COLLEGE OF ENGINEERING AND SCIENCE HANDBOOK 2019

DISCLAIMER

The information contained in Victoria University's 2019 College of Engineering and Science was current at 19 November 2018

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

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HOW TO USE THIS HANDBOOK

Victoria University's 2019 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 2019.

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 2019.

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.

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College of Engineering and Science

Below are details of courses offered by the College of Engineering and Science in 2019.

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.

Bachelor of Engineering (Civil Engineering)

Course Code: EBCC
Campus: Footscray Park.
This course is for Continuing students only.

About this course: Civil Engineering is a broad-based discipline involving the planning, design, construction and management of a wide range of essential community infrastructure including, commercial and industrial buildings, water supply and wastewater systems, irrigation, drainage and flood protection systems, bridges, roads, highways and transportation systems, and port harbour and airport facilities. The course philosophy is very much based on a recognition of society's need for well-rounded engineers who not only have sound technical and communication skills but also a good understanding of the environmental, economic, social and political environment in which they must operate. The course is founded on a solid base of science and engineering fundamentals in the first two years, with emphasis then being given in years three and four to applied discipline-specific topics, design and project work. Substantial emphasis is given in a range of subjects to professionalism, ethics and community responsibility, team assignments, broad problem solving and communication skills, and the concepts of sustainability and sustainable engineering practices. A focus on local engineering examples, experiential learning and site visits, together with significant input from external industry-based lecturers, provides students with exposure to real world problems and is considered a motivational cornerstone of the course. There are two major streams in structural and water engineering running through the course, complemented by minor streams in geomechanics and transportation engineering. Environmental and management issues are covered in specific subjects but also more broadly by integration into a range of other subjects throughout the course. Subject streams are generally sequential within a well-defined structure. It is envisaged that this structure may be modified somewhat in the future with a view to further motivating students by allowing them a greater degree of flexibility and specialisation, once a firm foundation has been established in the early years of the course. The incorporation of more flexibility should also allow students to remedy any perceived deficiencies in the more basic communication and technical skills. A study abroad exchange program is under investigation with the Department of Civil Engineering at the University of Nebraska at Omaha, Nebraska, USA.

Course Objectives: On successful completion of this course, students will be able to:
1. The course is designed to develop skills for the application of engineering principles of planning, design, construction and management of buildings, roads, water supply and all other major community amenities.

Careers: A wide range of careers involving planning, design, construction and engineering management in private industry or with government authorities.

Course Duration: 4 years

Admission Requirements: The prerequisite subjects for admission into the first year of the course are based on entry at post Year 12, Victorian Certificate of Education, or equivalent level, and are as follows. Persons transferring from other courses or having overseas or other entrance qualifications of at least equivalent standard to those listed above, should apply for admission in the normal manner. A preliminary interview with the Head of School concerned is advisable for such applicants. 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+, subject to individual profile, or TOEFL - a score of 550+, and a Test of Written English (TWE) score of 5+.

COURSE STRUCTURE

The course is offered over four years on a full-time basis. Part-time study may be approved. However the course cannot be completed solely on a part-time basis. Students must complete 384 credit points.

Year 1

Semester 1

NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEM1001	Algebra and Calculus	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

NEC2102	Solid Mechanics	12
NEC2104	Engineering Surveying	12
NEF2101	Fluid Mechanics 1	12
VAN2061	Engineering Materials	12

Year 2, Semester 2

NEC2103	Engineering Materials & Construction	12
NEC2201	Introduction to Structural Engineering Design	12

NEC2203	Hydraulics	12
NEC2204	Highway Engineering	12

Year 3, Semester 1

NEC2202	Geomechanics	12
NEC3101	Structural Analysis	12
NEC3103	Hydrology and Water Resources	12
NEC3202	Civil Engineering Design 1	12

Year 3, Semester 2

NEC3102	Geotechnical Engineering	12
NEC3203	Structural Engineering Design 1	12
NEC3201	Hydraulic Engineering	12
NEF3202	Research Methods	12

Electives

Approved Electives from within the College of Engineering and Science

NEA2102	Architectural Design and Theory	12
NBC2003	Building Systems and Services	12
NEA4203	Commercial Sustainable Design	12

Electives from outside the College of Engineering and Science

(Subject to approval by Course Coordinator)

Year 4, Semester 1

NEC4101	Environmental Engineering 1	12
NEC4102	Structural Engineering Design 2	12
NEF3101	Project Management	12
NEF4101	Research Project 1	12

Year 4, Semester 2

NEC4172	Urban Development and Transportation	12
NEF4201	Research Project 2	12
NEF4206	Advanced Engineering Design	12
NEF4207	Engineering Applications	12

Other Course Specific Notes Assessment in subjects is designed to monitor a student's progress and achievements as well as contribute to and enhance their learning. Normally a prescribed range of assessment methods is employed in any subject. Assessment is by a combination of written assignments, tests, laboratory work and examinations. Supplementary assessment is not normally available in any subject except at the discretion of the Head of School in exceptional circumstances. Special Consideration in assessment may be granted on the grounds defined by the University Statutes. Guidelines on the use of electronic calculators and other electronic storage devices in examinations are provided in individual subject 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 made. Degree with Honours A Degree with Honours Program is offered concurrently with the fourth year of the ordinary Bachelor of Engineering program. Normally, students entering the final year of a full-time Bachelor of Engineering program (or its equivalent in part-time mode), will be offered honours candidacy, if they have achieved a minimum hour weighted average of 60 per cent over year levels 1 to 3, have not repeated a subject throughout levels 1 to 3 and have not been granted more than one year completion by compensation throughout the duration of the course. Fourth year honours degree gradings will be determined by the relevant Examiners Board on the basis of the hour weighted average for year level 4. Industrial Experience Candidates applying for the award of a degree in civil engineering must ensure that they have submitted for approval evidence of having undertaken a minimum of 12 weeks industrial experience relevant to the course to satisfy Engineers Australia requirements. Professional Recognition Engineers Australia has granted full recognition for the Bachelor of Engineering in Civil Engineering. Recognition is a requirement for Graduate Membership of Engineers Australia and additionally for equivalent membership of many overseas professional engineering institutions. Overseas Exchange Program Victoria University has exchange agreements with universities in many countries, some of which are the U.S.A., Canada, Mexico, United Kingdom and many European and Asian countries. For those students who do wish to study abroad, there is the opportunity to experience living in a different culture and environment, and to develop self-responsibility and reliance skills. Many students achieve improved results in their remaining studies after returning home, having developed a clearer perception of their future career with a stronger determination to succeed.

