th edition Fluid Mechanics McGraw Hill Comprehensive class, laboratory and activity notes. On-Line material

Assessment: Test, Based on weeks 1-6 (45 minutes), 10%. Test, Based on weeks 6-12 (45 minutes), 10%. Laboratory Work, Assessment of experiment and report on Stability of Floating Body, 10%. Laboratory Work, Assessment of experiment and report on Tube and Shell heat exchanger, 10%. Examination, End-of-semester examination (3 hours), 60%. Test 1 assesses: Learning Outcomes 1,4,5 and Graduate Capabilities 1,2,3,4 Test 2 assesses: Learning Outcomes 1,2,3. and Graduate Capabilities 1,2,3,4. Laboratory Work 1 assesses: Learning Outcomes 1,4,5 and Graduate Capabilities 1,2,3,4,5,6 and is linked to 10% LiWC Laboratory Work 2 assesses: Learning Outcomes .1,2,3.. and Graduate Capabilities 1,2,3,4,5,6 and is linked to 10% LiWC Examination covers Learning Outcomes 1,2,3,4,5 and Graduate Capabilities 1,2,3,4,5,6.

VAN2061 Engineering Materials

Locations: Footscray Park.

Prerequisites: VAN1022 Solid Mechanics 1 and REP1001 Engineering Physics 1A.

Description: Atomic structure and bonding. Prediction of properties of materials. Chemical stoichiometry and application of mass balances in chemical processes in environment and manufacturing. Extent and speed of reactions incorporating rate laws and Arrhenius theory and their applications to materials science, automotive engineering, civil engineering and biochemical reactions. Reactions involving thermal and electrical energy production and their application to fuel technology and fuel cells. Corrosion and corrosion protection of metals. Processes of polymer, aluminium, steel and copper production.Introduction to microstructure and crystallography of materials and their effect on material properties. Formation of metal grains and casting processes. Dislocation theory and strengthening processes in metals. Introduction to metal alloys and phase equilibria and phase equilibrium diagrams. Phase diagrams and microstructures of plain carbon steels and cast irons. Construction of TTT curves and their application to heat treatments of plain carbon steels and cast irons.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the processes and key issues related to engineering science in manufacturing and environment; 2. Solve a range of numerical engineering problems found in engineering practice and engineering design; and 3. Find and use relevant information, to formulate and solve specific problems, to work both autonomously and as a member of a team, to effectively communicate ideas, issues, investigations and results by a variety of methods, and to work in culturally diverse settings within the context of the subject areas.

Class Contact: 5 hrs equivalent per week of sessions made up of small group work, team meetings, workshops, seminars, laboratory sessions and site visits. In addition, students are expected to devote at least this much time for private and/or group study.

Required Reading: Rojter, J. (2005), Fundamental Applications of Science to Materials Technology, Victoria University.Class Notes.Rojter, J. (2005), Structure and Mechanical Properties of Solids1, Victoria University. Class Notes.Zumdahl, S.S., and Zumdahl, A.S (2003), Chemistry, 6th Ed, Houghton Mifflin Company.Callister, W.D. Jr (2004), Materials Science and Engineering- An Introduction, John Wiley and Sons Inc.

Assessment: An individual portfolio which providesevidence that demonstrates that the learning outcomes have been achieved. The portfolio may include skills audits, laboratory reports, site visit / project reports, reflective journals, workbooks, self and peer assessment.

VAN3052 Engineering Management

Locations: Footscray Park.

Prerequisites: ENF1201 - Engineering Mathematics 2ENF1202 - Engineering Physics 2ENF1204 - Introduction to Engineering DesignENF1205 - Engineering Fundamentals

Description: Prospective employers in contemporary engineering disciplines seek graduate engineers with strong management knowledge and skills. This unit is designed to teach specialised engineering management concepts graduates need to perform their duties industry. Topics covered include principles of engineering management, project tendering process, principles of life cycle engineering, financial modelling of engineering systems and planning techniques for repetitive engineering processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the time value of money concepts for the economic evaluation of engineering systems or projects; 2. Implement general management principles for the successful delivery and management of engineering projects; 3. Exhibit the ability to apply principles of project planning and control techniques for repetitive construction or production; 4. Articulate and apply basic principles of project life cycle costing, including reporting, planning and evaluation of systems; 5. Examine from an economic and functional viewpoint the feasibility of alternative design solutions; and 6. Demonstrate the ability to apply financial modelling to a project, including conduct of sensitivity analyses and application of techniques to account for uncertainty in the project evaluation process.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising lectures (24 hours) and workshops (24 hours).

Required Reading: The Lecturer will provide information on other textbooks that can be used in conjuction with other units, aswell as those available by online subscription. Students please check with the Main library.

Assessment: Test, Mid Semester Test (90 minutes), 20%. Test, Computer Lab Tests (1 hour each at end of weeks 6 and 12), 20%. Exercise, Weekly task assessments – Weeks 1-12 (Continual assessment), 10%. Examination, End of Semester Examination (3 hours), 50%.

VAN4011 Engineering Project 1

Locations: Footscray Park.

Prerequisites: VAN3052 - Engineering Management

Description: This unit constitutes a major capstone task for the engineering courses listed above, and provides students with the opportunity to integrate and further develop a range of technical and generic skills acquired in earlier course years. It will typically expose students to industry practice or the research approach and will involve: preliminary investigation followed up by explicit formulation of an engineering-related problem, review of relevant literature and/or discussion with a range of stakeholders, critical analysis of the problem, development/testing of a range of possible alternative solutions, and evaluation of these against social, environmental and economic criteria prior to selection of a 'best' solution. Students are also required to undertake a number of activities aimed at improving their communication and project management skills. This project will normally be continued in VAN4012, semester 2.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering knowledge, problem solving and project management skills learnt from the course; 2. Demonstrate resourcefulness, creative approach and ability to generate ideas utilising information pertaining to a broad range of topics relevant to the project; 3. Formulate, plan, design and/or construct and test solutions for an engineering problem specific to their chosen discipline; 4. Demonstrate skills in working with technical support staff, fellow students, and industry and/or community representatives and reflect on own and others' environmental, social and cultural practices; and 5. Critically evaluate and respond to own and others' performance using established parameters.

Class Contact: Lecture1.0 hrWorkshop10.0 hrsSixty (60) hours per week comprising supervised and unsupervised sessions made up of individual or small group work, team meetings, seminars, practical work and site visits.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: Portfolio, Project Participation, 85%. Presentation, Oral, 15%. The portfolio will typically be based on individual project participation (which may be demonstrated by a project reflective journal plus peer group and staff observations) .

VAN4012 Engineering Project 2

Locations: Footscray Park.

Prerequisites: VAN4011 - Engineering Project 1

Description: This unit constitutes a major capstone task for the engineering courses listed above, and provides students with the opportunity to integrate and further develop a range of technical and generic skills acquired in earlier course years. It will typically expose students to industry practice or the research approach and will involve: preliminary investigation followed up by explicit formulation of an engineering-related problem, review of relevant literature and/or discussion with a range of stakeholders, critical analysis of the problem, development/testing of a range of possible alternative solutions, and evaluation of these against social, environmental and economic criteria prior to selection of a 'best' solution. Students are also required to undertake a number of activities aimed at improving their communication and project management skills. (The project work undertaken here will normally be a continuation of that carried out in VAN4011.)

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering knowledge, problem solving and project management skills learnt from the course; 2. Demonstrate resourcefulness, creative approach and ability to generate ideas utilising information pertaining to a broad range of topics relevant to the project; 3. Formulate, plan, design and/or construct and test solutions for an engineering problem specific to their chosen discipline; 4. Apply skills in working with technical support staff, fellow students, and industry and/or community representatives and reflect on own and others' environmental, social and cultural practices; and 5. Critically evaluate and respond to own and others' performance using established parameters.

Class Contact: Workshop8.0 hrsSixty (60) hours for one semester comprising of supervised and unsupervised sessions made up of individual or small group work, team meetings, seminars, practical work and site visits.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: Portfolio, Project Participation, 75%. Presentation, Oral and Project, 25%. The portfolio will typically be based on individual project participation (which may be demonstrated by a project reflective journal plus peer group and staff observations). .

VAN4051 Engineering Project Management

Locations: Footscray Park.

Prerequisites: VAN3052 - Engineering Management

Description: The role of engineering project management in the industry. Roles of Project Managers. Principles of project management. Nine areas of Project Management Body of Knowledge and five processes (PMBoK). Tendering process, strategies and practices. Forms of engineering, construction and project management contracts. Contract administration phases. Cost management systems for the progressive cost control of a project. Plan site administration of medium sized projects. Financial feasibility for long-term development projects; break-even analysis; engineering project evaluation; preparation of project cash flow; current engineering industry practices. Understand various forms of project delivery methods. Developing quality management system. Developing quality assurance process; measuring process performance; feedback and corrective action; responding to external changes; alternative approaches to total quality management. Identifying required resources - in terms of human, equipment and materials; understanding needs versus wants; selecting and apportioning in a resource limited situation. Managing through people; motivation; use of power; management styles; effective project communication; non-adversarial approach to people management; role of unions and employer organisations in an engineering industry; legal aspects relating to contracts, responsibility and liability of a manager running a small engineering company. This unit includes a mandatory series of lectures on professional conduct and ethics.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the nine areas of project management body of knowledge and five processes in engineering projects; 2. Demonstrate project cash flows and budgets with respect to project control at various stages of the projects; 3. Undertake preliminary financial feasibility studies of engineering facilities; 4. Participate effectively as a member of a multi-discipline project control group; 5. Demonstrate and implement quality management system in an engineering industry or an engineering project; 6. Describe the role of unions and employer organisations in an engineering industry; 7. Identify resource conflicts and resolve them; 8. Describe the processes involved in running a successful engineering business; and 9. Demonstrate proper and ethical professional conduct.
Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr Workshop 1.0 hr
Required Reading: Kerzner H., 2001 10th Ed. Project management:a systems approach to planning, scheduling, and controlling John Wiley Meredity and Mantel 6th Ed. Project Management - A Managerial Approach John Wiley
Assessment: Portfolio, Portfolio, 100%. The portfolio may include calculations, site visit reports, a reflective journal, workbook(s), self and peer assessment, skills audit tests, tests/exams, assignment/project reports. Further details on portfolio components will be issued to students during the first week of classes. .

VCC8001 Research Thesis Full Time

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit will enable students to: identify a research problem and critically review the relevant literature; determine appropriate methods to study the problem; collect, and analyse data, and generate results using suitable statistical and analytical techniques; draw conclusions, critically evaluate the process undertaken and make recommendations for future research and for practice; present the results of the research undertaken, both clearly and accurately in a written thesis. The research topic chosen will allow the candidate to develop a methodology and to apply it to an appropriate problem or situation. The thesis will normally be from 15,000 to 25,000 words. It will report on independently conducted research which demonstrates the student's ability to clearly define a problem, to undertake a detailed literature search and review the literature on the topic area. The student shall also demonstrate both the ability to develop and/or apply models to study the problem and good data selection, collection and analysis skills. Students will normally be supervised by an academic member of the Department of Civil and Building Engineering and by a joint supervisor external to the Department. The external supervisor will be an academic from another Department of Victoria University or from another institution or an industry practitioner.
Credit Points: 48
Class Contact: Twelve hours per week for one semester.
Required Reading: To be advised by lecturer.

VCC8002 Research Thesis Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VCC8011 Research Thesis (Part-Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: 1. expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field 2. intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem 3. expert cognitive, technical and creative skills to:

- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature

4. expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. 5. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. 6. intellectual independence, initiative and creativity in new situations and/or for further learning. 7. ethical practice and full responsibility and accountability for personal outputs. 8. autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the College and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

VCC8012 Research Thesis (Part Time)

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: 1. expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field 2. intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem 3. expert cognitive, technical and creative skills to:

- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature

4. expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. 5. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. 6. intellectual independence, initiative and creativity in new situations and/or for further learning. 7. ethical practice and full responsibility and accountability for personal outputs. 8. autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Required Reading: To be determined in consultation with the supervisor.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the College and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

VEA3001 Introduction to Control Systems A

Locations: Footscray.
Prerequisites: VEF2002 Systems and Mathematics 2B
Description: The unit is designed to enable it to both ensure that students develop an understanding of Control Engineering, and to provide support for students requiring knowledge of Control Engineering in a concurrently studied PBL unit. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the subject will incorporate laboratory exercises and demonstrations of the concepts and techniques presented. Although primarily concerned with continuous time systems, lectures on discrete time systems may be delivered should these be required for the concurrent Engineering Design exercises.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the use of transfer functions, signal flow graphs and block diagrams in the description and analysis of control systems; 2. Appreciate the difference between real systems and the models of these systems; 3. Be aware of the limitations of simulation software. To be able to write a quantitative specification of system performance; 4. Use Root Locus Techniques and Matlab to analyse the performance of LTI SISO system models; 5. Design P, PI, PID, lead, lag and lead-lag controllers to modify the behaviour of a LTI SISO model; 6. Have an introductory knowledge of state-space models; 7. Calculate an overall transfer function by use of both Mason s Gain Formula and Block Diagram Reduction; and 8. Use Matlab/Simulink to analyse the behaviour of LTI SISO systems (including use of LTI viewer and rltool).
Class Contact: 30 hours of class contact per semester. 2 hours lecture/tutorial and 0.5 hours of laboratory exercises per week.
Required Reading: Ives, R., Introduction to Control Systems 3B Lecture Notes, Victoria University, 2008.
Assessment: End of semester examination 65%, mid-semester test 15%, and laboratory 20%.

VEA3002 Introduction to Control Systems B

Locations: Footscray.
Prerequisites: VEA3001 Introduction to Control Systems A
Description: This unit of study further develops the student's knowledge of Control Systems and Control Engineering. The unit is designed to enable it to both ensure that students develop an understanding of Control Engineering and to provide support for students requiring knowledge of Control Engineering in a concurrently studied Engineering Design unit. This has required the syllabus to be presented as a collection

of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Write and execute C programs on the DSpace DS1102 card to both control and monitor a DC motor servomechanism; 2. Operate the DS1102 system using both the Control Desk GUI and through Matlab/Simulink; 3. Understand how execution time impacts upon and limits the ability to achieve real time control; 4. Convert between State-Space and transfer function models of a LTI SISO system; and 5. Understand that State-Space models enable the representation of internal signals, and may be used to model MIMO systems.

Required Reading: Ives, R., Introduction to Control Systems 3B (Real Time Control) Lecture Notes, Victoria University, 2009.

Assessment: End of semester examination 65%, a mid-semester test 15% and laboratory 20%.

VEA4001 Discrete Time Control Systems A

Locations: Footscray.

Prerequisites: VEA3001 Introduction to Control Systems A

Description: This unit of study further develops the student's knowledge of Control Systems and Control Engineering and to provide support for students requiring knowledge of Computer Controlled Systems in a concurrently studied Engineerung Design unit. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. In addition to delivery by lecture and tutorial the subject will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand of the use of pulse transfer functions in the description and analysis of computer controller systems; 2. Convert a continuous-time transfer function model into a zero-order hold equivalent pulse transfer function model; 3. Convert between pulse transfer function models and difference equation models; 4. Perform analysis and design of discrete-time control systems with the Root Locus method; 5. Perform analysis and design of discrete-time control systems with the use of Bode diagrams in conjunction with the Bilinear transformation 6. Understand the need of performance trade-off in control design problems; 7. Use MatLab/Simulink to analyse and design discrete-time control systems; and 8. Use the DSpace DS1102 DSP card and Real-Time Workshop for rapid prototyping.

Class Contact: 30 hours of class contact. 2 hours lecture/tutorial and 0.5 hours of laboratory exercises per week

Required Reading: Ogata, K., Discrete-Time Control Systems, Prentice-Hall, 1995.

Assessment: End of semester examination 65%, a mid-semester test 15% and laboratory 20%.

VEA4200 Fuzzy Control and Applications

Locations: Footscray Park.

Prerequisites: VEA3001 Introduction to Control Systems A.