Bachelor of Engineering (Architectural Engineering)

Course Code: EBDA
Campus: Footscray Park, City Flinders.
This course is for Continuing students only.

About this course: The VU Engineering PBL model is built on the learning principles of Active Learning (problem/project/practice based), Collaborative Learning (self-directed and team-based), and Integrative Learning (interdisciplinary knowledge and skills). Interwoven with these three principles are those of 'Engagement' and 'Practice'. In line with the model, the first two years of the course have a strong emphasis on managing the transition of students from a secondary education environment that emphasises passive learning to a higher education environment that is built around problem/project/practice work. For this reason, the course uses shorter problems in first year before moving on to longer community-based projects in year 2, industry-based projects in year 3, and practice on industry projects in year 4. The course has also built in a range of student support mechanisms in learning, language, mathematics and technical skills.

Course Objectives: The objectives of the course are to produce graduates who:

- have a solid foundation of scientific, engineering and project management knowledge;

- have a broad appreciation of building technology and construction techniques;
- can offer specialised ability to design building structures in steel, concrete and timber; or specialised design skills in environmental services systems including lighting, electrical power, air conditioning, ventilation, water supply distribution and fire protection/life safety systems;
- can develop creative, practical and sustainable solutions for the design of building structural or building services systems;
- can manage people, finances and resources for building projects;
- can communicate appropriately and effectively in different modes with different audiences;
- can work independently and collaboratively;
- can understand community needs in the context of societal aspirations and expectations for sustainability and the built environment;
- have both the skills and motivation to continue learning as professionals; and
- are work-ready and thus attractive to prospective employers in the building design industry.

Architectural Engineering at Victoria University is the first program in Architectural Engineering in Australia to receive full accreditation from Engineers Australia.

Careers: Architectural Engineering graduates will have enhanced skills for careers in:

- advanced environmental services systems design including air conditioning (HVAC);
- interior lighting design;
- sustainable building design;
- green star auditing;
- conducting building energy audits and conservation studies;
- simulation of building environmental systems performance;
- building structural design including assessment of buildings for reuse;
- fire and life safety systems design;
- design of water systems, including distribution, reclaim and recycling;
- conducting project feasibility assessments and cost estimating;
- construction planning, management and project supervision;
- engineering consultations and investigations;
- facilities management;
- risk assessment for building insurance;
- support for preservation architecture;
- building renovation and refurbishment; and
- computer aided design and drawing.

Course Duration: 4 years

Admission Requirements: 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 in Mathematical methods (CAS) or specialist mathematics.

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

Admission Requirements VET: 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 Engineering (Architectural Engineering) students are required to complete 384 credit points (equivalent to 32 units) consisting of:

- 192 credit points (equivalent to 16 units) of Core Engineering studies;
- 192 credit ponts (equivalent to 16 units) from either the Structures or Services Streams.

Year 1, Semester 1

NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEM1001	Algebra and Calculus	12

Year 1, 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

NEA2102	Architectural Design and Theory	12
NEC2102	Solid Mechanics	12
NEC2103	Engineering Materials & Construction	12
NEF2101	Fluid Mechanics 1	12

Year 2, Semester 2

NEA2201	Building Development and Compliance	12
NEC2201	Introduction to Structural Engineering Design	12
NEC2203	Hydraulics	12
NEF2251	Fundamentals of Electrical and Electronic Engineering	12

Year 3, Semester 1

STRUCTURES STREAM:

NEC2202	Geomechanics	12
NEC3101	Structural Analysis	12

NEA4203	Commercial Sustainable Design	12
NEF3101	Project Management	12
SERVICES STREAM:		
NEC3101	Structural Analysis	12
NEF3001	Applied Project 1	12
NEA4203	Commercial Sustainable Design	12
NEE3103	Electrical Machines	12
Year 3, Semester 2		
STRUCTURES STREAM:		
NEC3102	Geotechnical Engineering	12
NEC3203	Structural Engineering Design 1	12
NEF3202	Research Methods	12
NBC2003	Building Systems and Services	12
SERVICES STREAM:		
NEA4102	Residential Sustainable Design	12
NEF2201	Building HVAC Systems	12
NEF3202	Research Methods	12
NBC2003	Building Systems and Services	12
Year 4, Semester 1		
STRUCTURES STREAM:		
NEA4102	Residential Sustainable Design	12
NEC4102	Structural Engineering Design 2	12
NEF3101	Project Management	12
NEF4101	Research Project 1	12
SERVICES STREAM:		
NEC4101	Environmental Engineering 1	12
NEF3101	Project Management	12
NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12
Year 4, Semester 2		
STRUCTURES STREAM:		
NEF4207	Engineering Applications	12
NEA4204	Architectural Lighting and Acoustics	12
NEF4201	Research Project 2	12
NEF4206	Advanced Engineering Design	12
SERVICES STREAM:		
NEF4201	Research Project 2	12
NEA4204	Architectural Lighting and Acoustics	12
NEF4206	Advanced Engineering Design	12
NEF4207	Engineering Applications	12

Industrial Experience Candidates applying for the award of Bachelor of Engineering (Architectural Engineering) must ensure that they have submitted for approval, evidence of having undertaken a minimum of 12 weeks industrial experience relevant to the course to satisfy Engineers Australia requirements. Degree with Honours Program A Degree with Honours Program is offered concurrently with the fourth year of the ordinary Bachelor of the Engineering program. To be eligible for consideration for a degree with honours a student will: (a) have achieved a minimum weighted average of 60% over year levels 1 to 3; (b) not have repeated a Unit of Study throughout year levels 2 to 3; (c) not have been granted more than one conceded pass throughout the duration of the course; and (d) discretion to award honours grading that do not meet criteria above will rest with the Course Coordinator. Eligibility for admission to a degree with honours will be determined at the end of year level 3 for students who are enrolled on a full time basis or, a part time basis or, who have transferred into the course with exemptions. The level of awarded honours will be determined by the hour weighted average for year level 4. The following grading will apply: H1 First Class honours 80-100 H2A Second Class Honours, Upper 70-79 H2B Second Class Honours, Lower 60-69 P Pass 50-59

Bachelor of Engineering (Civil Engineering)

Course Code: EBDC
Campus: Footscray Park.
This course is for Continuing students only.

About this course: The VU Engineering PBL model is built on the learning principles of Active Learning (problem/project/practice based), Collaborative Learning (self-directed and team-based), and Integrative Learning (interdisciplinary knowledge and skills). Interwoven with these three principles are those of 'Engagement' and 'Practice'. In line with the model, the first two years of the course have a strong emphasis on managing the transition of students from a secondary education environment that emphasises passive learning to a higher education environment that is built around problem/project/practice work. For this reason, the course uses shorter problems in first year before moving on to longer community-based projects in year 2, industry-based projects in year 3, and practice on industry projects in year 4. The course has also built in a range of student support mechanisms in learning, language, mathematics and technical skills.

Course Objectives: The objectives of the course are to produce graduates who:

- have a solid foundation of scientific, engineering and project management knowledge;

- can develop creative and practical solutions to engineering problems;
- can communicate appropriately and effectively in different modes with different audiences;
- can work independently and collaboratively;
- can understand community needs in the context of societal aspirations and expectations;
- have both the skills and motivation to continue learning as professionals; and
- are work-ready and thus attractive to prospective employers.

Careers: A wide range of private and public sector careers involving the planning, design, construction, management and/or rehabilitation of essential community infrastructure including residential / commercial / industrial buildings, water supply and wastewater systems, irrigation / drainage / flood protection systems, bridges / roads / transport systems, and ports/ harbours and airport facilities.

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (ESL) or 20 in any other English AND in Mathematical methods (CAS) or specialist mathematics. Persons transferring from other courses or having overseas or other entrance qualifications of at least equivalent standard should apply for admission in the normal manner.

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: Students with a suitable VET qualification can apply for admission in the normal manner.

COURSE STRUCTURE

The Bachelor of Engineering (Civil Engineering) is a 384 credit point degree.

Year 1, Semester 1

NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEM1001	Algebra and Calculus	12

Year 1, 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

NEC2102	Solid Mechanics	12
NEC2103	Engineering Materials & Construction	12
NEC2104	Engineering Surveying	12
NEF2101	Fluid Mechanics 1	12

Year 2, Semester 2

NEC2201	Introduction to Structural Engineering Design	12
NEC2203	Hydraulics	12
NEC2204	Highway Engineering	12
VAC2032	Civil Project	12

Year 3, Semester 1

NEC2202	Geomechanics	12
NEC3101	Structural Analysis	12
NEC3202	Civil Engineering Design 1	12
NEC3103	Hydrology and Water Resources	12

Year 3, Semester 2

NEC3102	Geotechnical Engineering	12
NEC3201	Hydraulic Engineering	12
NEC3203	Structural Engineering Design 1	12
NEF3202	Research Methods	12

Year 4, Semester 1

NEC4101	Environmental Engineering 1	12
NEC4102	Structural Engineering Design 2	12
NEF3101	Project Management	12
NEF4101	Research Project 1	12

Year 4, Semester 2

NEC4172	Urban Development and Transportation	12
NEF4201	Research Project 2	12
NEF4206	Advanced Engineering Design	12
NEF4207	Engineering Applications	12

Industrial Experience Candidates applying for the award of Bachelor of Engineering (Civil Engineering) must ensure that they have submitted for approval, evidence of

having undertaken a minimum of 12 weeks industrial experience relevant to the course to satisfy Engineers Australia requirements. Degree with Honours Program A Degree with Honours Program is offered concurrently with the fourth year of the ordinary Bachelor of the Engineering program. To be eligible for consideration for a degree with honours a student will: (a) have achieved a minimum weighted average of 60% over year levels 1 to 3; (b) not have repeated a Unit of Study throughout year levels 2 to 3; (c) not have been granted more than one conceded pass throughout the duration of the course; and (d) discretion to award honours grading that do not meet criteria above will rest with the Course Coordinator. Eligibility for admission to a degree with honours will be determined at the end of year level 3 for students who are enrolled on a full time basis or, a part time basis or, who have transferred into the course with exemptions. The level of awarded honours will be determined by the hour weighted average for year level 4. The following grading will apply: H1 First Class honours 80-100 H2A Second Class Honours, Upper 70-79 H2B Second Class Honours, Lower 60-69 P Pass 50-59

Bachelor of Engineering (Electrical and Electronic Engineering)

Course Code: EBDE
Campus: Footscray Park.
This course is for Continuing students only.