Description: Introduction to fuzzy sets theory: vagueness and uncertainty formalisation problem, fuzzy sets theory and probability theory comparison and discussion, fuzzy set definitions, properties of fuzzy sets, operations on fuzzy sets.Fuzzy relations: classical relations, fuzzy relations, operation on fuzzy relations, the extension principal. Natural language formalisation and approximate reasoning: linguistic variables, fuzzy propositions, fuzzy if - then statements, inference rules.Theoretical fundamentals of fuzzy control: the structure of a fuzzy controller, the rule base, the data base, the inference engine, choice of fuzzification and defuzzification procedures. Software and hardware tools for fuzzy control. Fuzzy controller design using software packages. Fuzzy controller implementation. Applications of fuzzy control.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the basic mathematical concepts of fuzzy sets; 2. Understand the structure of fuzzy logic controller; 3. Design and implement fuzzy logic controller; 4. Use MatLab/Simulink to analyse and design fuzzy control systems; and 5. Use the DSpace DS1102 DSP card and Real-Time Workshop for rapid prototyping of the fuzzy control systems.

Class Contact: 30 hours comprising 15 hours of lectures/tutorial and 15 hours of laboratory and project work.

Required Reading: K.M. Passino and S. Yurkovich , Fuzzy Control, Addison-Wesley, 1998. Free downloads from http://www.eleceng.ohio-state.edu/~passino/.

Assessment: Class tests/assignments throughout the semester 20%; Laboratory work 40%; Project work 40%.

VEA4400 Robotics and Automation

Locations: Footscray Park.

Prerequisites: VEF1002 Enabling Sciences 1B and VEF1004 Electrical Fundamentals 1B.

Description: Programmable Logic Controllers: Introduction to PLCs, programming and application. Overview of Robotics, classification, control methods, drive mechanisms. Programming and applications of specific robots. Homogenous transforms, configurations. Euler angles. Manipulator Kinematics. Introduction to KAREL. Robotic Vision: vision systems, introduction to image processing, edge detection algorithms, 2D recognition, stereo vision.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply programmable logic controllers and manipulators in factory automation; 2. Program robots for manufacturing tasks; and 3. Analyse and design vision systems for automatic inspection and guidance.

Class Contact: 30 hrs of contact comprising 15 hrs of lectures/tutorials and 15hrs of Laboratory.

Required Reading: Handout Notes.

Assessment: Examination 40%, Tests 10%, Laboratory Assignments 50%.

VEB1100 Engineering Design and Practice 1A

Locations: Footscray Park.

Prerequisites: Year 12 mathematics.

Description: This is a practical, PBL mode, unit in which students work in teams to solve a number of problems specifically designed to integrate with the learning and content from VEF1001 and VEF1003. Teams of students will have an Electrical Engineering staff member as a 'coach or mentor' whilst working on these problems. 'Specialist' staff from the VEF1001 and VEF1003 units will be available to assist students with technical aspects of the problems. Staff members from the School of Communication, Culture and Languages will be available on a weekly basis to assist with the development of communications skills. Staff members from other Faculties and the will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Display in-depth technical competence in at least one engineering discipline; 4. Work on problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Discuss the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Discuss professional and ethical responsibilities and display a commitment to them; 10. Recognise the need for undertaking lifelong learning; and 11. Locate, evaluate, manage and use information effectively.

Class Contact: 10 hours per week or equivalent for one semester.

Required Reading: Bazerman, C., & Wiener, H. S. (2003). Writing skill handbook (5th ed.). New York: Houghton Miflin. Faculty of Health, Engineering and Science. (2006). Handbook of Communication Skills for first year students in the Faculty of Health, Engineering and Science (8th ed.). Victoria University.

Assessment: Students will be assessed in this unit on the basis of a portfolio, in which they are required to demonstrate the attainment of learning outcomes using:- peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports.

VEB1200 Engineering Design and Practice 1B

Locations: Footscray Park.

Prerequisites: VEB1100 - Engineering Design and Practice 1A

Description: This is a practical, PBL mode, unit in which students work in teams to solve a number of problems specifically designed to integrate with the learning and content from VEF1002 and VEF1004. Teams of students will have an Electrical Engineering staff member as a 'coach or mentor' whilst working on these problems. 'Specialist' staff from the VEF1002 and VEF1004 units will be available to assist students with technical aspects of the problems. Staff members from the School of Communication, Culture and Languages will be available on a weekly basis to assist with the development of communications skills. Staff members from other Faculties will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Display in-depth technical competence in at least one engineering discipline; 4. Work on problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Discuss the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Discuss professional and ethical responsibilities and display a commitment to them; and 10. Recognise the need for undertaking lifelong learning.

Class Contact: 10 hours per week or equivalent for one semester.

Required Reading: Bazerman, C., & Wiener, H. S. (2003). Writing skill handbook (5th ed.). New York: Houghton Miflin. Faculty of Health, Engineering and Science. (2006). Handbook of Communication Skills for first year students in the Faculty of Health, Engineering and Science (8th ed.). Victoria University.

Assessment: Students will be assessed in this unit on the basis of a portfolio, in which they are required to demonstrate the attainment of learning outcomes using:- self and peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports.

VEB2100 Engineering Design and Practice 2A

Locations: Footscray Park.

Prerequisites: VEB1200 - Engineering Design and Practice 1B

Description: This is a practical, PBL mode, unit in which students work in teams to solve a number of problems specifically designed to integrate with the learning and content from VEF2001 and VEF2003. Teams of students will have an Electrical Engineering staff member as a coach or mentor whilst working on these problems. Specialist staff from the VEF2001 and VEF2003 units will be available to assist students with technical aspects of the problems. Staff members from the School of Communication, Culture and Languages will be available on a weekly basis to assist with the development of communications skills. Staff members from other Faculties will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Display in-depth technical competence in at least one engineering discipline; 4. Work on problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Discuss the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Discuss professional and ethical responsibilities and display a commitment to them; and 10. Recognise the need for undertaking lifelong learning.

Class Contact: 10 hours per week for one semester

Required Reading: There are no prescirbed readings for this unit. Students will be guided by the unit co-ordinator to material relevant to the student's design project.

Assessment: Students will be assessed in this unit on the basis of attendance and participation (10%), project demonstrations (10%), oral presentations (10%), written technical paper (10%) and report (10%) as well as a portfolio (50%). In the portfolio, students are required to demonstrate the attainment of learning outcomes using:- peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports.

VEB2200 Engineering Design and Practice 2B

Locations: Footscray Park.

Prerequisites: Nil.

Description: This is a practical, PBL mode, unit in which students work in teams to solve a number of problems specifically designed to integrate with the learning and content from VEF2002 and VEF2004. Teams of students will have an Electrical

Engineering staff member as a coach or mentor whilst working on these problems. Specialist staff from the VEF2002 and VEF2004 units will be available to assist students with technical aspects of the problems. Staff members from the School of Communication, Culture and Languages will be available on a weekly basis to assist with the development of communications skills. Staff members from the other schools will be available to provide workshops to assist students with the development of generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Display in-depth technical competence in at least one engineering discipline; 4. Work on problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Discuss the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Discuss professional and ethical responsibilities and display a commitment to them; 10. Recognise the need for undertaking lifelong learning; and 11. Locate, evaluate, manage and use information effectively.

Class Contact: 10 hours per week or equivalent for one semester.

Required Reading: To be provided upon commencement of the unit to suit the student's design project(s).

Assessment: Students will be assessed in this unit on the basis of a portfolio, in which they are required to demonstrate the attainment of learning outcomes using:- self and peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports.

VEB3100 Engineering Design and Practice 3A

Locations: Footscray Park.

Prerequisites: VEB2200 - Engineering Design and Practice 2B VEF2004 - Systems & Applications 2D OR

Description: This unit is designed to create the opportunity for students to integrate generic skills with the learning and content from the concurrent third year subjects. The PBL approach to this unit of study requires students to form a holistic consideration of problems which are not only technical in nature but also exercise the students generic skills. Students are required to demonstrate critical thinking, problem solving skills, systems thinking and professional engineering practice. The unit is delivered in PBL mode and will encourage students to become independent learners and self reflective about professional communication processes and practices.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Display in-depth technical competence in at least one engineering discipline; 4. Work on problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Discuss the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Discuss professional and ethical responsibilities and display a commitment to them; 10. Recognise the need for undertaking lifelong learning; and 11. Locate, evaluate, manage and use information effectively.

Class Contact: 10 hours per week for one semester.

Required Reading: There are no prescribed readings for this unit. Students will be guided by the unit co-ordinator to material relevant to the unit.

Assessment: Students will be assessed in this unit on the basis of a portfolio, oral presentations, project demonstration, and written technical report. In the portfolio students are required to demonstrate the attainment of learning outcomes using: peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports. The weightings of the components mentioned above are:- Workshop attendance and participation: 10% Oral presentation: 10% Semester and final team product demonstration: 30% Written technical report: 30% Reflective Journal Portfolio: 20%

VEB3101 Engineering Project 3A

Locations: Footscray Park.

Prerequisites: Successful completion of EBES Year 2.

Description: Application of system analysis and design principles to develop a detailed specification, detailed design and test plan for a project with substantial software and/or hardware components. Development of the system is undertaken in a staged process, with deliverables and presentation at the end of each stage.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principle of system analysis and design and be able to apply this methodology to project work; and 2. Produce necessary project documentation that could be used for implementation and testing of the hardware and/or software by a suitably qualified engineering technologists or engineers.

Class Contact: Thirty-six (36) hours of contact comprising of twelve (12) hours of lectures/tutorials and twenty-four (24) hours of laboratory and project work.

Required Reading: Ng, Y. (Ed.). (2008). Class notes (Rev. ed.). Footscray, Australia: Victoria University, School of Electrical Engineering.

Assessment: Project, Project, 60%. Examination, Examination, 40%.

VEB3102 Engineering Project 3B

Locations: Footscray Park.

Prerequisites: VEB3101 - Engineering Project 3A

Description: Application of software, hardware techniques and research skills acquired in the course to implement and test an individual project according to a detailed specification and test plan.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply theories and techniques from various specialisations to solve complex engineering problem; and 2. Implement and test a project according to a detailed specification and test plan.

Class Contact: 30 hours of Project work.

Required Reading: There is no prescribed reading for this unit. Students will be guided by the unit co-ordinator to material relevant to the project.

Assessment: Project work (100%).

VEB3200 Engineering Design and Practice 3B

Locations: Footscray Park.

Prerequisites: VEB3100 - Engineering Design and Practice 3Aplus Year 3 semester 1 Stream Core Unit.
Description: This unit is designed to create the opportunity for students to integrate generic skills with the learning and content from their chosen specialisation unit. The PBL approach to this unit of study requires students to form a holistic consideration of problems which are not only technical in nature but also exercise the students generic skills. Students are required to demonstrate critical thinking, problem solving skills, systems thinking and professional engineering practice. The unit is delivered in PBL mode and will encourage students to become independent learners and self reflective about professional communication processes and practices.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Display in-depth technical competence in at least one engineering discipline; 4. Work on problem identification, formulation and solution; 5. Utilise a systems approach to design and operational performance; 6. Function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 7. Discuss the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development; 8. Describe the principles of sustainable design and development; 9. Discuss professional and ethical responsibilities and display a commitment to them; 10. Recognise the need for undertaking lifelong learning; and 11. Locate, evaluate, manage and use information effectively.
Class Contact: 10 hours per week for one semester.
Required Reading: There are no prescribed readings for this unit. Students will be guided by the unit co-ordinator to material relevant to the unit.
Assessment: Students will be assessed in this unit on the basis of a portfolio, oral presentations, project demonstration, and written technical report. In the portfolio students are required to demonstrate the attainment of learning outcomes using: peer evaluation and assessment, weekly team/client meetings, a reflective journal, reflective essays, expositions, audio/visual project presentations and written project reports. The weightings of the components mentioned above are:- Workshop attendance and participation: 10% Oral presentation: 10% Semester and final team product demonstration: 30% Written technical report: 30% Reflective Journal Portfolio: 20%

VEB4006 Directed Studies in Electrical Engineering 1

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit is to provide prescribed learning outcomes tailored to the requirements of students transferring into undergraduate programs offered by the School of Electrical Engineering. The outcomes will be defined by the School on an individual, as-required, basis. The unit is intended to facilitate both articulation students and students with recognised prior learning that does not lend itself to simple mapping into the units offered in their selected program. The content will be a subset of the content of a core program unit of study, which matches both the required learning outcomes and is defined by the School to satisfy the 6 credit point weighting of this unit.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key elements in a previously unseen problem associated with the negotiated content area of this unit of study; 2. Locate the relevant underpinning theory in references available to them; and 3. Use that support and sppropriate mathematical and laboratory techniques, where necessary, to apply that information to the novel sitiation to reach a solution to the problem posed.
Class Contact: 5 hours per week or equivalent for one semester.
Required Reading: To be prescribed by the School.
Assessment: A series of assignments, tests and reports as negotiated for each individual or group of students with a similar background.

VEB4012 Directed Studies in Electrical Engineering 2

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit is to provide prescribed learning outcomes tailored to the requirements of students transferring into undergraduate programs offered by the School of Electrical Engineering. The outcomes will be defined by the School on an individual, as-required, basis. The unit is intended to facilitate both articulation students and students with recognised prior learning that does not lend itself to simple mapping into the units offered in their selected program. The content will be a subset of the content of a core program unit of study, which matches both the required learning outcomes and is defined by the School to satisfy the 12 credit point weighting of this unit.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key elements in a previously unseen problem associated with the negotiated content area of this unit of study; 2. Locate the relevant underpinning theory in references available to them; and 3. Use that support and appropriate mathematical and laboratory techniques, where necessary, to apply that information to the novel situation to reach a solution to the problem posed.
Class Contact: 10 hours per week or equivalent for one semester.
Required Reading: To be prescribed by the School.
Assessment: A series of assignments, tests and reports as negotiated for each individual or group of students with a similar background.

VEB4100 Engineering Design 4A

Locations: Footscray Park.
Prerequisites: ENE3200 - Engineering Design and Practice 3B
Description: In this unit, students will commence a major design project resulting in a complete and working outcome which meets the agreed specifications and demonstrates an understanding of professional engineering standards. Student teams will analyse the problem, undertake a feasibility study or gap analysis, develop functional and design specifications (in collaboration with the Project Clients and Mentors), and write a comprehensive project proposal. The proposal will evaluate possible options and alternative engineering solutions using objective criteria functions. Cost, resources, technical ability, reliability, sustainability and environmental impacts should all be considered in choosing the best approach. Students will pitch their idea to the client and student audience in an oral presentation. Once a solution has been agreed upon, students will enter a contract wth the client to deliver on the project. Students will then develop a comprehensive project management plan as the final outcome of this unit. If the unit is successfully passed, students will then execute and deliver on the project in the semester 2 follow-up unit VEB4200.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Undertake detailed identification and analysis of a problem; 2. Evaluate the feasibility of a range of solutions taking into account such factors as cost, technical

requirements, business requirements, environmental and sustainability issues; 3. Demonstrate skills in synthesising, prototyping, critically analysing and testing project deliverables and delivering outcomes to specifications; 4. Effectively perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; project log; and PowerPoint presentations that meet industry and university standards; and 6. Communicate with all stakeholders in an ethical and professional manner and present project findings in professional oral presentations to the client and university audiences.

Class Contact: Lecture2.0 hrsTutorial1.0 hrEquivalent of one (1) hour per week, comprising on average ½ hour/week in progress presentations, and ½ hour/week meeting with the project supervisor. Most of the work in this unit will occur outside formal classes.

Required Reading: Project Management notes will be provided by the Lecturer. Other required reading will be prescribed by the project mentor as needed for the project.Thinh Nguyen Lecture Notes Victoria University Other required reading will be prescribed by the project mentor as needed for the project.

Assessment: Report, Project Proposal, 40%. Presentation, Oral Presentation, 10%. Other, Project Contract, 10%. Other, Project Plan, 40%. As each piece of assessment builds upon the subsequent assessment, all assessments are hurdles requiring students to pass the assessment before being eligible to complete the next assessment. This also ensures that the project life cycle is progressed in a logical order. .

VEB4200 Engineering Design 4B

Locations: Footscray Park.

Prerequisites: VEB4100 - Engineering Design 4A

Description: This unit continues the project work from the previous semesters VEB4100. In this semester, students will be taking their project plans and executing them to create the project deliverables. The deliverables must be created in accordance with the project contract. Assessment of the project outcomes will be based on how well students delivere the project as per the terms of the contract. The outcomes of this unit comprise the project deliverables, technical report and oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering knowledge to create, test and validate project designs or research activities to deliver on outcomes that meet client specifications; 2. Effectively manage a complex design or research project; 3. Produce a range of high quality professional and technical documents including project reports; and PowerPoint presentations; and 4. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: Lecture2.0 hrsTutorial1.0 hrOne hour per week or equivalent for one semester comprising on average ½ hour/week in progress presentations, and ½ hour/week meeting with the project supervisor. Most of the work in this unit will occur outside formal classes.

Required Reading: There are no prescribed readings for this unit. Students will be guided by the unit co-ordinator to material relevant to the project being undertaken.

Assessment: Report, Project Report, 40%. Presentation, Oral Presentation, 10%. Project, Project Deliverables, 50%.

VEE3001 Introduction to Electrical Machines

Locations: Footscray Park.

Prerequisites: VEF2004 Systems and Applications 2D

Description: This unit of study is intended to provide a sound knowledge of induction and synchronous machines including equivalent circuits, performance analysis based on the equivalent circuits, and operating characteristics under varying operating conditions. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented. Unit Content Introduction to induction motor and rotating field. Equivalent circuit of an induction motor. Power, torque, efficiency, power factor calculations. Induction motor starting. Speed control of induction motor. Introduction to synchronous machines. Synchronous motors and their characteristics. Synchronous generators. Loci of synchronous motor. Synchronous motor starting.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop an understanding of the structure of A.C. electrical machines and the purpose of the various components; 2. Develop equivalent circuit models for the machines; 3. Learn to calculate the operating characteristics of machines using the equivalent models (power, torque, efficiency, power factor etc.); 4. Develop an understanding of staring dynamics of motors; and 5. Develop an understanding of appropriate applications of A.C. machines in industries.

Class Contact: 30 hrs of class contact: Two and an half hours per week.

Required Reading: Theodore Wildi, 2002, Electrical Machines, Drives and Power Systems, fifth Edition, Prentice Hall.

Assessment: Written examination 65% Test 20% Laboratory 15%.

VEE3002 Introduction to Electrical Power Systems

Locations: Footscray.

Prerequisites: VEF2004 Systems and Applications 2D

Description: This unit of study is intended to provide an introduction to electrical power systems. The unit will cover topics of generation, transmission, and distribution systems at introductory levels. Various types of generation systems will be introduced. Different types of transmission/distribution systems and associated gears will be introduced. Models of long, medium and short transmission lines will be introduced to assist in calculation of power, voltage, current and power factor. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop an understanding on power systems components; 2. Understand the configuration and operation of a power system; 3. Develop skills in calculating the electrical parameters in a power system; and 4. Gain knowledge in ways of controlling frequency and voltage in a power system.

Class Contact: 30 hrs of class contact. Two and an half hours per week.

Required Reading: Theodore Wildi 2002, Electrical Machines, Drives and Power Systems, fifth Edition, Prentice Hall.

Assessment: Written examination 65% Test 20% Laboratory 15%.

VEE4100 Electric Energy Systems Analysis and Operation

Locations: Footscray Park.

Prerequisites: Nil.

Description: Electricity distribution in the deregulated Australian power industry. Admittance model and Network Calculations Load flow analysis techniques, Gauss Siedel and Newton Raphson methods, uses of load flow analysis, cases studies. Economic operation of power systems. The planning, design and operation of electrical energy transmission and distribution networks: planning, design standards and performance requirements. voltage control. power quality and reliability. overvoltage protection. earthing and safety. embedded generation. power electronic systems for performance improvement.

Credit Points: 6

Class Contact: 30 hours comprising 24 hours of lectures/tutorial and 6 hours of laboratory.

Required Reading: Grainger J. J. and Stevenson W.D. Power System Analysis, 1994, McGraw Hill.

Assessment: Assignment and Laboratory Exercises 40%; End of semester examination 60%; A pass in each component of assessment is required for a subject pass.

VEE4200 Electric Energy Systems Protection

Locations: Footscray Park.

Prerequisites: Nil.

Description: This subject covers the planning, design and operation of electrical protection systems for the generation, transmission and distribution electric energy: planning, design standards and performance requirements; principles and types of protection systems (overcurrent, impedance, differential, backup, fuses); application to generators, motors, transmission lines, transformers, busbars, and distribution; instrument transformer steady state and transient behaviour; electrical studies for planning and design of protection systems; power system communications for protection application.

Credit Points: 6

Class Contact: 30 hours of class contact comprising 24 hours of lectures/tutorial and 6 hours of laboratory.

Required Reading: Lecture notes provided.

Assessment: Assignment and Laboratory Exercises 40%; End of semester examination 60%; A pass in each component of assessment is required for a subject pass.

VEE4400 High Voltage Engineering

Locations: Footscray Park.

Prerequisites: Nil.

Description: Electrical insulation properties and characteristics, insulator selection, insulation co-ordination in electric energy networks, sources of overvoltages, lightning impact on transmission and distribution networks, surge propagation theory, circuit interruption theory and circuit breaker operation.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and describe the various insulator technologies; 2. Analyse surge propogation and its impact on electrical networks; and 3. Study circuit breaker operation.

Class Contact: 30 hours of class contact comprising 24 hours of lectures/tutorial and 6 hours of laboratory.

Required Reading: Lecture notes provided.

Assessment: Assignment and Laboratory Exercises 40%; End of semester examination 60%; A pass in each component of assessment is required for a subject pass.

VEE4500 Power Electronics

Locations: Footscray Park.

Prerequisites: VEF2004 Systems and Applications 2D

Description: Introduction to the theory, design and analysis of conversion of electric power by means of power electronics, including AC to DC and DC to DC power converters. The fundamental knowledge of electronic speed control techniques for DC motor drives for different applications. AC-DC single-phase and three-phase power converters: Diode and SCR bridge rectifiers. DC-DC Switching Mode Power Converters, buck converters and boost converters, Buck-boost converters. Unipolar and bipolar voltage switching method. Flyback converters, push pull converters. First quadrant, two quadrant and four quadrant drive. Different electronic speed control techniques for DC motor drives.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the basics and operations of power semiconductor switches; 2. Know the building blocks of power electronics conversion; 3. Analyse AC/DC and DC/DC power converters; 4. Analyse and design different types of switching power supplies in different modes of operation; and 5. Demonstrate the knowledge of electronic speed control techniques for DC motor drives for different applications.

Class Contact: 30 hrs of class contact consisting of 2 hrs of Lecture/Tutorial per week and 0.5 hrs of Laboratory per week.

Required Reading: 1) Lecture notes provided. 2) N. Mohan, T. M. Undeland & W. P. Robbins, 2003, Power Electronics - Converters, Applications, and Design, John Wiley & Sons.

Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination, a mid-semester test and requires satisfactory performance of laboratory based components of this unit.

VEE4700 Power System Communication, Monitoring and Instrumentation

Locations: Footscray Park.

Prerequisites: Nil.

Description: Introduction to communication principles and terminologies used in power systems Leading global organisations and their standards Power system automation and integration concepts *Discussion on architectures, protocols as utilised in power system communication networks Middleware technologies Information embedded power systems Power system security aspects, SCADA and contingency analysis Network sensitivity methods; generation dispatch Operational metering Tariffs and wholesale energy trading Future technologies and their implications for power system communications

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Recognise the role of communications in power systems and identify various communication requirements needed in power system protection and distribution networks; 2. Understand the use of communication media and architectures in power systems; 3. Understand the value of what global organisations like IEC and EPRI bring to the development of new technologies and structures for the advancement of power systems; 4. Comprehend system automation and integration concepts; 5. Comprehend the communication standards, protocols and architectures most commonly employed in power system protection and distribution networks; 6. Comprehend the importance of security and contingency analysis in the operation of power system networks; 7. Identify the different instrumentation used in power systems; and 8. Understand operational metering, tariffs and wholesale energy trading.

Class Contact: 30 hours of class contact.
Required Reading: Kalam, A. and Kothari, D.P., 2008, Power System Communications, New Age International (P) Ltd, 2008.
Assessment: Students will be assessed in this unit of study based on an end of semester examination 60%, a team assignment 10%, word limit: 1000, a class test 10% and laboratory exercises 20%.

VEE4800 Alternative Energy Systems

Locations: Footscray Park.
Prerequisites: Nil.
Description: The aim of this unit of study is to introduce students to unconventional energy sources such as solar, wind, biomass and fuel cells etc. and energy storage; problem facing the Electricity Supply Industries in Australia and its choices. The unit will focus on: Overview of major alternative sources and their energy content Environmental and economic advantages of using alternative energy generation technologies along with the concept of sustainability in order to provide the basis for the consideration of alternative energy systems The unit will cover: Conventional energy systems and green house effect Evaluation and feasibility studies of solar energy, wind energy, fuel cells, hydrogen generation, bio-fuel, tidal and geothermal systems Analysis and modelling of above systems Economic analysis of above systems Design of hybrid systems and integration
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand different alternative energy sources and their availability; 2. Know the design and operation principles of alternative energy systems; 3. Analyse economic and environmental impact of the alternative energy systems; and 4. Demonstrate an awareness of current applications of alternative energy systems.
Class Contact: 4 hours per week. Total 48 hours comprising lecture/tutorials/laboratory
Required Reading: Masters, G 2004, 1st edn, Renewable and Efficient Electric Power Systems, John Wiley & Sons, Hoboken, NJ. Boyle, G 2004, 2nd edn, Renewable Energy: Power for a Sustainable Future, Oxford University Press, Oxford.
Assessment: Students will be assessed in this unit on the basis of an end of semester examination, a mid-semester test and requires satisfactory performance of laboratory based components of this unit.

VEE8001 Research Thesis 1 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VEE8002 Research Thesis 2 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VEE8011 Research Thesis 1 Part Time

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: 1. expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field 2. intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem 3. expert cognitive, technical and creative skills to:

- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature

4. expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. 5. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. 6. intellectual independence, initiative and creativity in new situations and/or for further learning. 7. ethical practice and full responsibility and accountability for personal outputs. 8. autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the

College and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

VEE8012 Research Thesis 2 Part Time

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Doctor of Philosophy (PhD) at Victoria University is VU's Doctoral Degree (Research) program, and qualifies individuals who acquire and apply a substantial body of knowledge to research, investigate and develop new knowledge, in one or more fields of investigation or scholarship. This unit contributes to the research student's progress towards the production of a thesis in an approved thesis format for independent examination by at least two external expert examiners of international standing. In this unit of study the student will be expected to demonstrate progress towards thesis completion as per the Learning Outcomes below.
Credit Points: 24

Learning Outcomes: On successful completion of this unit, the student will be able to demonstrate significant progress towards demonstration of: 1. expert understanding of a substantial body of theory and its practical application at the frontier of a field of work or learning, including substantial expert knowledge of ethical research principles and methods applicable to the field 2. intellectual independence and cognitive skills to undertake a systematic investigation, reflect critically on theory and practice and evaluate existing knowledge and ideas, including identifying, evaluating and critically analysing the validity of research studies and their applicability to a research problem 3. expert cognitive, technical and creative skills to:

- design, develop and implement a research project/s to systematically investigate a research problem
- develop, adapt and implement research methodologies to extend and redefine existing knowledge
- manage, analyse, evaluate and interpret data, synthesising key ideas and theorising within the context of key literature

4. expert communication skills to explain and critique theoretical propositions, methodologies and conclusions; to disseminate and promote new insights; and to cogently present a complex investigation of originality, or original research, both for external examination and to specialist (eg. researcher peers) and non-specialist (industry and/or community) audiences through informal interaction, scholarly publications, reports and formal presentations. 5. capacity to reflect on, develop and evaluate strategies for achieving their own learning and career goals. 6. intellectual independence, initiative and creativity in new situations and/or for further learning. 7. ethical practice and full responsibility and accountability for personal outputs. 8. autonomy, authoritative judgment, adaptability and responsibility as an expert and leading scholar.

Required Reading: To be determined in consultation with the supervisors.
Assessment: The student will demonstrate substantial progress towards completion of the research thesis through formal meetings with their thesis supervisors, who will provide formative feedback. The unit will be assessed by the supervisory team, the College and University through 6-monthly progress reports. Thesis, Research Thesis, Pass/Fail.

VEF1001 Enabling Sciences 1A

Locations: Footscray Park.
Prerequisites: Nil.
Description: Basic algebra, including index, log laws, indicial and log equations, algebraic expansions; Functions, straight line, parabola, circle etc. Mod function. Domain, range, inverse functions; Trig. Functions and their graphs, period amplitude, degrees radians. Basic trig identities, Inverse Trig functions. Converting aCosx±bSinx to single Sin, Cosine terms; Limits, continuity, differentiation, rules, higher derivatives, Implicit differentiation. Tangents and Normals; Parametric differentiation, derivatives of logs and exponentials. Rates of change, maximum and minimum problems. Trig and inverse trig derivatives, logarithmic differentiation; Introduction to integration. Fundamental theorem of Integral Calculus. Substitution rule. Areas, Mean values, Root mean square; Methods of integration, partial fractions, simple integration by parts; Introduction to differential equations, separation of variables, population growth, air resistance; Complex numbers.Physical Units and Dimensions: Physical quantities, system of units and standards, dimensions, unit conversion, significant figures. Kinematics and Mechanics: Scalars and vectors, displacement, velocity and acceleration, motion in one and two dimensions, force, Newton's laws of motion, friction, work and energy, momentum and conservation laws, impulse and collisions, rotational motion, Waves: SHM, damped harmonic motion, forced oscillations and resonance, oscillatory motion, mechanical and acoustic waves, superposition and standing waves, Doppler effect, beats, sound intensity levels.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform basic differentiation and integration; 2. Calculate rates of change in maximum and minimum problems; 3. Perform integration by parts; 4. Use Newton's laws to calculate displacement, velocity and acceleration; and 5. Apply the rules of conservation of energy and momentum.
Class Contact: 60 hours of lectures/tutorials per semester.
Required Reading: D.Hughes-Hallett, A.Gleason, W.McCallum et al. Single and Multivariate Calculus. John Wiley and Sons, Inc. New York, 2005; Giancoli, D.C. Physics for Scientists and Engineers with Modern Physics, 4th Edition, 2008, Prentice Hall
Assessment: Class tests 30% End of semester examinations 70%

VEF1002 Enabling Sciences 1B

Locations: Footscray Park.
Prerequisites: VEF 1001 Enabling Sciences 1A.
Description: Descriptive statistics, data, histograms etc. Describing data, mean, median, mode, quantiles, measures of dispersion; Introduction to probability, sample space, mutually exclusive and independent events. Intro to PDFs and intro. to Normal distribution; Normal distribution, mean of n variate values, 3,2,1 sigma confidence limits. Binomial, Poisson distributions; Exponential, Hypergeometric distr. Normal approx. to Binomial and Poisson. Sample mean. Central limit theorem; Determinants, matrices, Cramer's rule, inversion; Solution of systems of algebraic equations. Row operation, Gaussian elimination, echelon form, ranks; Newton Raphson, numerical integration. Midpoint, Trapezoidal and Simpsons rules; Introduction to series and some convergence tests; Simple power series and the Maclaurin series; Partial differentiation, algebraic, trig, exp, and log functions. Rules; Partial differentiation, conditions for max/min. Simple problems; Intro to second order constant coefficient, homogeneous D.s. Three types of solutions via the auxiliary equation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Have an understanding of statistics including the Normal, exponential, Poisson and Hyper geometric distributions; 2. Have an understanding of Electric and

magnetic fields and calculate the forces acting on charged particles; and 3. Understand wave/particle duality and the Bohr model of the atom.

Class Contact: 60 hours of lectures/tutorials per semester.

Required Reading: D.Hughes-Hallett, A.Gleason, W.McCallum et al. Single and Multivariate calculus. John Wiley and Sons, Inc. New York, 2005; Giancoli, D.C. Physics for Scientists and Engineers with Modern Physics, 4th Edition, 2000, Prentice Hall.

Assessment: Class tests 30%. End of semester examinations 70%.

VEF1003 Electrical Fundamentals 1A

Locations: Footscray Park.

Prerequisites: Nil.