About this course: The Bachelor of Engineering in Electrical and Electronic Engineering is a flexible degree that allows students to specialise in four disciplinary areas. Embedded Systems, Microelectronic Systems, Communications Systems and Power Systems Engineering. The course is delivered using a Problem Based Learning (PBL) methodology which uses real world problems as a significant part of the learning process. In Year 2 projects will involve students interacting with a community organisation or school, while in later years the focus will be on working with an industry partner. The projects will be based on the identified needs of the industry or community partners. The projects allow the student to apply their theoretical and technical engineering knowledge and skills in real contexts, develop and reflect on their professional attributes, and learn from the expertise, experience and perspectives of the project partners. The first three years of the course develop the basic concepts in electrical and electronic engineering, computer systems and programming, together with related engineering sciences, mathematics, design projects and laboratory studies. Students have the opportunity to choose their field of specialisation in fourth year of the course. The main objectives of the course are to: provide an integrated foundation for electrical disciplinary studies and course specialisation into the particular areas of Embedded Systems, Microelectronic Systems, Communication Systems and Power Systems Engineering; develop attitudes of personal initiative and enquiry in students that they may continue to further education and meet the technological changes in their profession; develop oral and written communications and an understanding of society and the engineer's role in society; provide for professional recognition by the Engineers Australia and other professional bodies.

Course Objectives: The objectives of the course are to produce graduates who:

- have a solid foundation of scientific, engineering and project management knowledge;
- can develop creative and practical solutions to engineering problems;
- can communicate appropriately and effectively in different modes with different audiences;
- can work independently and collaboratively;
- can understand community needs in the context of societal aspirations and expectations;
- have both the skills and motivation to continue learning as professionals; and
- are work-ready and thus attractive to prospective employers.

Careers: Professional Electrical Engineers are employed in a wide range of industries such as communications, power, microelectronics and embedded systems engineering.

Course Duration: 4 years

Admission Requirements: Units 3 and 4 - a study score of at least 25 in English (ESL) or 20 in any other English AND in Mathematical methods (CAS) or specialist mathematics. Persons transferring from other courses or having overseas or other entrance qualifications of at least equivalent standard should apply for admission in the normal manner.

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: Students with a suitable VET qualification can apply for admission in the normal manner.

COURSE STRUCTURE

To attain the Bachelor of Engineering (Electrical and Electronic Engineering), students are required to complete 384 credit points of study.

Year 1, Semester 1

NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEM1001	Algebra and Calculus	12

Year 1, 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
NEE2106	Computer Programming for Electrical Engineers	12

NEE2107	Telecommunications	12
NEE2110	Engineering Design and Practice 2A	12
Year 2, Semester 2		
NEE2201	Linear Systems with Matlab Applications	12
NEE2204	Power System Supply Chain Management	12
NEE2205	Analogue Electronics	12
NEE2210	Engineering Design and Practice 2B	12
Year 3, Semester 1		
NEE3103	Electrical Machines	12
NEE3104	Digital Systems	12
NEE3201	Introduction to Control Systems	12
NEF3101	Project Management	12
Year 3, Semester 2		
NEE3203	Embedded Systems	12
NEE3207	Analogue and Digital Transmission	12
NEE3208	Signal Processing	12
NEF3202	Research Methods	12
Year 4, Semester 1		
NEE4110	Electrical Power Systems, Analysis and Operation	12
NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12
NEM4102	Finite Element Analysis	12
Year 4, Semester 2		
NEE4211	Mobile Networks and Communications	12
NEF4201	Research Project 2	12
NEF4205	Sustainable Energy Systems	12
NEF4206	Advanced Engineering Design	12

Industrial Experience Candidates applying for the award of Bachelor of Engineering (Electrical and Electronic Engineering) must ensure that they have submitted for approval, evidence of having undertaken a minimum of 12 weeks industrial experience relevant to the course to satisfy Engineers Australia requirements. Degree with Honours Program A Degree with Honours Program is offered concurrently with the fourth year of the ordinary Bachelor of the Engineering program. To be eligible for consideration for a degree with honours a student will: (a) have achieved a minimum weighted average of 60% over year levels 1 to 3; (b) not have repeated a Unit of Study throughout year levels 2 to 3; (c) not have been granted more than one conceded pass throughout the duration of the course; and (d) discretion to award honours grading that do not meet criteria above will rest with the Course Coordinator. Eligibility for admission to a degree with honours will be determined at the end of year level 3 for students who are enrolled on a full time basis or, a part time basis or, who have transferred into the course with exemptions. The level of awarded honours will be determined by the hour weighted average for year level 4. The following grading will apply: H1 First Class honours 80-100 H2A Second Class Honours, Upper 70-79 H2B Second Class Honours, Lower 60-69 P Pass 50-59

Bachelor of Engineering (Mechanical Engineering)

Course Code: EBDM
Campus: Footscray Park.
This course is for Continuing students only.

About this course: The Mechanical Engineering degree at VU is designed to provide the broad education required for a successful career in such widespread areas as manufacturing; design of machines and industrial processes; machine health monitoring; energy and thermal systems; air, marine and land-based transportation systems; aerodynamics and fluid mechanics; creation and design of medical devices; resources and mining; and computer-aided engineering. Initial focus is on engineering principles and analysis and the role of engineers in society. In higher years, knowledge gained is applied to real-world engineering projects and problems as well as management. Completion of a major industry or research-oriented project and a minimum of twelve weeks' relevant industrial experience are required to graduate Work experience opportunities are available for selected students.

Course Objectives: The objectives of the course are to produce graduates who:

- have a solid foundation of scientific, engineering and project management knowledge;
- can develop creative and practical solutions to engineering problems;
- can communicate appropriately and effectively in different modes with different audiences;
- can work independently and collaboratively;
- can understand community needs in the context of societal aspirations and expectations;
- have both the skills and motivation to continue learning as professionals; and
- are work-ready and thus attractive to prospective employers.

Careers: The Mechanical Engineering degree at VU is designed to provide the broad education required for a successful Engineering and Management career in such widespread areas as manufacturing; design of machines and industrial processes; machine health monitoring; energy and thermal systems; air, marine and land-based transportation systems; aerodynamics and fluid mechanics; creation and design of medical devices; resources and mining; Defence; and computer-aided engineering.