Description: Circuit Theory and Electronics: Basic concepts of electricity. KVL and KCL. Analysis of DC circuits using Nodal Voltage Method. Independent DC sources, ideal and practical. Resistors. Power of a signal and amplifiers. Dependent sources. Introduction to the operational amplifier and some application circuits. Resistive transducers. Volt-ampere characteristics. Thevenin and Norton's Theorems. Capacitors. Transient responses of RC series circuits. Ideal diode. Simple rectifier circuits and power supplies.Number Systems and Codes: Base conversions, representation of data in the binary and hexadecimal systems, binary arithmetic, signed and unsigned values.Computer Programming: An overview of a typical computer system. The program creation process; editing, compiling and debugging. Data types, correct choice of type and their range. The use of variable, assignment, arithmetic and logical operations. Flow control using loops; if, while and switch statements. An Introduction to arrays.Digital Electronics: Logic gates, truth tables and Boolean algebra. Equation formation in Sum of Products and Product of Sums forms. Graphical methods of equation minimization including Venn diagrams and the Karnaugh map. Circuit implementation using universal gate sets.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the concepts, units and interrelationship between electric charge, voltage and power; 2. Understand and be competent in the application of Kirchhoff's Laws for circuit analysis; 3. Be competent in the application of the Nodal Voltage Method, and the concept of equivalence (including Thevenin's and Norton's Theorems) to the solution of linear DC circuit analysis; 4. Understand the different types of gain, and input and output resistance of an amplifier; 5. Analyse the following ideal operational amplifier circuit applications: inverting and non-inverting amplifier, buffer, inverting summer, comparator, and difference amplifier. To understand some of the uses of these circuits; 6. Understand how a dependent source may be used to model the finite voltage gain and finite input resistance of a real operational amplifier; 7. Understand that the operational amplifier voltage range is limited by the DC supply rails, and to appreciate that its gain is dependent upon the signal frequency; 8. Understand the differences between ideal linear and real resistors; 9. Understand from a components Volt-ampere characteristic whether or not the device can sink or source power, is linear or non-linear, is bilateral or non-bilateral; 10. Use Volt-ampere characteristics to find the voltage, current or power of a component connected to a Thevenin Equivalent Circuit; 11. Understand the definition and units of capacitance. To know the physical nature of stray capacitance and of capacitors; 12. Solve CR charge/discharge transient analysis problems. To appreciate some applications of this type of analysis; 13. Understand how a capacitor acts as an energy storage component; 14. Have a basic understanding of a TRU power supply, including ripple voltage calculations; 15. Write truth tables, construct logic expressions, and minimize expressions using Boolean algebra or Karnaugh map; and 16. Design and construct combinational logic circuits for simple applications. Write C++ program to solve simple problems that may include use of selection and repetition structures, create single dimensional arrays and store and manipulate data.

Class Contact: 60 hours of lectures/tutorials per semester.

Required Reading: Ives, R Introduction to Electrical and Electronic Engineering, Victoria University; Savitch, W. Problem Solving with C++, 4th edition, 2004, Addison-Wesley.

Assessment: Class tests,30% End of semester examination 70%.

VEF1004 Electrical Fundamentals 1B

Locations: Footscray Park.

Prerequisites: VEF1003 Electrical Fundamentals 1A or equivalent.

Description: Circuit Theory and Electronics: Principle of Superposition. DC characteristics of real operational amplifiers. AC Circuit theory and some practical AC circuits. Phasors and complex impedance. Introduction to magnetism. Self-inductance. Transient & RC RL circuit responses. Resonance. Passive filters & bandwidth. AC characteristics of real operational amplifiers. Power in AC circuitsComputer Programming: Functions and function parameters. Text files and text strings. An introduction to data structures and classes.Digital Electronics: Latches and flip-flops, types, triggering, synchronous and asynchronous signals. Asynchronous counter design using flip-flop chains and manufacturer's devices. Multi-mode synchronous counter and state machine design. Electrical characteristics of logic devices.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the Principle of Superposition to circuit analysis, and be aware of those circuits where it is not applicable; 2. Convert data sheet characteristics of an IC amplifier into a network model. To be able to use the Principle of Superposition to examine the significance of these characteristics in linear applications of the amplifier; 3. Analyse linear AC circuits; 4. Calculate the RMS value of periodic waveforms; 5. Understand the basics of electromagnetism sufficient to underpin the solution of circuits containing self-inductors; 6. Define resonance; 7. Understand the behaviour of AC circuits both at resonance, and at frequencies either side of the resonant frequency; 8. Convert freely between impedance and admittance, as required by given problems; 9. Calculate the attenuation vs frequency response of first order passive filters; 10. Calculate the various measures of power associated with AC power circuits; 11. Understand how given limitations of real operational amplifiers may manifest themselves in AC circuit applications; 12. Design and construct sequential logic digital circuits using D and J-K flip-flops; 13. Use state diagrams and state tables for design; and 14. Write C++ programs using user defined functions and pointers and user defined data structures. Write/read data to/from text files.

Class Contact: 60 hours of lectures/tutorials per semester.

Required Reading: Ives, R Electrical and Electronic Engineering, Victoria University.

Assessment: Class tests 30%. End of semester examination 70%.

VEF2001 Linear Systems and Mathematics 2A

Locations: Footscray Park.

Prerequisites: VEF1002 Enabling Sciences 1B and VEF1004 Electrical Fundamentals 1B

Description: Linear Systems: Analysis of linear time-invariant systems in time-domain. Zero-input response and zero-state response. Relationship between impulse response and transfer function. Poles and zeros and their significance. Analysis of linear time-invariant systems in frequency-domain. Frequency response and Bode

diagrams.Mathematics: Laplace transformation and solution of ordinary linear differential equations with constant coefficients. Introduction to Fourier series and Fourier transforms. Elementary eigenvalue-eigenvector problems and solution of a set of ordinary linear first-order differential equations with constant coefficients.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform time-domain analysis of linear time-invariant systems using Laplace transforms; 2. Perform frequency-domain analysis of linear time-invariant systems using Fourier series and Fourier transforms; 3. Apply linear algebra to find trajectories of linear systems modelled as a system of first-order linear ordinary differential equations with constant coefficients; and 4. Employ simple MatLab commands and Simulink to analyse linear time-invariant systems.

Class Contact: Linear Systems component: Three hours of lecture and problem solving per week for twelve weeks, for one semester. Total 36 hours.Mathematics component: Two hours of lectures and problem solving per week for twelve weeks, for one semester. Total 24 hours.

Required Reading: Linear Systems component:Alexander, C.K. and M.N.O. Sadiku, Fundamental of Electric Circuits, McGraw-Hill, 2004. Strum, R.D. and D.E. Kirk, Contemporary Linear Systems using MatLab. Brooks/Cole, 2000.Mathematics component: Kreyszig, E., Advanced Engineering Mathematics, John Wiley, 2006.

Assessment: This subject is designed to complement our Engineering Design subjects and as such will have significant formative assessment components. In addition there will be summative assessment in the form of multiple "skills audits" to account for 30% and end of semester examinations accounting for 70% of the total marks.The end of semester examinations include a three-hour Linear Systems Component Examination (accounting for 35% of the total marks) and a three-hour Mathematics Component Examination (accounting for 35% of the total marks).

VEF2002 Systems and Mathematics 2B

Locations: Footscray Park.

Prerequisites: VEF 2001 Linear Systems and Mathematics 2A

Description: Communication Systems: Communication systems and networks. Circuit switching, Cellular telephony systems and Internet. Communication signal analysis using Fourier series, Fourier transforms and convolution. Spectral standards and bandwidth calculations. Waveform distortion. Nyquist sampling theorem. Digital modulations: PCM, DPCM, DM.Control Systems: Feedback problems and their solutions. Low sensitivity design. Dynamic characteristics and closed-loop stability, algebraic stability tests. Introduction to PID controllers.Probability and Statistics: Probability theory. Random variables. Discrete distributions. Expected value, moment, and variance. Joint distribution. Conditional distribution. Normal distribution. Function of random variables. Maximum likelihood estimation. Confidence intervals and hypothesis testing. Random processes. Correlation, covarianace, and power spectrum.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. State and differentiate the purposes and requirements of communication systems and control systems; 2. Perform elementary time-domain and frequency-domain analyses of simple communication systems and control systems; and 3. Employ simple MatLab commands and Simulink to analyse simple communication systems and control systems.

Class Contact: 60 hours of lectures/tutorials per semester.

Required Reading: Systems component:Nise, N.S. Control Systems Engineering, John Wiley, 2003.Lathi, B.P. Modern Digital and Analog Communication Systems, Oxford University Press, 1998.Probability and Statistics component:Kreyszig, E., Advanced Engineering Mathematics, John Wiley, 2006.

Assessment: This subject is designed to complement our Engineering Design subjects and as such will have significant formative assessment components. In addition there will be summative assessment in the form of multiple "skills audits" to account for 30% and end of semester examinations accounting for 70% of the total marks. The end of semester examinations include a three-hour Systems Component Examination (accounting for 40% of the total marks) and a three-hour Probability and Statistics Component Examination (accounting for 30% of the total marks).

VEF2003 Systems and Applications 2C

Locations: Footscray Park.

Prerequisites: VEF1004 - Electrical Fundamentals 1B

Description: Content Analog Systems: PN diodes, electrical characteristics, applications. Zener diodes. Bipolar transistors, characteristics, small signal model analysis and design. MOSFET devices, characteristics, configurations and use in amplifier design. Voltage regulators, series and shunt types. Digital Systems: Data path elements including encoders, decoders, comparators, multiplexers, demultiplexers, multi-mode synchronous counters registers, shift-registers, arithmetic circuits and ROMs. Applications of data path elements. Data path element function, description in VHDL and synthesis onto programmable logic devices. Computer Programming: Pointers and the use of pointers in data storage, manipulation and data structures. The creation and use of “classes”. Binary files and random file input/output. An introduction to image processing using bitmap image files. Microprocessor Systems: The architectural structure of a simple 8-bit microprocessor/microcontroller. Program and data organization, programmers model, register sets, instruction set and addressing modes. Assembly language programming. Interfacing via external ports; timers, interrupts and special function peripherals.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and implement combinational and sequential data processing elements using VHDL with PLDs and manufacturers components; 2. Analyse an engineering problem that requires a computational solution; construct suitable "classes" and functions for an algorithmic solution. Code and test the solution; 3. Create the hardware and software requirements for an engineering task requiring a small microprocessor based system. Design, build and test the system including the hardware and software components; and 4. Analyse and design simpler rectifier based power supplies and small signal amplifiers.

Class Contact: 60 hours of lectures/tutorials per semester.

Required Reading: Roth, C.H. Fundamentals of Logic Design, 5th edition, Thomson Learning, 2004. Sedra, A. and Smith, K, Microelectronic Circuits, 5th edition, Oxford University Press, 2004Savitch. W. Problem Solving wit C++, 4th Edn, 2004, Addison -Wesley Class Lecture Notes 2007.

Assessment: This subject is designed to complement our Engineering Design subjects and as such will have significant formative assessment components. In addition there will be summative assessment in the form of multiple "skills audits" to account for 30% and two 3 hour end of semester examinations accounting for 70% (35%+35%) of the total marks..

VEF2004 Systems & Applications 2D

Locations: Footscray Park.

Prerequisites: VEF2003 - Systems and Applications 2C

Description: Analog Systems: Differential amplifiers, models of operation, gain, CMMR; design for performance characteristic. Frequency response of amplifiers; an

introduction to wide-band and high frequency amplifier design. Oscillators, RC, LC, phase shift, integrator and crystal types. Data converters; dual-slope, successive approximation and "flash" type. Switching regulators and power supplies. Digital Systems: Synchronous state machine analysis and design. Moore and Mealy machines. State optimization and reduction techniques. Races and hazards; effects and elimination. An introduction to the algorithmic state machine; gate level synthesis and implementation in VHDL. Simple PLD architectures; macro cells, clocking and output options, limitations. Mechanical and Electromagnetic Fundamentals: Magnetic field, Faraday's Law and Lenz's Law, self and mutual inductors Transformers : Single phase transformer. The ideal and realistic transformer equivalent circuits, parameter estimation. Transformer performance: efficiency and voltage regulation. DC shunt motors.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse a range of circuit types and assess the circuit performance; 2. Design circuits to meet performance criteria and select suitable components for circuit realisation; 3. Implement optimal state machines for a range of electronic engineering applications; 4. Apply a system level approach to digital design using the algorithmic state-machine design paradigm; 5. Appreciate fundamentals of mechanical and electromagnetic energy conversion; and 6. Analyse simple power systems containing DC machinesand transformers.

Class Contact: 60 hours of lectures/tutorials per semester.

Required Reading: Roth, C.H. Fundamentals of Logic Design, 5th edition, Thomson Learning, 2004.Sedra, A. and Smith, K. Microelectronic Circuits, 5th edition, Oxford University Press, 2004Chapman, S. J. Electric Machinery and Power System Fundamentals, McGraw Hill 2002.Class Lecture Notes 2009.

Assessment: This subject is designed to complement our Engineering design subjects and as such will have significant formative assessment components. In addition there will be summative assessment in the form of multiple "skills audits" to account for 30% and two 3 hour end of semester examinations accounting for 70% (35%+35%) of the total marks.

VEG3001 Analogue Electronics A

Locations: Footscray.

Prerequisites: VEF2003 Systems and Applications 2C

Description: This unit of study covers analogue electronic circuits analysis and design techniques commonly used in engineering systems. The unit is designed to provide support for students requiring knowledge of electronic circuits design in a concurrently studied Engineering Design unit. The subject includes the theory and implementation of feedback techniques for circuit stability. Differential amplifiers with active loads and multistage amplifiers. The design requirements of biquadratic filters, output stage/power amplifiers of an electronic systems. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform analysis of most common circuits used in electronic systems; 2. Perform design calculation of discrete electronic circuits used in different electronic systems; 3. Use feedback techniques required to insure stabilise function of electronic circuits; 4. Use techniques required for frequency compensation of electronic circuits; 5. Use Multisim/Pspice, to analyse the behaviour of any electronic circuits and system; and 6. Perform rapid prototyping of a specified electronic circuit.

Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory

Required Reading: Sedra A & Smith K. Microelectronic Circuits , 5th edition, Oxford University Press, 2004. Also extra materials to be provided upon commencement of subject, and dependent upon demands generated by any concurrent Engineering Design exercises.

Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination 65%, mid-semester test 15% and satisfactory performance of laboratory based exercises 20%

VEG4100 Digital Signal Processing A

Locations: Footscray Park.

Prerequisites: VEF2001 Linear Systems and Mathematics 2A

Description: Introduction Continuous-time and discrete-time signals. The sampling theorem. Impulse sampling and the zero-order hold. The z-transform.Analysis of discrete-time systems Unit-pulse response. Causal linear shift-invariant systems. Ordinary convolution. Bounded-input bounded output stability. Difference equation and transfer pulse transfer function. Unit-delay operator and realization structures of causal linear shift-invariant systems. A stability test. The frequency response function The discrete-time Fourier transform pairs. Mapping between the s-plane and the z-plane. Infinite duration Impulse Response filters Butterworth and Chebyshev filters. Frequency scaling and transformations. Transformation of analog filters into IIR filters. Matched z-transform, impulse-invariance, and bilinear transformations. Finite duration Impulse Response filters Linear phase response. Filter design with window functions. Frequency sampling filters. The Discrete-Time Fourier transform Relationship between DFT and DTFT. The Fast Fourier transform. Computation of frequency spectra, zero padding. Cyclic convolutions and its application in filter realization.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform time and frequency domain analysis of discrete-time linear signal processing systems; 2. Design simple FIR and IIR filters; and 3. Perform spectral analysis on sampled signals with DFT via FFT.

Class Contact: 30 hours class contact comprising 24 hours of lectures/tutorial and 6 hours of laboratory.

Required Reading: E.C. Ifeachor and B.W. Jervis, Digital Signal Processing - A Practical Approach, Prentice Hall, 2002.

Assessment: Laboratory assessment 30%; End of semester examination 70%.

VEG4101 Professional Practice 4A

Locations: Footscray Park.

Prerequisites: VEB3200 - Engineering Design and Practice 3B

Description: Professional Engineering Ethics. Engineers Australia Code of Ethics, IEEE Code of Ethics. Standards, codes of practice, and statutory requirements for the profession. Social responsibility. Environmental and sustainability considerations in engineering design and management. The role of the engineering institutions. Lifelong professional development, networking, contributing to the community. Basic business principles. Accounting, book keeping methods. Depreciation. Taxation. Understanding company reports. Career choices: (i) working for a salary small company or large company? Developing a long term career plan. Career choices: (ii) starting your own business consulting, trading, manufacturing. Innovation and enterprise. (Note: This topic will be developed in more detail in VEG4202). Writing an effective resume and job application. Winning at the job interview. Interview training. Mock job application, mock job interview, with oral and video evaluation and feedback.

Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss the interactions between engineering systems and their social, cultural, environmental, economic and political context; 2. Discuss the role of engineering in society; 3. Display a commitment to professional and ethical responsibilites; 4. Explain the need for lifelong learning and professional development; 5. Interact with people in other disciplines and professions to broaden knowledge, and to achieve multidisciplinary outcomes with a properly integrated engineering contribution; 6. Describe general business principles currently in operation; and 7. Describe the process of applying for jobs and the process of selection.
Class Contact: Lecture1.0 hrTutorial1.0 hrSixty (60) hours or equivalent for one semester comprising formal and informal class work.
Required Reading: There are no prescribed readings for this unit. Students will be guided by the unit co-ordinator to material relevant to the unit.
Assessment: A series of assignments (class exercises and projects), tests and examination (100%).

VEH3001 Digital System Design A

Locations: Footscray.
Prerequisites: VEF2004 - Systems & Applications 2D
Description: Design simple and complex asynchronous state machines and implement them on PLDs. Apply a sound technical design approach, manage the design complexity in an efficient manner and implement the solution with modern software development tools and devices.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and implement a digital system containing of the order of 20,000 logic gate elements; and 2. Apply a sound technical design approach, manage the design complexity in an efficient manner and implement the solution with modern software development tools and devices.
Class Contact: 30 hours of class contact. 2.5 hours per week - 2 hours lecture/tutorial and 0.5 hours laboratory work integrated with VEB3002 as experimental workshop..
Required Reading: Roth, C.H. Fundamentals of Logic Design, 5th edition, Thomson Learning, 2005.
Assessment: End of semester examination 70%, a mid-semester test and assignments 20% and laboratory 10%.

VEH3002 Digital System Design B

Locations: Footscray.
Prerequisites: VEF2004 - Systems & Applications 2D
Description: Need for Asynchronous FSMs. Models of Asynchronous FSMs. Analysis of Asynchronous Circuits. Timing problems - critical and non-critical races, cycles, static and essential hazards. Design of Asynchronous Machines - hazard-free, one-hot designs. One-hot Asynchronous Sequencers.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design simple and complex asynchronous state machines and implement them on PLDs; and 2. Apply a sound technical design approach, manage the design complexity in an efficient manner and implement the solution with modern software development tools and devices.
Class Contact: 30 hours of class contact. 2.5 hours per week - 2 hours lecture/tutorial and 0.5 hours laboratory work.
Required Reading: Tinder, R.F. Engineering Digital Design, 2nd Edition Academic Press, 2005.
Assessment: End of semester examination 70%, a mid-semester test and assignments 20% and laboratory 10%.

VEH3003 Embedded Computer Systems Design

Locations: Footscray.
Prerequisites: VEF2003 - Systems and Applications 2C
Description: This unit of study provides an introduction to microprocessor embedded systems design and to provide support for students requiring knowledge of embedded systems in a concurrently studied Engineering Design unit. The aim of the unit is to extend students knowledge of microprocessor systems into embedded applications using a high level language. Hardware and software system aspects are considered along with means of managing system complexity. In addition to lectures and tutorials the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design, build and implement an embedded system using a modern microcontroller; and 2. Code in a high level language that interfaces to appropriate signal acquisition and actuating devices and meets performance requirements in terms of functionality (logical and timing) and cost.
Class Contact: 30 hours of class contact. 2 hours of Lecture/Tutorial and 0.5 hours of laboratory work per week.
Required Reading: Microchip Corporation. Complete Mid-range Reference Manual; 2004 Microchip Corporation. Complete PIC18C Reference Manual; 2006
Assessment: End of semester examination (80%). Mid-semester test laboratory (20%

VEH3004 Real Time and Multitasking Computer Systems

Locations: Footscray.
Prerequisites: VEH3003 - Embedded Computer Systems Design
Description: This unit of study provides an introduction to real time multitasking systems through the use of a real time kernel and to provide support for students requiring knowledge of embedded systems in a concurrently studied Engineering Design unit. The aim of the unit is to extend student s knowledge of computer systems into time critical and very complex applications using a structured design approach and the use of a real time kernel. Hardware and software system aspects are considered along with means of managing system complexity. In addition to lectures and tutorials the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse a complex embedded computer control task and formulate a multitasking solution; and 2. Implement the solution using a high level language, supported by a commercial real time kernel.
Class Contact: 30 hours of class contact. 2.5 hours per week - 2 hours lecture/tutorial and 0.5 hours laboratory work.
Required Reading: Pumpkin Inc; SALVO Reference Manual; 2005. Microchip Corporation. Complete PIC18C Reference Manual; 2006.
Assessment: End of semester examination 80% and a mid-semester test and laboratory 20%.

VEH4001 Computer Systems on an ASIC

Locations: Footscray.
Prerequisites: VEH3004 - Real Time and Multitasking Computer Systems
Description: This unit of study integrates the entire computer engineering (hardware

and software) knowledge from earlier years of study. The aim of the unit is for the students to learn how to bring together one (or more) microprocessors, memory blocks (containing a C++ real time program), I/O blocks and the student s designed special purpose devices onto a single VLSI device. Managing the design of complex systems, the manufacturing pathway to mass production and economic considerations are also included. The unit also provides support for students requiring knowledge of this area of digital systems in a concurrently studied Engineering Design unit. Consequently, the syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and implement a single chip digital system containing multiple microprocessors and dedicated hardware operating multiple tasks in a real-time manner; and 2. Other outcomes will be in the management of design complexity for 1 million+ gate designs, economic and manufacturing considerations.

Class Contact: 30 hours of class contact consisting of 2.5 hours per week - 2 hours lecture/tutorial and 0.5 hours laboratory work per week.

Required Reading: Provided notes to support lecture program. Labrosse, J. J. MicroC/OS II The Real Time Kernal, 2nd edition, CMP ,2002.

Assessment: End of semester examination 80%, a mid-semester test and laboratory 20%.

VEM3001 Custom IC Design & EDA Tools

Locations: Footscray Park.

Prerequisites: VEF2004 Systems and Applications 2D

Description: The design of basic CMOS integrated circuits is covered, including overview of MOS technology, complex complementary CMOS design, combinational design techniques including dynamic and domino logic, CMOS Latchup and circuit protection. Students will develop hands-on experience in design, simulation, verification and implementation using industry standard EDA tools for custom design. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand basic custom integrated circuits design; 2. Understand custom integrated circuit design flow and circuit design; 3. Carry out significant tasks designed to improve desired generic skills and attributes; 4. Understand industry standard electronic design automation tools; and 5. Understand electronic design automation tools for custom IC designs.

Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory.

Required Reading: Rabaey, J. M., 2002, Digital Integrated Circuits, 2nd Edition, Prentice Hall. Chang, H., Cooke, L., Hunt, M., Martin, G., McNelly, A. and Todd, L, 1999, Surviving the SOC Revolution . A Guide to Platform-Based Design , Kluwer Academic.

Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination 50%, a project 35% and satisfactory performance of laboratory based exercises 15%.

VEM3002 Application Specific IC Design

Locations: Footscray Park.

Prerequisites: VEF2004 - Systems & Applications 2D

Description: The design of Application Specific integrated circuits (ASIC) is covered, including introduction, ASIC VLSI design cycle, fundamental approach and design aspects, full and semi-custom design methodology, IBM ASIC design flow place and route, ESD failure, and ESD protection. Students will also develop hands-on experience in design, simulation, verification and implementation using industry standard EDA tools for ASIC design. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand Application Specific Integrated Circuits design; 2. Understand ASIC integrated circuit design flow and circuit design; and 3. Carry out significant tasks designed to improve desired generic skills and attributes.

Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory exercises.

Required Reading: Chinnery, D., Keutzer, K., Keutzer, K. W., Closing the Gap Between Asic & Custom: Tools and Techniques for High-Performance Asic Design , Kluwer Academic Publishers, 2002.

Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination 50%, a project 35% and satisfactory performance of laboratory based components of this unit 15%

VEM4001 Advanced Custom IC Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: Overview of MOS and sub-micron technology, scaling and signal integrity, IC design techniques. CMOS cell design: device-level design constraints, gate design, pas transistor circuits, sequential circuits, mask level design. Layout considerations, design rules and mask level design. Circuit optimisation techniques. Timing issues in VLSI circuit design. Design of VLSI system sub-systems: Arithmetic and logic processing elements, adders, counters, I/Os, buffers, data path design and layout, etc. Chip floor planning. Design tradeoffs-cost, power and performance. The syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit of study will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand basic integrated circuits design; 2. Understand integrated circuit design flow and circuit design; and 3. Carry out significant tasks designed to improve desired generic skills and attributes.

Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory exercises.

Required Reading: Rabaey, J. M., 2002, Digital Integrated Circuits, 2nd Edition, Prentice Hall.

Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination 50%, a project 35% and satisfactory performance of laboratory based components of this unit 15%.

VEM4002 Heterogeneous Systems

Locations: Footscray Park.
Prerequisites: VEM3002 - Application Specific IC Design
Description: Overview of current trends in semiconductor technology, fundamental physical and economic constrains, technology roadmap for semiconductors, challenges and needs for nano-electronics, organic and molecular microelectronics, system implementation issues, development of mixed signal and RF systems, MEMS, wireless sensor networks, ambient technology. The syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit of study will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse current trends in semiconductor technology; 2. Understand simulation and design of heterogeneous systems; and 3. Carry out significant tasks designed to improve desired generic skills and attributes.
Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory exercises.
Required Reading: Luryi, et al., Future Trends in Microelectronics, 2004.
Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination 50%, a project 35% and satisfactory performance of laboratory based components of this unit 15%.

VEM4012 Design for Testability

Locations: Footscray Park.
Prerequisites: VEH3001 - Digital System Design A
Description: Techniques to improve the testability of microelectronics circuits and systems are covered. Design for test concepts, ad-hoc and structured, which improve the circuit to allow efficient testing after manufacturing are fully analysed. This includes device reliability, memory reliability, test issues, controllability and observability, built in self test, scan chain synthesis, boundary scan, automatic test pattern generation, and system on chip test issues. Students will develop hands-on experience in design for test using industry standard EDA tools. The unit of study is designed to provide support for students requiring knowledge of electronic circuits design in a concurrently studied Engineering Design unit. The specific aims of this unit of study are to help students develop competence in and comprehension of the principles of reliability and design for test of microelectronics circuits and systems, learn the fundamentals of various ad-hoc and structures design for test techniques for digital microelectronic circuits and to develop practical skills with industry standard tools, methods and techniques through practical application. The unit will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit of study will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appreciate the reliability issues related to microelectronic devices and integrated circuits; 2. Understand circuit testability issues and design for testability; 3. Understand fault modelling and testing methodologies; 4. Appreciate system level testing; and 5. Use EDA design for test tools.
Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory exercises.
Required Reading: Lala, P.K., Digital Circuit Testing and Testability, Academic Press, 1997.
Assessment: Students will be assessed in this unit of study on the basis of an end of semester examination 60%, satisfactory performance of laboratory based exercises and project work 40%.

VEM4100 Analog and Mixed Signal Design

Locations: Footscray Park.
Prerequisites: VEF2004 - Systems & Applications 2DVEM3001 - Custom IC Design & EDA Tools
Description: The design of CMOS analog and mixed-signal integrated circuits is covered. Design concepts of high speed low power amplifiers, filters, sample and hold circuits, comparators, digital to analog and analog to digital converters are fully analysed. Students will develop hands-on experience in design, simulation, verification and implementation using industry standard EDA tools.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the most common integrated circuit design, and D/A and D/A converters; and 2. Use industry standard Software design tools.
Class Contact: 2.5 hours per week consisting of lectures/tutorials and laboratory exercises.
Required Reading: Behzad Razavi, 'Design of analog CMOS integrated circuits', McGraw hill International Edition, 2001.
Assessment: Laboratory exercises: 20%; Project: 20%; Final Examination: 60%.

VEP3001 Photonics

Locations: Footscray Park.
Prerequisites: VEF1002 - Enabling Sciences 1B
Description: This unit provides an introduction to photonics and optoelectronics, and also support for students requiring knowledge of the creation, transmission and detection and manipulation of light (photons) in a concurrently studied PBL unit. In this unit students will be presented with a description of the nature of light, the generation of light (light sources and their properties such as lasers, light emitting diodes), the transmission of light (optical fibres and waveguides, optical amplifiers), the detection. The primary delivery means of the syllabus will be by lecture, supported by laboratory demonstrations.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the properties of light and behaviour as light particles (photons); 2. Understand the properties of lasers and optical amplification; 3. Understand the properties of semiconductor photonics; 4. Understand properties of optical fibres and waveguides and how they transmit light; and 5. Understand how optical fibre systems are designed.
Class Contact: 30 hours of class contact per semester. 2 hours of lecture/tutorial and 0.5 hours of laboratory exercises per week.
Required Reading: Palais, J.C., Fibre Optic Communications, 5th edn, 2004, Prentice Hall: N.J.
Assessment: End of semester examination 65%, two assignments 15% and requires satisfactory performance of laboratory based components of this subject 20

VES2201 Design & Ergonomics

Locations: Footscray Park.
Prerequisites: NEF1204 - Introduction to Engineering DesignNEM2102 - Introduction to Engineering Materials
Description: This unit is based on an engineering project to introduce students to the design of human based systems. It emphasizes the engineering design phases, from

requirements analysis to prototype. Topics on mechanical design elements e.g. gears, belts, fasteners, bolts, will be covered with the major project as an application. Design uncertainties and reliability, load design calculations, anthropometry, human factors and ergonomic design will be covered for each mechanical element. Use of relevant design software such as computer-aided design and solid modelling will be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of the concepts for static and dynamic actions; 2. Apply concepts in the determination of design loads to an introductory level; 3. Show ability within the context of the subject areas, to formulate and solve basic design problems; 4. Critically evaluate the sensibility of design outcomes; 5. Show a basic understanding of ergonomic design; 6. Present design outcomes both written and orally in a professional manner; 7. Demonstrate the ability to work both autonomously and as a member of a design team;

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

Assessment: Presentation, Oral and project demonstration, 20%. Report, Two (2) Reports (1 individual report and 1 group report at 3000 words maximum each), 40%. Examination, Final Exam (3 hours), 40%.

VES3101 Introduction to Computer Networks A

Locations: Footscray Park.

Prerequisites: VEF2003 - Systems and Applications 2C VEF2004 - Systems & Applications 2D

Description: This unit of study is designed to provide students with a good understanding of the hardware and techniques that underpin a modern computer network. The unit will also provide support for Engineering Design unit that has a computer network focus. This unit will cover: Basic concepts of computer communication. Data and signals, Frequency Spectrum and bandwidth, Data encoding, Framing and synchronisation. Modulation of data, Modems. Physical layer interfaces. Transmission of data, Transmission media, Multiplexing. Error detection and correction. Data link control, Data link protocols. Local area networks. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understanding the basic principles and techniques used in computer data communication; and 2. Have a good foundation for further learning in Computer networking.

Class Contact: 30 hours of class contact. 2 hours of Lecture/Tutorial and 0.5 hours of Laboratory exercises per week.

Required Reading: Forouzan. B., Fagan. S. C., Data Communication and Networking, McGraw Hill, 2006.

Assessment: Written Examination (40%): Class Tests (30%): (Two 1 hour tests to be held during the semester teaching period.) Laboratory Assignments (30%): (Five laboratory assignments, each 6%). Evaluation of CGA in unit(as %): Level1(%) Level2(%) Level3(%)

VES3102 Introduction to Computer Networks B

Locations: Footscray Park.