Course Duration: 4 years

Admission Requirements: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including Units 3 and 4: a study score of at least 25 in English (ESL) or 20 in any other English PLUS Units 3 and 4 with a study score of at least 20 in one of the following: Mathematics (any).

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Mathematics OR 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: 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 Engineering (Mechanical Engineering), students will be required to complete 384 credit points (equivalent to 32 units) consisting of:

- 384 credit points (equivalent to 32 units) of Core studies.

Year 1, Semester 1

NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEM1001	Algebra and Calculus	12

Year 1, 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

NEC2102	Solid Mechanics	12
NEF2101	Fluid Mechanics 1	12
NEM2101	Mechanical Engineering Design	12
NEM2102	Introduction to Engineering Materials	12

Year 2, Semester 2

NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEM2104	Numerical Modelling of Mechanical Systems	12
NEM2201	Thermodynamics 1	12
NEM2202	Dynamics	12

Year 3, Semester 1

NEF3101	Project Management	12
NEM3101	Engineering Analysis and Modelling	12
NEM3103	Thermodynamics 2	12
NEM3203	Stress Analysis	12

Year 3, Semester 2

NEF3202	Research Methods	12
NEM3102	Design of Mechanical Systems	12
NEM3201	Manufacturing Materials	12
NEM3202	Fluid Mechanics 2	12

Year 4, Semester 1

NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12
NEM4101	Mechanical Vibrations	12
NEM4102	Finite Element Analysis	12

Year 4, Semester 2

NEF4201	Research Project 2	12
NEF4205	Sustainable Energy Systems	12
NEF4206	Advanced Engineering Design	12
NEM4202	Advanced Engineering Analysis	12

Industrial Experience Candidates applying for the award of Bachelor of Engineering (Mechanical Engineering) must ensure that they have submitted for approval, evidence of having undertaken a minimum of 12 weeks industrial experience relevant to the course to satisfy Engineers Australia requirements. Degree with Honours Program A Degree with Honours Program is offered concurrently with the fourth year of the ordinary Bachelor of the Engineering program. To be eligible for consideration for a degree with honours a student will: (a) have achieved a minimum weighted average of 60% over year levels 1 to 3; (b) not have repeated a Unit of Study throughout year levels 2 to 3; (c) not have been granted more than one conceded pass throughout the duration of the course; and (d) discretion to award honours grading that do not meet criteria above will rest with the Course Coordinator. Eligibility for admission to a degree with honours will be determined at the end of year level 3 for students who are enrolled on a full time basis or, a part time basis or, who have transferred into the course with exemptions. The level of awarded honours will be determined by the hour weighted average for year level 4. The following grading will apply: H1 First Class honours 80-100 H2A Second Class Honours, Upper 70-79 H2B Second Class Honours, Lower 60-69 P Pass 50-59

Bachelor of Engineering Science (Sports Engineering)

Course Code: EBSG
Campus: Footscray Park.
This course is for Continuing students only.

About this course: The course covers practical and supporting engineering skills necessary for a career in a variety of key industries and organisations connected with engineering sports related technologies. These industries include equipment and sports gear manufacturers, professional sports associations and clubs, sports institutes, sport infrastructure designers and elite sports research. Graduates can work as design engineers, test engineers and software engineers. The initial part of the course is structured to provide a solid foundation in mathematics, physics, engineering sciences and human movement. The intermediate semesters include studies in specific topics of engineering materials, electrical engineering; mechanical engineering, biomechanics and ergonomics design. Students complete the course with studies in mechatronics and dynamics, management and professional practice, computer applications as well as a major project which will normally involve working with an industry partner. Work experience opportunities are available for selected students.

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate conceptual understanding of mathematics and physics with specialist bodies of knowledge from electrical and mechanical engineering for application within the sports engineering discipline; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the sports engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative and sustainable engineering solutions; 4. Critically evaluate both sources and validity of information and use established processes for information management 5. Present clear and coherent expositions of the integration of electrical engineering, mechanical engineering and biomechanics in the design of new sport technologies, to a variety of audiences; 6. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 7. Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

Careers: The program will produce graduates with an appropriate breadth and depth of capability that will enable them to actively contribute to or lead multidisciplinary teams with interests in sports-related application or research. Graduates will be highly skilled engineering technologists capable of crossing and blending traditional engineering and human movement science discipline boundaries and who will be able to provide knowledge-based practical engineering services to the sports, sports science, and exercise and rehabilitation industries. Graduates find employment with: sports equipment designers and vehicle manufacturers, elite sports associations and clubs, sport research and development organisations. Employment opportunities may exist with automotive, transport, electronics and embedded systems industries.

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 Mature Age: Basic academic degree or work experience background in (any) fields of engineering or sports science. Applications will be treated on an individual basis.

COURSE STRUCTURE

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

- 48 credit points (equivalent to 4 units) of Core College studies, and;
- 240 credit points (equivalent to 20 Units) of Professional Core studies.

Major field of studies: Physiology, Biomechanics, Dynamics, Fluid mechanics and thermodynamics, Digital and analogue electronics, Mechatronics, sensors and data acquisition, Materials, Engineering design, Computing, Management and professional practice.

Year 1, Semester 1:

NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEM1001	Algebra and Calculus	12

Year 1, 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:

AHE2127	Motor Learning	12
NEE2101	Electrical Circuits	12
NEE2106	Computer Programming for Electrical Engineers	12
NEE2107	Telecommunications	12

Year 2, Semester 2

NEE2201	Linear Systems with Matlab Applications	12
NEE2204	Power System Supply Chain Management	12
NEE2205	Analogue Electronics	12
NEE2210	Engineering Design and Practice 2B	12

Year 3, Semester 1:

AHE2102	Sports Biomechanics	12
NEE3104	Digital Systems	12
NEE3201	Introduction to Control Systems	12
NEF3101	Project Management	12

Year 3, Semester 2:

NEE3203	Embedded Systems	12

NEE3207	Analogue and Digital Transmission	12
NEE3208	Signal Processing	12
NEF3202	Research Methods	12

Master of Project Management

Course Code: EMPR
Campus: Footscray Park.
This course is for Continuing students only.

About this course:-

Course Objectives: To provide students with a conceptual understanding of relevant models, modes of analysis and techniques for understanding and procurement. They will also have developed the ability to apply and carrying out project management, contract management and evaluate these models, modes of analysis and technique in the context of the legal, ethical and accountability requirements which apply. In addition to the technical skills provided in the course, graduates will have developed strong relevant professional skills as well as strong personal, interpersonal and organisational attributes. By utilising a consultative committee of current project management professionals, the course has been designed to meet the needs of project managers in industry, equip professionals already in industry with advanced principles and techniques to enable them to assume the role of project manager and/or become an effective member of project management teams and adopt a unique approach to manage people, resources, time line and risks to achieve a successful project outcome.

Careers: This course is designed to 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.

Course Duration: 1.5 years

Admission Requirements Other: A Degree or a Diploma in any discipline and a minimum of 2 years post-qualification experience. The requirement of qualification may be waived in exceptional circumstance on the basis of experience.

COURSE STRUCTURE

To attain the Master of Project Management, students will be required to complete 144 credit points, consisting of

- 60 credit points of Core Project Management studies;
- 24 credit points of Research studies;
- 60 credit points of Elective studies.

Core Units:

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

PLUS

NEF6001	Research Project Part A	12
NEF6002	Research Project Part B	12

Elective Units:

Select 60 credit points (equivalent to 5 units) from the following:

BHO6505	Marketing Management	12
BMO6508	Operations Management	12
BMO6622	Managing Innovation and Entrepreneurship	12
BMO6624	Organisation Change Management	12
EPM5700	Project Management and Information Technology	12
EPM5710	Project Procurement Management	12
EPM5730	Project Stakeholder Management	12
EPM5740	Project Risk Management	12
EPM5750	Project Investment Analysis	12

Master of Engineering (Building Fire Safety and Risk Engineering)

Course Code: EMQB
Campus: City Flinders.
This course is for Continuing students only.

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: On successful completion of this course, students will be able 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;
- Understand 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: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline OR Applicants without an undergraduate qualification may be admitted to the Graduate Diploma based on approved work experience. Upon completion of the Graduate Diploma, graduates will be eligible for admission to this course with credit granted for completed units.

Admission Requirements International: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline PLUS IELTS (or equivalent): Overall score of 6.5 (with no band less than 6.0 in Listening, Reading, Writing and Speaking)

COURSE STRUCTURE

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

- 120 credit points of Core Fire Safety and Risk studies;
- 24 credit points of Industrial Experience (VQB5773) studies, and;
- 48 credit points of Research Project (VQT6061 and VQT6062) studies.

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

Graduate Certificate in Project Management

Course Code: ETPR
Campus: Footscray Park.
This course is for Continuing students only.

About this course:-

Course Objectives: To provide students with a conceptual understanding of relevant models, modes of analysis and techniques for understanding and carrying out project management, contract management and procurement. They will also have developed the ability to apply and evaluate these models, modes of analysis and technique in the context of the legal, ethical and accountability requirements which apply. In addition to the technical skills provided in the course, graduates will have developed strong relevant professional skills as well as strong personal, interpersonal and organisational attributes. By utilising a consultative committee of current project management professionals, the course has been designed to meet the needs of project managers in industry, equip professionals already in industry with advanced principles and techniques to enable them to assume the role of project manager and/or become an effective member of project management teams and adopt a unique approach to manage people, resources, time line and risks to achieve a successful project outcome.

Careers: This course is designed to 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.

Course Duration: 0.5 years

Admission Requirements Other: A Degree or a Diploma in any discipline and a minimum of 2 years post-qualification experience. The requirement of qualification may be waived in exceptional circumstance on the basis of experience.

COURSE STRUCTURE

One Semester (full time) or Maximum two years (part time)

Year 1, Semester 1

Course structure consists of two project management core units plus two college based elective units.

Project Management Core Unit

EPM5600	Principles of Project Management	12

College Based Electives

BMO6508	Operations Management	12
BMO6624	Organisation Change Management	12
EPM5710	Project Procurement Management	12
EPM5740	Project Risk Management	12

Year 1, Semester 2

Project Management Core Unit

EPM5610	Project Planning and Control	12

College Based Electives

BHO6505	Marketing Management	12
BMO6622	Managing Innovation and Entrepreneurship	12
EPM5730	Project Stakeholder Management	12
EPM5750	Project Investment Analysis	12

Students who successfully complete four required units are eligible to graduate with a Graduate Certificate in Project Management. Students who are enrolled in the Graduate Diploma in Project Management or Master of Project Management are not eligible to apply but may exit with a Graduate Certificate in Project Management.

Graduate Certificate in Performance-Based Building & Fire Codes

Course Code: ETQB
Campus: City Flinders.

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: On successful completion of this course, students will be able to: 1. Make professional use of performance-based building codes; 2. Employ the concepts and alternative acceptable frameworks for performance-based codes, with particular, but not exclusive, emphasis given to fire safety engineering design; 3. Acquire appropriate knowledge and skills necessary for the assessment and application of performance-based building and fire codes; 4. Explain the basic physics and chemistry governing ignition, fire growth and spread, smoke movement and fire extinguishment and structural behaviour during fire; 5. Apply relevant concepts concerning occupant communication and response in relation to fire cues; 6. Discuss basic fire safety engineering analysis through the use of assessment tools; 7. 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; 8. 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: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Completion of an Australian Bachelor degree (or equivalent) in any discipline PLUS A minimum five (5) years approved work experience.

Admission Requirements International: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Completion of an Australian Bachelor degree (or equivalent) in any discipline PLUS A minimum five (5) years approved work experience PLUS IELTS (or equivalent): Overall score of 6.5 (with no band less than 6.0 in Listening, Reading, Writing and Speaking)

Admission Requirements Other: A letter of recommendation and an interview may be required.