Prerequisites: VEF2002 - Systems and Mathematics 2B VEF2004 - Systems & Applications 2D

Description: This unit of study is designed to provide students with a good understanding of computer networking protocols and the management of computer networks. The unit will also provide support for Engineering Design unit that has a computer network focus. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. This unit will cover: Network Models: OSI, TCP/IP; Network Layer - IP addressing, subnetting, netmask, IP protocols, ARP, ICMP, IP routing; Transport Layer - TCP, UDP protocols, flow control, error control, BSD sockets; Application Layer: DNS, HTTP. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand principle and practice of computer networking protocols; and 2. Design and manage a computer network.

Class Contact: 30 hours of class contact. 2 hours of Lecture/Tutorial and 0.5 hours of Laboratory exercises per week.

Required Reading: Tanenbaum, A., Computer Networks., 4th Ed, Prentice Hall, 2003.

Assessment: Written Examination 40%, Class Tests 20%, Laboratory Assignments 40% (Five laboratory assignments, each 8% weighting).

VES3111 Mechatronics & Sensors 1

Locations: Footscray Park.

Prerequisites: NEE2102 - Computer Systems

Description: This unit is designed to build upon the basic Sports Engineering sensor concepts learned in VES1001. Study sensors characteristics and performance. Selection of suitable sensors for human activities. More advanced problems and challenges will be set to facilitate and demonstrate the utility of sensors in real-world sports. Related measurement and control systems will be investigated. Students will be encouraged to experiment with and devise practical sensors, measurement and control systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Show an understanding of the merits and limitations of sensors and control systems; 2. Demonstrate knowledge of sources of the appropriate sensors and transducers; 3. Demonstrate the ability to read and understand sensor and transducer technical characteristics; and 4. Apply their knowledge to the design of more advanced measurements systems.

Class Contact: Lab 3.0 hrs Lecture 1.0 hr Sixty (60) hours for one semester comprising lectures, workshops, laboratory activities and field experiments.

Required Reading: Bartlett, R 2007, 2nd edn, Introduction to sports biomechanics: analysing human movement patterns, Routledge.

Assessment: Test, Mid-semester test (1.5 hour), 20%. Portfolio, Individual portfolio presentation and team report (5000 words equivalent), 30%. Examination, Final Examination (three (3) hours), 50%.

VES3121 Sports Materials

Locations: Footscray Park.

Prerequisites: VAM2121 - Mechanics of Engineering Materials

Description: This unit is designed to give students a sound knowledge of various types of materials for use in sports engineering applications. Students will study the fundamentals of materials science (atomic structure and bonding). Material classes

and their characteristics metals, polymers ceramics and biomaterials (including timber and human tissue). Engineering properties of materials (strength, elasticity, plasticity, hardness, toughness, dynamic cushioning and damping and thermal and electrical properties). Material selection and performance. Introduction to composite materials and their application. Students will undertake a series of informative laboratory and field experiments to assist in their understanding of the properties and behaviour of various engineering materials commonly used in sporting applications.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate a sound understanding of various engineering material types and their application to sports; 2. Predict the behaviour of materials under various sport loads such as static loads, impacts and collisions, and climatic fluctuations; 3. Undertake effective and practical material selection for the design of sports materials that enhance the performance of athletes; 4. Identify and select suitable materials that afford protection against injury, while optimising freedom of movement and comfort; and 5. Demonstrate the ability to justify their decisions on material selection.

Class Contact: Lecture2.0 hrsTutorial2.0 hrsSixty (60) hours for one semester comprising team workshops, including supporting lectures and labs.

Required Reading: Callister, W D Jr 2004, Materials science and engineering - an introduction, John Wiley and Sons Inc.

Assessment: Assignment, Team based assignments (three at 2000 words equivalent each), 30%. Portfolio, Individual portfolio, 30%. Examination, Final exam (three hours), 40%.

VES3131 Computer Aided Engineering Design

Locations: Footscray Park.

Prerequisites: VES2201 - Design & Ergonomics

Description: This unit is based on design tasks that address specific aspects of computer-aided mechanical design: 1. The modelling of solids. This will involve the generation of three-dimensional drawings using a suitable solids modelling software tools. The computer files will be used to compute various 3D properties of the design such as volume, centre of gravity, radius of gyration etc. 2. The estimation of stresses and deflections using finite element modelling and analysis. Students will analyse the engineering performance of their design using suitable Finite Element Analysis software tools. This will be supported by the fundamental theory of finite element analysis with respect to computing stresses and deflections. 3. Computer-aided kinematic and kinetic analysis of rigid-body systems and mechanisms using suitable software tools. Students will generate solutions for a variety of systems and mechanism.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate sound knowledge of computer-aided engineering tools in design; 2. Predict and evaluate the mechanical performance of their design using a range of computer-aided engineering tools to compute geometric characteristics, stress and deflection properties and kinetic and kinematic performance for rigid body systems; 3. Show the ability within the context of the subject areas, to formulate and solve basic design problems; 4. Critically evaluate the sensibility of design outcomes; 5. Present design outcomes both written and orally in a professional manner; 6. Demonstrate the ability to work both autonomously and as a member of a design team; and

Class Contact: Lecture2.0 hrsTutorial3.0 hrs

Required Reading: Benny Raphael and Ian F C Smith., (2003) Fundamentals of computer-aided engineering, Wiley.

Assessment: Presentation, Oral presentation, 10%. Portfolio, Design assessments, 35%. Report, Final Report, 40%. Examination, Practical Exam, 15%.

VES3202 Mechatronics & Sensors 2

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to expand and build upon the knowledge gained in VES3111. Students will be studying the electronics required to design human bio-sensing systems. Topics that will be covered include operational amplifiers as buffers, differential amplifiers, instrumentation amplifiers, voltage biasing, rectifiers, first and second order filters. Emphasis will be given to design rules, specifications and application requirements for biosensing problems. Students will learn how biosignals affect the design of the required biosensing solution. The second part will cover DC motors as actuators that do work. Common permanent magnet motors, servos and stepper motors will be introduced. The circuit model of the motor will be used to explain the design considerations behind motor selection.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the common types of biosignals and the relevant equipment used to measure biosignals; 2. Adapt analogue electronic requirements to extract biosignals i.e. instrumentation amplifiers, filters; 3. Explain the common types of DC motors and how they function; 4. Use appropriate electronics to interface with DC motors; 5. Collaborate with colleagues and produce tangible results.

Class Contact: Lab2.0 hrsLecture2.0 hrs

Required Reading: J. Edward Carryer, R. Matthew Ohline, Thomas William Kenny, (2011) 1st ed. Introduction to Mechatronic Design Prentice Hall

Assessment: Test, Mid-semester test (1 hour), 20%. Laboratory Work, Laboratory Reports (4 reports - 1500 words max each), 40%. Examination, Final exam (3 hours), 40%.

VES3212 Sports Engineering Project

Locations: Footscray Park.

Prerequisites: VES3131 - Computer Aided Engineering Design

Description: This unit is designed to consolidate engineering research, investigation or design experience by requiring each student to undertake an individual engineering project (Capstone), selected from a list of projects offered or proposed by the student and approved by an academic. Projects are sourced from industry and academia. Each student is supervised by a staff member with expertise in the area of the project. Oral presentation skill, and report writing are further developed from the previous years. The project must include a strong engineering theme relevant to sports engineering which may cover the broad spectrum of the topics studied in this course. Industry projects must be assessed by the subject coordinator and have an academic and industry supervisor.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct research on a specific project topic using all available resources including books, internet journals, etc.; 2. Solve problems in a scientific manner and select the necessary components; and 3. Plan and manage a project using project management facilities such as Microsoft project manager.

Class Contact: Lab3.0 hrsLecture1.0 hrSixty (60) hours for one semester comprising student projects. Students will undertake projects while managing their own time under academic supervision.

Required Reading: The Lecturer will advise students which of the below texts are required and/or recommended in consultation with the student and their proposed

project.Mukhopadhyay, (2008) Smart sensors and sensing technology Springer. Barlett, (2007) Introduction to sports biomechanics/analyzing human movement patterns 2 Routledge. Webster, (1999) The measurement, instrumentation and sensors handbook, Boca Raton CRC Press.

Assessment: Presentation, Weekly Progress presentation, 20%. Report, Final Report (1,500 words equivalent), 50%. Project, Evaluation of quality of project product or outcome, 30%.

VES3232 Sports Engineering Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: Role and responsibilities of engineering managers in the industry. Principles of engineering management. General management principles and engineers as managers. Introduction to network planning, critical path analysis, resource allocation and the management of a development project. Feasibility studies and project evaluation. Economic analysis of engineering projects. Financial modelling of engineering systems. Strategies for plant selection. Planning and scheduling techniques for engineering projects. Tools for project control. Planning techniques for repetitive construction or production. Optimising resources and trend monitoring. Management of the development process using a computer package.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Prepare a plan, prepare network logic diagrams, determine critical paths and optimise project resources; 2. Apply the time value of money concepts for the economic evaluation of engineering systems or projects; 3. Apply general management principles for the successful delivery and management of engineering projects; and 4. Use commercially available software, such as Microsoft Project and Microsoft Excel, as time management and economic analysis tools.

Class Contact: Lab1.0 hrLecture1.0 hrTutorial2.0 hrs

Required Reading: Leland Blank & Anthony Tarquin, 2007 Engineering Economy Antill J.M., 1999 3rd ed. Antill's Engineering Management Wiley Rory Burke, 2005 Project Management: Planning and Control Techniques

Assessment: Test, Class tests (three at 30 mins each), 20%. Report, Major report (15,000 words equivalent), 60%. Assignment, two at 1500 words equivalent each, 20%.

VES4101 Computer Systems A

Locations: Footscray Park.

Prerequisites: VEF2003 - Systems and Applications 2CVEF2004 - Systems & Applications 2D

Description: This unit is designed to provide students with a good understanding of Operating Systems principles and the practical abilities to interact with modern OSs, both at the user's and programmer's levels. The unit will also provide support for Engineering Design unit that has a computer/OS focus. This unit will cover: Process: thread, process synchronisation, semaphore, thread library, consumer-producer problem, dead locks, resource allocation, scheduling. Files systems : directory structures, access control, implementation. Memory Management : memory allocation, protection, virtual memory. Grid : principles and applications. The syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the structure and operations of a modern computer system; 2. Access operating system facilities and resources by using a high level language such as C; 3. Develop multithreaded applications for a modern OS such as Unix; and 4. Understand the principle of GRID computing environment.

Class Contact: 30 hours of class contact. 2 hours of Lecture/Tutorial and 0.5 hours of Laboratory exercises per week.

Required Reading: Silberschatz. A., Operating Concepts, 7th Edition, Wiley, 2005.

Assessment: Written Examination 40%, Class Tests 20%, Laboratory Assignments (Five laboratory assignments, each 8% weighting) 40%.

VES4102 Computer Systems B

Locations: Footscray Park.

Prerequisites: VEF2003 - Systems and Applications 2CVEF2004 - Systems & Applications 2D

Description: This unit of study is designed to provide students with a good understanding of graphical user interfaces design and implementation in application programming. The unit will also provide support for Engineering Design unit that has a programming user interface need. This unit will cover: Introduction to graphical user interfaces (GUI). Application of object oriented techniques to the production of windows-based programs. Window interface design, placement, and implementation. Development of class libraries. Platform independent window toolkit. The syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Understand the principle and application of object oriented paradigm to user interface design; and 2. Use window GUI class libraries to implement user interfaces in application programs.

Class Contact: 30 hours of class contact. 2 hours of Lecture/Tutorial and 0.5 hours of laboratory exercises per week.

Required Reading: Deitel.H, Java How to Program, 7/e, Prentice Hall, 2007.

Assessment: End of semester examination 40% Class Tests 20% Laboratory Assignments (Five laboratory assignments, each 8% weighting):40

VES4301 Software Engineering

Locations: Footscray Park.

Prerequisites: VEF2003 - Systems and Applications 2CVEF2004 - Systems & Applications 2D

Description: The unit's aim is to introduce students to the principle, technique and practice of the current software engineering process. The unit will also provide support for Engineering Design unit that has software engineering focus. This subject will cover: Introduction to the engineering of quality software. The software development lifecycle model. System analysis, software requirements definition, specification, elicitation, analysis and modelling. Process specifications and data dictionary production. Software design process, principles and production. The testing process, planning and strategies. CASE tools and software engineering environments. Software project planning and estimating. The syllabus will be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises.

Credit Points: 6

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply best practice software engineering process to the specification, design, construction, delivery and maintenance of software.

Class Contact: 30 hours of class contact per semester. 2 hours of Lecture/Tutorial and 0.5 hours of Laboratory exercises per week.

Required Reading: Schach. S, Classical and Object-Oriented Software Engineering, 7/e, McGraw Hill, 2006.
Assessment: End of semester examination :40% Class Tests :20% Laboratory Assignments (Five laboratory assignments, each 8%):40%

VET3100 Analog and Digital Communications

Locations: Footscray Park.
Prerequisites: VEF2002 - Systems and Mathematics 2B
Description: This unit of study provides an introduction to Telecommunication Engineering. The unit is designed to provide the theoretical basis for the understanding of the engineering aspects of the design, construction, and operation of the existing and emerging Telecommunication systems. It also provides the support for students requiring basic knowledge of Telecommunication Engineering in order to handle concurrently studied Engineering Design projects that involve various aspects of Telecommunication Engineering. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain signals and their characteristics as depicted in time and frequency domains 2. Discuss the information bearing nature of signals and the bandwidth considerations; 3. Explain the principles behind frequency translation and its depiction as various types of modulation; 4. Explain the signal transition in linear and non-linear systems, and the recognition of such systems in terms of filters and other components; 5. Describe the types of noise present in telecommunication systems and the characterization of thermal noise; 6. Perform the statistical analysis of random signals and the characterisation of such signals in terms of correlation and power spectral density functions; 7. Explain the concept of signal to noise ratio and its influence in faithful reception of analog and digital signals; 8. Outline the assessment of performance in digital communication systems in terms of bit error probability; 9. Explain the basis of line coding and application of line coding in baseband digital communication systems; and 10. Discuss the baseband recovery of bandpass communication systems and the impact of the type of modulation in such systems.
Class Contact: 30 hours of class contact for one semester comprising 2 hours of lecture/tutorials and 0.5 hours of laboratory work per week.
Required Reading: Lathi, B. P. (2001). Modern digital and analog communication systems (3rd ed.). Oxford University Press.
Assessment: Continuous assessment in laboratory work (6 hours per semester) (20%); mid-semester written test (20%); end-of-semester examination (60%).

VET3200 Digital Modulation and Coding

Locations: Footscray Park.
Prerequisites: VET3100 - Analog and Digital Communications
Description: This unit of study provides continuation of the Communication Systems Engineering stream covering the remaining areas of the main stream Telecommunication Engineering. The unit is designed to provide the theoretical basis for the understanding of the engineering aspects of the design, construction, and operation of the existing and emerging Telecommunication systems. It also provides the support for students requiring basic knowledge of Telecommunication Engineering in order to handle concurrently studied Engineering Design projects that involve various aspects of Telecommunication Engineering. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principles of digital communication systems and components; 2. Describe the optimum signal detection using matched filter receiver in additive white Gaussian noise; 3. Explain the baseband transmission techniques; 4. Discuss the effects of bandwidth limitation, intersymbol interference, Nyquist signalling and channel equalisation; 5. Describe the bandpass transmission techniques; 6. Describe the BPSK, QPSK, and QAM modulation systems and coherent detection of those systems; 7. Explain the carrier and clock synchronisation techniques; 8. Explain the channel coding including linear block codes, convolutional codes, Viterbi decoding; 9. Explain information theory, source coding, and data compression; and 10. Explain coded modulation systems, trellis coding, and decoding.
Class Contact: 30 hours of class contact for one semester comprising 2 hours of lecture/tutorials and 0.5 hours of laboratory work per week.
Required Reading: Kurzweil, J. (2000). An introduction to digital communications. John Wiley. Proakis, J. G., & Salehi, M. (2002). Contemporary communication systems using MATLAB. Belmont, CA: Thomson Brooks/Cole.
Assessment: Continuous assessment in laboratory work (6 hours per semester) (20%); mid-semester written test (20%); end-of-semester examination (60%).

VET4101 Field and Waves in Telecommunications

Locations: Footscray Park.
Prerequisites: VEF2002 - Systems and Mathematics 2B
Description: This unit of study provides an introduction to Field and Wave in Telecommunication Engineering. The unit is designed to provide the theoretical basis for the understanding of the engineering aspects of the design, construction, and operation of the existing and emerging Telecommunication systems. It also provides the support for students requiring basic knowledge of Telecommunication Engineering in order to handle concurrently studied Engineering Design projects that involve various aspects of Telecommunication Engineering. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the space and material media that are capable of carrying signals used in Telecommunication systems; 2. Describe the physical composition of such media, their characteristics and modes of operation; 3. Discuss the limitations of such media with regard to frequency, bandwidth, and power; 4. Explain the phenomena of propagation of electromagnetic waves in space and material media including coaxial cables and waveguides; 5. Discuss the theoretical basis for electromagnetic wave propagation including the derivation and application of Maxwell s equations; 6. Explain the Smith chart and its application in the design of high frequency circuits and systems; and 7. Explain free space propagation and practical propagation models.
Class Contact: 30 hours of class contact for one semester comprising 2 hours of lecture/tutorials and 0.5 hours of laboratory work per week.
Required Reading: Cheng, D. K. (1999). Field and wave electromagnetics (2nd ed.). Addison Wesley.

Assessment: Continuous assessment in laboratory work (6 hours per semester) (20%); mid-semester written test (20%); end-of-semester examination (60%).

VET4202 Data Communications

Locations: Footscray Park.
Prerequisites: VET3100 - Analog and Digital Communications
Description: This unit of study provides continuation of the Communication Systems Engineering stream covering the remaining areas of the main stream Telecommunication Engineering. The unit is designed to provide the theoretical basis for the understanding of the engineering aspects of the design, construction, and operation of the existing and emerging Telecommunication systems. It also provides the support for students requiring basic knowledge of Telecommunication Engineering in order to handle concurrently studied Engineering Design projects that involve various aspects of Telecommunication Engineering. This has required the syllabus to be presented as a collection of lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent Engineering Design exercises. In addition to delivery by lecture and tutorial the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss the basic principles involved in data communication systems; 2. Explain the data network architecture, operation, and performance analysis; 3. Evaluate the protocols employed in data networks; 4. Explain the particular aspects of local area and wide area networks; 5. Discuss wireless networks, their operation, and interfacing with network backbone; 6. Explain the analytical techniques employed in data network performance estimation; 7. Explain the basic queuing theory and its application to data networks; 8. Describe data network switching and switching systems; 9. Discuss the principles involved in data network design and the heuristic algorithms employed; and 10. Explain cost effective designs of local and wide area networks.
Class Contact: 30 hours of class contact for one semester comprising 2 hours of lecture/tutorials and 0.5 hours of laboratory work per week.
Required Reading: Forouzan, A. B. (2003). TCP/IP protocol suite. McGraw-Hill. Spohn, D. L. (2002). Data network design. McGraw-Hill.
Assessment: Continuous assessment in laboratory work (6 hours per semester) (20%); mid-semester written test (20%); end-of-semester examination (60%).

VET4300 Digital Communications

Locations: Footscray Park.
Prerequisites: VET3200 - Digital Modulation and Coding
Description: Overview of Digital modulations: QPSK, OQPSK, DQPSK, MSK, GMSK, QAM. Vector space representation of digital signals, Correlation receiver, Matched filter receiver, Karhunen-Loeve representation of noise, Maximum likelihood sequence estimation (MLSE) detector, Performance in AWGN channels, Trellis coded modulation. Modem techniques: Classic PLL, Maximum likelihood carrier phase estimation, Maximum likelihood timing recovery, Adaptive equalization and echo cancellations, the LMS algorithm, decision feedback equalization.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design common digital modulators and receivers; 2. Perform performance analysis of digital communication systems in AWGN channels; and 3. Design simple equalizers and synchronisers.
Class Contact: 36 hours per semester comprising 24 hours of lecture/tutorial and 12 hours of laboratory work.
Required Reading: Haykin, S. Communication Systems, 4th Edition, 2001, John Wiley & Sons; Kurzweil, J, An Introduction to Digital Communications, 2000, John Wiley & Sons.
Assessment: Assignments and class tests 30%; End of semester examination 70%.

VET4400 Digital Signal Processing in Telecommunications 2

Locations: Footscray Park.
Prerequisites: VEG4100 Digital Signal Processing A
Description: Multi-rate signal processing: Decimation and interpolation. Applications. Multistage implementation. DSP building blocks: filter banks, correlators and matched filters.Oscillators and phase locked loops. Applications of DFT/FFT. Fast convolution and correlation. Deconvolution. Spectral analysis. Adaptive algorithms and their applications. DSP implementation: hardware and software tools.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply multi-rate signal processing; 2. Apply fast convolution; and 3. Apply parameter estimation algorithms in the form of subsystems in telecommunication.
Class Contact: 36 hours per semester comprising 24 hours of lecture/tutorial and 12 hours of laboratory work.
Required Reading: Ifeachor, E.C., Jerwis, B.W. Digital Signal Processing - A Practical Approach, 2nd Edition, 2002, Pearson Prentice Hall.
Assessment: Assignments and class test 30%; End of semester examination 70%.

VET4600 Wireless Communications

Locations: Footscray Park.
Prerequisites: VET3200 - Digital Modulation and CodingVET4101 - Field and Waves in Telecommunications
Description: Free space propagation, Reflection, Mean path loss, Local propagation loss, Rayleigh fading, Rician fading. Time selective channel, Frequency selective channel, Power delay profile, Coherent bandwidth, Channel estimation and tracking methods.Receiver diversity: Selective combining, Maximal-ratio combining, Equal gain combining. Transmitter diversity: Space time coded modulations, MIMO systems, Space division multiple access.CDMA: Direct sequence modulation, Gold Codes, Walsh-Hadamard sequence, RAKE receiver, Near-far problem, Power control, WCDMA, OFDM.
Credit Points: 6
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform performance analysis of wireless communication systems with appropriate fading models; 2. Apply diversity techniques to overcome system impairment due to multi-path fading; and 3. Understand the advantages and disadvantages of modern techniques like WCDMA and OFDM.
Class Contact: 36 hours per semester comprising 24 hours of lecture/tutorial and 12 hours of laboratory works.
Required Reading: Haykin, S., Moher, M. Modern Wireless Communications, 2004, Pearson Prentice Hall; Rappaport, T. Wireless Communications, Principles and Practice, 2nd Edition, 2002, Prentice Hall.
Assessment: Assignments and class tests 30%; End of semester examination 70%.

VMR8001 Research Thesis 1 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate

Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VMR8002 Research Thesis 2 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VMR8011 Research Thesis 1 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

VMR8012 Research Thesis 2 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

VPP5630 Research Methods

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit of study (UoS) aims at informing students of the range of research methods appropriate to the project management discipline and developing basic skills for carrying out research. It introduces nature of research, types of research, research problems and objectives, literature review, research design, research ethics, data collection, measurement and analysis methods, typical qualitative and quantitative methods, development of research proposal, advanced information retrieval skills, etc.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to:
1. Understand research skills, techniques and methodologies for the completion of a full research proposal.
Class Contact: Tutorial3.0 hrs
Required Reading: Formal class notes will be provided to students for each UoS. These notes are reviewed and updated regularly.
Assessment: Assignment 1 (40%); Assignment 2 (Oral 20% and Report 40%)

VPP5716 Project Development Analysis and Review

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit will develop skills and techniques to assess and manage projects and to appreciate the role and objectives of project managers and developers. Unit content examines management of project in the economy: An overview: typology of relationship between property, project management and property management. Feasibility and economic issues in development of project: Elements of a project development feasibility study. Parameters of project investment. Decisions including market analysis and financial evaluation techniques. Project investment criteria and considerations. Management of the development process (a client perspective): client briefing; formation of project team; design management, construction and financial management, project marketing. Financial feasibility - Case study and methods of evaluation. Law and property management - Strata titles; standard mortgage clauses; standard lease agreements. Land valuation and techniques for valuing project and property. Market survey and predictions - impact of macro-economic conditions on decisions to develop; marketing of space.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to:
1. Apply project development processes to assess and manage projects; and 2. Describe the role and objectives of developers and project managers.
Class Contact: Thirty six (36) hours for one semester comprising lectures, computer laboratory sessions, seminars and workshops.
Required Reading: Formal class notes will be provided to students for each UoS. These notes are reviewed and updated regularly.
Assessment: Assignment, Individual assignment, 15%. Project, Group project, 45%. Examination, End-of-semester examination, 40%. Students must attain a mark of 50% in each assessable component to pass this UoS.

VPP8001 Research Thesis 1 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VPP8002 Research Thesis 2 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on

the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VPP8011 Research Thesis 1 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

VPP8012 Research Thesis 2 Part Time

Prerequisites: Nil.
Credit Points: 24

VPT8001 Research Thesis 1 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VPT8002 Research Thesis 2 Full Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 48

VPT8011 Research Thesis 1 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

VPT8012 Research Thesis 2 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link:
http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link:
http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

VQB5611 Risk Assessment and Human Behaviour

Locations: Werribee.
Prerequisites: Nil.
Description: The unit introduces students to basic fire safety engineering design concepts and provides students with the necessary knowledge concerning occupant communication and response submodels and subsystems as a basis for assessing the necessary input data for a risk assessment model. An introduction to Building Code of Australia (BCA) and Fire Engineering Guidelines is provided. Important aspects of human behaviour during fire will also be introduced. Many assumptions generally held about the way humans respond to fire emergencies have been shaped by the media and provide a sensationalised view. In this unit, we will seek to clarify this view by presenting research to uncover what can truly be expected from people when a fire occurs. Statistics from coronial data will also be examined to provide an overview of who is at most risk when a fire starts. The focus will be on urban and residential structure fires, but human behaviour during bushfires will also be discussed. Other areas covered in this unit are: Fire statistics and statistical analysis of occurrence, death and injuries; Introduction to risk management including probability, reliability, fault trees, event trees. The initiation and development of fires, fire characterisation and design fires.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts and alternative acceptable frameworks for performance-based codes, with an emphasis to fire safety engineering design; 2. Utilise basic concepts of risk management and probabilistic risk assessment; 3. Develop simple fault tree and event tree; 4. Interpret and analyse fire statistical data of various sorts; 5. Evaluate the occupant communication and response in relation to fire cues; and 6. Interpret physiological and psychological effects of fire, and construct tenability criteria for the life safety.
Class Contact: Over a one week period, there will be twenty-eight (28) hours of face-to-face learning. Students are also expected to complete an equivalent amount of structured self-directed studies.

Required Reading: Australian Building Codes Board, 2011, 2011 edn, Building code of Australia, Australian Building Codes Board. Australian Building Codes Board, 2005, 2005 edn, International fire engineering guidelines, Australian Building Codes Board. In addition, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material.
Assessment: Report, Report (2500 words), 50%. Assignment, Assignment 1 (1300 words), 25%. Assignment, Assignment 2 (1300 words), 25%. There will be a Report and 2 Assignments and the content of this unit will be a part of the examination that will be conducted as part of VQB5642 assessment.

VQB5612 Scientific Principles for Fire Professionals

Locations: Werribee.
Prerequisites: Nil.
Description: The unit provides students with basic information on scientific principles for fire professionals such as combustion, products of combustion (heat and smoke), heat and mass transfer, response of structural elements to heat, visibility through smoke and smoke toxicity. The unit will cover basic chemical reactions and the fire triangle, ignition of solid and liquid fuels, combustion, fire plumes and fire behaviour of building contents and lining materials. The unit will also provide an introduction to pre and post flashover enclosure fires and mathematical modelling of enclosure fires (zone and field models).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate an understanding of the basic chemical reactions and the fire triangle, with the ignition of solid and liquid fuels, combustion, and products of combustion (heat and smoke); 2. Recognise fire properties of various materials and fire behaviour of building contents and lining materials; 3. Interpret basic theories of heat transfer, fluid dynamics and fire dynamics; 4. Evaluate visibility through smoke and smoke toxicity; 5. Infer basic concepts how structural elements are affected during fire; and 6. Recognise capabilities and limitations of a number of commonly used assessment tools.
Class Contact: Over a one week period, there will be twenty-four (24) hours of face-to-face learning and four (4) hours of laboratory demonstration. In addition students are expected to complete an additional twenty-four (24) hours of structured self-directed studies.
Required Reading: Drysdale, D 2011, 3rd edn, An introduction to fire dynamics, John Wiley and Sons, London. Holman, JP 2010, 10th edn, Heat transfer, McGraw Hill Higher Education, Boston. In addition, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material.
Assessment: Assignment, Assignment 1 (1300 words), 25%. Assignment, Assignment 2 (2500 words), 50%. Assignment, Assignment 3 (1300 words), 25%. There will be three (3) Assignments and content of this unit will be a part of the examination that will be conducted as part of VQB5642 assessment.

VQB5641 Fire Safety Systems Design

Locations: Werribee.
Prerequisites: VQB5612 - Scientific Principles for Fire Professionals
Description: The unit provides students with an understanding of fire safety systems design principles and interaction between various submodels as described in fire engineering guidelines. It covers developing fire scenarios and design fires based on ignition probability, availability and effectiveness of suppression system and compartmentation and structural adequacy. It also covers basics of spread of smoke and fire in buildings, buoyancy of smoke, principles of smoke hazard management, structural performance in fire, detection and extinguishment and principles of evacuation. The unit will include an application of the Fire Brigade Intervention Model (FBIM) to fire situations, and emphasizes knowledge about the capabilities of fire brigade equipment including trucks, water pumps, scaffolding, and hoses. Students will be given hands-on-experience of operating the equipment during a field visit to the Metropolitan Fire and Emergency Services Board.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Recognise the interaction between various submodels described in the Fire Engineering Guidelines; 2. Infer the underlying basic physics of some assessment tools and when to refer designs to a more appropriately qualified assessor; 3. Evaluate various fire safety system options and analyse how these systems affect building fire safety; 4. Appraise the role and capabilities of fire brigade; and 5. Recognise the importance of occupational health and safety issues related to fire fighting and rescue operation.
Class Contact: Over a one week period, there will be 22 hours of face to face learning. Students are also expected to complete an additional 22 hours of structured self directed studies. In addition there will be a field visit.
Required Reading: Australian Building Codes Board 2011, 2011 edn, Building code of Australia 2011, Australian Building Codes Board. Australian Building Codes Board 2005, 2005 edn, International fire engineering guidelines, Australian Building Codes Board. Drysdale, D 2011, 3rd edn, An introduction to fire dynamics John Wiley and Sons, London. Australian Fire and Emergency Services Authorities Council, Fire brigade intervention education (CD Version) Australian Fire and Emergency Services Authorities Council. In addition, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material.
Assessment: Assignment, Assignment 1 - word limit 1500, 30%. Assignment, Assignment 2 - word limit 2200, 45%. Assignment, Assignment 3 - word limit 1300 (LiWC), 25%. There will be three (3) assignments and content of this unit will be a part of the examination that will be conducted as part of VQB5642 assessment.

VQB5642 Performance Codes Methodology and Structure

Locations: Werribee.
Prerequisites: Nil.
Description: The unit introduces the student to the principles, methodology and scope of performance based building codes in light of Building Code of Australia, Australian Standards and State legislation (technical and administrative framework) and provides the student with an understanding of the structure of performance design and approval. The unit will also cover estimation of acceptance criteria based on performance requirements, introduction to quantitative risk assessment and expected risk to life (ERL) and fire cost expectation (FCE). The unit introduces to legal issues, documentation, joint and several kinds of tortfeasor liability. An introduction to Bushfire Regulations will also be covered in addition to thorough life performance and maintenance of fire safety equipment; quality assurance and the building permit/inspection process. In this unit students will have the opportunity to critically analyse a fire engineering report in reference to the above codes.
Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to:

- Apply the principles, methodology and scope of performance-based building codes.
- Execute the approval process in relation to the structure of performance design.

- Interpret the legal, statutory and design integrity requirements.
- Critically assess a performance-based fire safety solution document and/or recognise when to refer designs onto a more appropriately qualified assessor.
- Recognise the need for a compliance of the design assumptions throughout the operational life of the building.