COURSE STRUCTURE

To attain the Graduate Certificate in Performance-Based Building and Fire Codes, students will be required to complete 48 credit points, consisting of:

- 48 credit points (equivalent to 4 units) of Core studies.

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

Bachelor of Science (Science For Teaching)

Course Code: NBAS

Campus: Werribee, Footscray Park.
This course is for Continuing students only.

About this course: The Bachelor of Science (Science for Teaching) provides students aspiring to become specialist Science teachers with a solid foundation in Science, which will facilitate a seamless pathway to a Master of Teaching (Secondary). The degree will provide graduates with a choice of three Teaching Majors in Science, five specialist Teaching Minors and three Breadth Minors, enabling graduates to teach General Science to Year 10 and Science to VCE secondary levels. The flexible structure of this course allows students to study a range of Science disciplines including Biology, Chemistry, Environmental Science, Physics and Mathematics, as well as disciplines from other Colleges: such as Psychology (College of Health and Biomedicine and the College of Arts and Education), English Literature and Aboriginal Studies (College of Arts and Education).

Course Objectives: On successful completion of this course, students will be able to: 1. 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; 2. Develop and apply in-depth knowledge of specialist areas, including accessing, analysing and evaluating information and resolving complex problems with creativity and intellectual independence; 3. Apply independent, collaborative and interpersonal skills to effectively communicate contemporary changes in science, education and industry to wide ranging audiences; 4. Critically review, analyse, adapt and apply broad and coherent theoretical and technical knowledge of scientific and mathematical principles in diverse contexts; 5. Exhibit professional judgement, by adapting the knowledge and skills obtained to make effective decisions that reflect social, political and/or ethical contextual factors; 6. 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: 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. PLUS: Units 3 and 4 with a study score of 20 in one of the following: Biology, Chemistry, Physics (any), or Mathematics (any).

Admission Requirements Mature Age: Five years (minimum) work/life experience in Science, Training & Development, Education or similar. OR: Applicants that completed an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). AND: Units 3 and 4 with a study score of 20 in one of the following: Biology, Chemistry, Physics (any), or Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Science (Science for Teachting) students will be required to complete 288 credit points consisting of:

- 96 credit points of First Year Core units;
- 96 credit points of Major studies (from the list below);

Plus one of the following: Option A:

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

Option B:

- 96 credit points (equivalent to 8 units) of Minor studies (2 in total from the list below).

First Year Core Units

NEM1001	Algebra and Calculus	12
NEM1002	Statistics for Decision Making	12
NSC1210	Skills for the Scientist	12
RBF1150	Global Environmental Issues	12
RBF1310	Biology 1	12
RBF1320	Biology 2	12
RCS1601	Chemistry 1A	12
RCS1602	Chemistry 1B	12

Majors

NMABCH	Biological Chemistry
NMAEBI	Environmental Biology
NMAECH	Environmental Chemistry

Minors

NMNCHE	Chemistry
NMNBIO	Biology
NMNENV	Environment
EMILIT	Literary Studies (Education Minor)
EMIMTH	Mathematics (Education Minor)
EMIPSY	Psychology (Education Minor)
NMIPHY	Physics

EMIAGL Aboriginal Yulendj (Knowledge) and Community

Bachelor of Building (Construction Management)

Course Code: NBBC
Campus: Footscray Park.
This course is for Continuing students only.

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 successful completion of this course, students will be able to: 1. 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; 2. 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; 3. Critically evaluate sources and validity of information and use established processes for information management including international perspectives and codes of practice as appropriate; 4. Advocate design and management objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms; 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks; 6. 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; 7. Negotiate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world; 8. 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. The course will also provide skills and knowledge that can be applied in other industries such as mining, petrochemicals and infrastructure development. 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.

Course Duration: 4 years

Admission Requirements: 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

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Biology, Chemistry, Physics or Mathematics OR 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: 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). OR 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.

COURSE STRUCTURE

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

- 96 credit points (equivalent to 8 units) of Core First Year studies;
- 264 credit points (equivalent to 22 units) of Building and Construction Management studies;
- 24 credit points (equivalent to 2 units) of Elective studies.

First Year College Core:

NBC1101	Maths for Builders	12
NBC1103	Basic Structural Mechanics	12
NBC1104	Structural Principles in Construction	12
NBC1111	Fundamentals of Building Construction	12
NBC1112	Building Science	12
NBC1113	Measurement and Estimating	12
NEF1103	Engineering and the Community	12
NEF1204	Introduction to Engineering Design	12

Year 2

Semester 1:

NBC2003	Building Systems and Services	12

NBC2004	Building and Construction Studies	12
NBC2005	Building Materials	12
NBC2006	Professional Estimating	12
Semester 2:		
NBC2002	Building Regulations	12
NBC2101	Building and Construction Surveying	12
NBC2109	Performance Based Solutions for Building	12
NEA2201	Building Development and Compliance	12
Year 3		
Semester 1:		
NBC3001	High Rise Development and Compliance	12
NBC3005	Construction Law	12
NBC3101	Project Management Practice	12
NBD3001	Risk and Safety Management	12
Semester 2:		
NBC3004	Construction Economics	12
NEF3202	Research Methods	12
NEF3101	Project Management	12
NEC3203	Structural Engineering Design 1	12
Year 4		
Semester 1:		
NBC4001	Procurement Management	12
NBC4002	Advanced Construction	12
NBC4101	Construction Management	12
NEF4101	Research Project 1	12
Semester 2:		
NBC4003	Cost Planning and Control	12
NEF4201	Research Project 2	12
PLUS		

Select 24 credit points (equivalent to two units) from the list of elective units below:

Elective Units:

NEA4102	Residential Sustainable Design	12
NEA4204	Architectural Lighting and Acoustics	12
NEF4207	Engineering Applications	12
NEF4105	Professional Engineering Practice	12

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 successful completion of this course, students will be able to: 1. 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. 2. 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. 3. 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. 4. Advocate building design objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional forms (oral, written, working drawings). 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks. 6. 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. 7. Negotiate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world. 8. Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

Careers: Graduates of this program will 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: 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.