Class Contact: Over a one week period, there will be twenty-eight (28) hours of face-to- face learning and students are expected to complete an equivalent amount of structured self directed studies.
Required Reading: Australian Building Codes Board 2011, 2011 edn, Building code of Australia, Australian Building Codes Board. Australian Building Codes Board 2005, 2005 edn, International fire engineering guidelines, Australian Building Codes Board. Drysdale, D 2011, 3rd edn, An introduction to fire dynamics, John Wiley and Sons, London. In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.
Assessment: There will be 2 assignments and 1 three-hour examination. The examination will cover contents from VQB5611, VQB5612 and VQB5641. Assignment, Assignment 1 - word limit 800, 15%. Assignment, Assignment 2 - word limit 1600, 35%. Examination, 3 hours (Hurdle requirement), 50%. The total combined assessment word equivalence is approximately 4,000 words. The final written examination is an open book test where the students will critically analyse a fire engineering design brief or report. To pass this unit a student must achieve a cumulative pass for the 2 Assignments and obtain a pass in the examination. .

VQB5751 Fire Technology Modelling

Locations: Werribee.
Prerequisites: VQB5612 - Scientific Principles for Fire ProfessionalsVQB5641 - Fire Safety Systems Design
Description: The unit provides students with an understanding on the details of combustion process, flame characteristics, fire behaviour of materials, fire retardants and various test methods. It also covers, modelling of decomposition and combustion of fuels in various forms and associated heat transfer mechanisms during pre and post flashover stages. Details of two-zone models and computational fluid dynamics models (including underlying physics and numerical scheme); and model validation are an integral part of this unit.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate an advanced understanding of chemical decomposition, with the pyrolysis of solid and evaporation of liquid fuels, combustion, and modelling of these reactions; 2. Identify fire properties of various materials, fire behaviour of building contents, lining materials and fire retardant products, and various test methods; 3. Explain advanced heat transfer, fluid dynamics and fire dynamics theories; and 4. Use a number of commonly used assessment tools for fire and smoke growth and propagation.
Class Contact: There will be one (1) week long session for this unit. Within this week the following will be conducted: Thirty (30) hours of Lectures (Fifteen (15) lectures of two (2) hours each, in a designated week) Two (2) hour Laboratory demonstration (two (2) hour session in the above week) Students are also expected to complete an equivalent amount of structured self-directed studies.
Required Reading: Drysdale, D., 2010 3rd An Introduction to Fire Dynamics John Wiley and Sons, London Australian Building Codes Board, 2005 2005 International Fire Engineering Guidelines Australian Building Codes Board
Assessment: Assignment, Assignment 1 (1300 words), 25%. Assignment, Assignment 2 (1800 words), 35%. Assignment, Assignment 3 (1000 words), 20%. Report, Report (1000 words), 20%.

VQB5761 Fire Safety Systems Modelling

Locations: Werribee.
Prerequisites: VQB5612 - Scientific Principles for Fire ProfessionalsVQB5641 - Fire Safety Systems Design
Description: The unit provides students with an understanding on the details of development of design fires with their likelihood of occurrence and modelling of active and passive building fire safety subsystems as well as the evacuation time. This will include detection and sprinkler operation predictions; suppression models and modelling of structure failure in various design fires. Smoke and flame spread and their management options, performance based detection and suppression system design and a fire brigade intervention model are also covered in the unit.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop possible fire scenarios and associated design fire with likelihood of occurrence; 2. Evaluate smoke hazards and appropriately use fire safety system options to reduce the risks; 3. Model active and passive fire safety systems, their interaction among themselves and with fire; 4. Model occupant evacuation during an emergency; and 5. Use fire brigade intervention model.
Class Contact: There will be one (1) week long session for this unit. Within this week, thirty (30) of hours lectures consisting of fifteen (15) lectures of two (2) hours each) will be delivered. Students are also expected to complete an equivalent amount of structured self-directed studies.
Required Reading: Australian Building Codes Board, 2005 2005 International Fire Engineering Guidelines Australian Building Codes Board Drysdale, D., 2010 3rd An Introduction to Fire Dynamics John Wiley and Sons, London
Assessment: Report, Report (1500 words), 30%. Assignment, Assignment 1 (1300 words), 25%. Assignment, Assignment 2 (1000 words), 20%. Assignment, Assignment 3 (1300 words), 25%.

VQB5771 Fire Safety Engineering Application

Locations: Werribee.
Prerequisites: VQB5611 - Risk Assessment and Human BehaviourVQB5642 - Performance Codes Methodology and StructureVQB5751 - Fire Technology ModellingVQB5761 - Fire Safety Systems Modelling
Description: This 24 credit point unit serves as a capstone unit in which students will have the opportunity to integrate technical knowledge and skills from previous units and apply them in realistic work-related settings. The first part of this unit provides students with an understanding on the details of various approaches used for the analysis, design and management of fire safety systems in buildings, with particular emphasis placed on an absolute quantitative approach. This approach uses a probabilistic risk assessment methodology based on historical data to assess the expected risk to life (ERL), safety and the expected costs (and their benefits) to develop a performance based building design. The students will be introduced to fire investigation processes and project management techniques. In the second part of the unit Students will work in project teams to design and develop a Fire Safety System for a building project in the student's own workplace or that of a fellow student. In this project students will be required to employ quantitative and qualitative assessment techniques, performance based building designs, and demonstrate compliance with BCA standards. They will need to factor in fire insurance implications and general environmental, social and economic impacts. This approach of Learning in the Workplace and Community (LiWC) is aimed at enabling

students undertake a real world project which affords them avenues to engage directly with industry, while simultaneously advancing both their technical and generic skills.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Work independently to conduct probabilistic risk assessment of a real or simulated system; 2. As a member of a project team identify and analyse the BCA performance requirements and fire safety issues of a building and develop approaches to address them and formally present to peers and industry representatives; 3. As a member of a project team develop a framework for a fire engineering assessment including: trial concept design, methods of assessment/analysis, acceptance criteria, hazards, and occupant and building characteristics, taking into consideration environmental, social and economic impacts calling on national and international best practices and present in a formal report; 4. As a member of a project team undertake a quantitative and /or qualitative analysis of a range of real world concept designs, select the best with an accompanying rationale that complies with the BCA Performance Requirements and develop a strategy for implementation and present in a formal report and/or a poster; and 5. Reflect upon and evaluate own performance as an individual learner as well as a project team member in the context of own continuing professional development strategy and career goals.

Class Contact: There will be two (2) week long sessions for this unit. Within these two (2) weeks, twenty (20) hours of lectures (consisting of ten (10) lectures of two (2) hours each) will be delivered. Another forty (40) hours will be used for formative and summative presentations, tutorials and consultations. Students are also expected to complete an equivalent amount of structured self-directed studies.

Required Reading: Australian Building Codes Board (2011) 2016 Ed. Building Code of Australia Australian Building Codes Board Australian Building Codes Board (2005) 2005 Ed. International Fire Engineering Guidelines Australian Building Codes Board Hurley M.(ed) (2016) 5th Ed. SFPE Handbook of Fire Protection Engineering National Fire Protection Association

Assessment: Assignment, Assignment word Limit 1,000 words (individual work), 10%. Presentation, Summative Presentation 1 - 15 minutes (teamwork), 5%. Report, Report 1 (Preliminary) - 3,000 words (teamwork), 10%. Report, Report 2 (Fire Engineering Brief)- 7,500 words (teamwork), 25%. Presentation, Summative Presentation 2 (Fire Engineering Brief) - 30 minutes (teamwork), 10%. Report, Report 3 (Fire Engineering Report) - 12,000 words (teamwork), 40%. Summative presentations will be given to the rest of the class and where possible to the industry representatives. This will assist the students to learn from each other and engage with industry through questions and answers.

VQB5773 Industrial Experience On Fire Safety

Locations: Werribee.

Prerequisites: Nil.

Description: This unit of study will serve as an industrial experience unit for the course in which students will undertake a substantial LiWC (Learning in Workplace and Community) experience for their employer or selected organization. Students will be asked to take part in a project agreed to by their workplace supervisor and Victoria University (VU) coordinator. The project will provide students with the opportunity to gain experience of a real world situation and where possible apply their academic learning (the key principles covered in the course) to those situations.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. As a member of a project team identify and analyse the performance requirements given in their national building code and fire safety issues related to a building and develop approaches to address them; 2. Gain experience of a real world situation; 3. Relate the key principles covered in the course to a building project; and 4. Reflect upon technical skills that they have developed throughout the industrial experience and what they aspire to develop in the rest of the course.

Class Contact: Aggregate at least six (6) weeks (consisting of thirty-five (35) hours per week) i.e. a total of two hundred and ten (210) hours of industrial experience is required.

Required Reading: Australian Building Codes Board, 2005 2005 Edition International Fire Engineering Guidelines Australian Building Codes Board

Assessment: Report, Report (8000 words), 80%. Report, Reflection (2000 words), 20%. The report will be independently assessed by the workplace supervisor and VU coordinator. The reflection report will be assessed by the VU coordinator.

VQB5781 Mathematics for Fire Safety Engineers

Locations: Werribee.

Prerequisites: VQB5612 - Scientific Principles for Fire Professionals

Description: Sound knowledge of mathematics is required for understanding the techniques and tools of analysis of fire safety designs. Core topics of this unit will include integration/ differentiation, vectors, matrices, linear equation, 1st and 2nd order linear differential equations and Taylor's series. Other topics will be chosen from numerical methods, vector calculus and partial differential equation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply calculus method to problems in risk engineering; 2. Use matrices to solve simultaneous linear equations; 3. Apply first order and second order ordinary differential equations to problems in fire safety; 4. Perform numerical integration and differentiation in the applied context; and 5. Perform numerical methods of differential equations representing engineering systems.

Class Contact: This unit will be conducted on-line over the summer semester (12 weeks). There will be three (3) hours per week on-line lectures over the twelve (12) weeks period. Students are also expected to complete an equivalent amount of structured self directed studies.

Required Reading: Kreyszig, E., 2010. 10th Edn, Advanced Engineering Mathematics John Willey & Sons, NY. Thomas, G. B., Weir, M. D., Hass, J. and Giordano, F. R., 2009. 12th Edn. Thomas' Calculus Addison-Wesley. DuChateau, P. and Zachmann, D. W., 2011. Schaum's Outline of Partial Differential Equations McGraw-Hill.

Assessment: Assignment, Assignment 1 (1500 words), 25%. Assignment, Assignment 2 (1500 words), 25%. Assignment, Assignment 3 (3000 words), 50%. Assignment 1 covers Learning Outcome 1 & 2 and Graduate Capabilities 1 & 2 Assignment 2 covers Learning Outcomes 3 & 4 and Graduate Capabilities 1 & 2 Assignment 3 covers Learning Outcomes 3, 4 & 5 and all three Graduate Capabilities. .

VQB5791 Mechanics of Thermo-Fluids and Solids for Fire Safety Engineers

Locations: Werribee.

Prerequisites: VQB5612 - Scientific Principles for Fire Professionals

Description: The unit provides students with a general understanding of fundamental and applied fluid dynamics, thermodynamics, combustion and mechanics of solids. Special emphasis is given to characterisation of fire dynamics and elucidation of structural behaviour (both elastic and inelastic) during a fire.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate a sound understanding of fluid mechanics, thermodynamics, combustion

and solid mechanics theories; 2. Develop and construct mathematical, physical and conceptual models of situations, systems and devices; 3. Utilise the above models (learning outcome 2) for purposes of analysis and design and understand their applicability and shortcomings; and 4. Design experiments and identify appropriate measurements required.

Class Contact: This unit will be conducted on-line over the summer semester (12 weeks). There will be three (3) hours per week on-line lectures over the twelve (12) weeks period. Students are also expected to complete an equivalent amount of structured self directed studies.

Required Reading: Drysdale, D., 2010 3rd Edition, An Introduction to Fire Dynamics, John Wiley and Sons, London. Hibbler R.C., 2011 8th Edition, Structural Analysis, Pearson International. White, F. M., 2011 7th Edition, Fluid Mechanics, McGraw-Hill Series in Mechanical Engineering, New Jersey. Cengel, Y. A. and Boles, M. A., 2011 7th Edition, Thermodynamics- An Engineering Approach McGraw Hill, New York.

Assessment: Assignment, Assignment 1 (1500 words), 25%. Assignment, Assignment 2 (1500 words), 25%. Assignment, Assignment 3 (3000 words), 50%. Assignment 1 covers Learning Outcome 1 and Graduate Capabilities 1 & 2 Assignment 2 covers Learning Outcomes 1 and Graduate Capabilities 1 & 2 Assignment 3 covers Learning Outcomes 2, 3 & 4 and all three Graduate Capabilities .

VQT6061 Building Fire Research A

Locations: Werribee.

Prerequisites: Students are normally expected to have a four-years degree in engineering or a three-years degree in science plus two years relevant work experience or have completed the Graduate Certificate in Performance-Based Building and Fire Codes with a distinction average.

Description: This unit provides students with opportunities for training in some key methodologies and research strategies for building fire research projects. Students have the opportunity to develop a range of skills in conceptualising and problematising research, to develop an understanding of various research tools and ability to plan an original research related to building fire safety. The project will be an engineering and/or scientific investigation of an approved topic developed through a detailed literature search and review of the literature on the approved topic area. Selection of appropriate research tools for the project, proposing various parameters to analyse and presenting the research proposal and methodology in an effective way are other key elements of this unit.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Clearly define a problem by undertaking a detailed literature search and review the literature on the topic/problem area; 2. Select appropriate research method and tools for a project; 3. Propose different ways of using/analysing data/ information for research; and 4. Produce a review explaining research question and methodology including literature review.

Class Contact: The equivalent of 72 hours comprising discussion, self-directed studies and research work.

Required Reading: Texts and peer-reviewed literature related to the chosen topic.

Assessment: Assessment will be on the basis of approval of the supervisor to proceed to VQT6062. Review, Literature review and research proposal (the total effective word length is 5000 words)., Yes/No. The review covers all learning outcomes and graduate capabilities.

VQT6062 Building Fire Research B

Locations: Werribee.

Prerequisites: VQT6061 - Building Fire Research A

Description: This unit provides students with the opportunity to carry out an original research project related to building fire safety which is developed in VQT6061. Students will be expected to apply the knowledge and skills gained from the coursework component of the EMQB degree to this research project. In this unit the students are expected to conduct of analytical/ numerical/ experimental research and critical analysis, interpretation and presentation of results. The student shall, where appropriate, demonstrate both the ability to develop and/or apply models to study the problem together with appropriate data selection, collection and analysis. Students will normally be supervised by an academic member of staff.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adopt sound research methodologies and apply appropriate research tools in the investigations of building fire safety problems; 2. Objectively and critically analyse and discuss the results obtained; and 3. Prepare a scientific research report in a format suitable for publication in a scientific journal.

Class Contact: The equivalent of 72 hours comprising discussion, self-directed studies and research work.

Required Reading: Texts and peer-reviewed literature related to the chosen topic.

Assessment: Assessment will be on the basis of examination of the research thesis. The thesis will be assessed by an examiner (other than the supervisor) with expertise in the area of the research. Thesis, Research Thesis (15,000-25,000 words), 100%. The Research Thesis covers all learning outcomes and graduate capabilities.

VQT8001 Research Thesis 1 Full Time

Prerequisites: Nil.

Description: Eligibility for entry to a Master of Science or Doctor of Philosophy program. This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 48

VQT8002 Research Thesis 2 Full Time

Prerequisites: Nil.

Description: Eligibility for entry to a Master of Science or Doctor of Philosophy program. This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/

Credit Points: 48

VQT8011 Research Thesis 1 Part Time

Prerequisites: Nil.

Description: Eligibility for entry to a Master of Science or Doctor of Philosophy program. This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24

VQT8012 Research Thesis 2 Part Time

Prerequisites: Nil.
Description: This unit of study is part of a research degree program. Information on research topics for the Faculty of Health, Engineering and Science may be found on the faculty website at the following link: http://www.vu.edu.au/Faculties/HealthEngineeringandScience/ResearchandResearchTraining/MajorResearchAreas/ Assessment criteria and Core Research Graduate Attributes can be found on the Office for Postgraduate Research website at the following link: http://www.vu.edu.au/Research/OfficeforPostgraduateResearch/PolicyProcessesandGuidelines/
Credit Points: 24