Admission Requirements International: 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 (or equivalent). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Construction, Environmental Sustainability or similar. OR: Applicants that completed an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Building Design, students will be required to complete 288 credit points consisting of:

- 96 credit points First Year Core studies;
- 192 credit points Professional Core and Capstone studies.

First Year Core Units

NBC1101	Maths for Builders	12
NBC1103	Basic Structural Mechanics	12
NBC1104	Structural Principles in Construction	12
NBC1111	Fundamentals of Building Construction	12
NBC1112	Building Science	12
NBC1113	Measurement and Estimating	12
NBD1100	Built Environment Communication and Skills	12
NBD1101	Building Design Documentation	12

Year 2, Semester 1

NBD2001	Architectural History and Analysis	12
NBD2002	Building Contract Documentation	12
NBD2100	Built Environment 1	12
NEA2102	Architectural Design and Theory	12

Year 2, Semester 2

NBD3001	Risk and Safety Management	12
NBD3100	Built Environment 2	12
NBC2003	Building Systems and Services	12
NEA2201	Building Development and Compliance	12

Year 3, Semester 1

NBC3101	Project Management Practice	12
NBD3002	Residential Sustainable Design	12
NBD3200	Urban Design and Development	12
NEF3001	Applied Project 1	12

Year 3, Semester 2

NBC3003	Building Services Management	12
NBC3204	Complex Construction	12
NBD3003	Commercial Sustainable Design	12
NEF3002	Applied Project 2	12

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 successful completion of this course, students will be able to:
1. 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. 2. 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. 3. Critically evaluate sources and validity of information and use established processes for information management. 4. Advocate building surveying objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms. 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks. 6. 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. 7. 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: 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.

Admission Requirements International: 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 (or equivalent). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Construction, Environmental Sustainability or similar. OR: Applicants that completed an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Building Surveying students will be required to complete 288 credit points consisting of:

- 96 credit points of First Year Core studies;
- 192 credit points of Professional Core and Capstone studies.

First Year Core Units

NBC1101	Maths for Builders	12
NBC1103	Basic Structural Mechanics	12
NBD1100	Built Environment Communication and Skills	12
NBC1111	Fundamentals of Building Construction	12
NBD1101	Building Design Documentation	12
NBC1104	Structural Principles in Construction	12
NBC1113	Measurement and Estimating	12
NBC1112	Building Science	12

Year 2, Semester 1

NBC2001	Building Planning Process	12
NBC2002	Building Regulations	12
NBC2004	Building and Construction Studies	12
NBC2109	Performance Based Solutions for Building	12

Year 2, Semester 2

NBC2003	Building Systems and Services	12
NBC2005	Building Materials	12
NBD3001	Risk and Safety Management	12
NEA2201	Building Development and Compliance	12

Year 3, Semester 1

NBC3001	High Rise Development and Compliance	12
NBC3002	Advanced Building Surveying	12
NBC3101	Project Management Practice	12
NEF3001	Applied Project 1	12

Year 3, Semester 2

NBC3003	Building Services Management	12
NBC3004	Construction Economics	12
NBC3204	Complex Construction	12
NEF3002	Applied Project 2	12

Bachelor of Information Technology (Professional)

Course Code: NBIP
Campus: Footscray Park.

About this course: The Bachelor of Information Technology (Professional) has been designed to focus on developing highly sought after skills in the Computer Science

Industry of Web and Mobile Application Development and Network and Systems Computing. Students will develop their skills in the first couple of years via state-of-the-art classrooms and facilities, including virtual and hands-on classroom teachings, building a body of experience and knowledge solving real-world problems, lead and project manage teams, and additionally receive the opportunity for first-hand, authentic, day-to-day work experience alongside IT professionals. Students will learn about the variety of career options available to graduates and apply knowledge learned in the classroom to that of the working environment, to produce a competent and confident graduate that is highly employable. This course offers high achieving students in NBIT Bachelor of Information Technology, the exciting opportunity to transfer to NBIP and experience 12 months of paid internship in the IT industry as part of their degree. Courses that offer industry placement and work experience roles are highly preferred by employers and students, as they play a critical part in developing job ready skills for graduates, such as the following roles: network design and implementation, system security consultancy, data modelling and database development, the web and mobile application programming, network and database system administration, information and communication technology (ICT) management.

Course Objectives: On successful completion of this course, students will be able to: 1. 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; 2. 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; 3. 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; 4. 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 the following roles:

- network design and implementation;
- system security consultancy;
- data modelling and database development;
- web and mobile application programming;
- network and database system administration;
- information and communication technology (ICT) management.

Course Duration: 3.5 years

Admission Requirements International: 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 (or equivalent). PLUS: A study score of at least 20 in Mathematics (any). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Information Technology or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). AND: A study score of at least 20 in Mathematics (any) (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Information Technology (Professional) students will be required to complete 336 credit points consisting of:

- 96 credit points of First Year Core studies;

48 credit points of Graduating Core studies; 96 credit points of Major studies;

- 2 x 48 credit points of Industry Placement studies.

First Year Core Units

NIT1101	Web Development and CMS	12
NIT1102	Introduction to Programming	12
NIT1103	Communication and Information Management	12
NIT1104	Computer Networks	12
NIT1201	Introduction to Database Systems	12
NIT1202	Operating Systems	12
NIT1203	Introduction to Project Management	12
NIT1204	Web Application and Server Management	12

Industry Placement Units

NIT3001	IT Professional 1	48
NIT3002	IT Professional 2	48

Compulsory Minors

NMIITC	Graduating Core

Majors

NMAWMD	Web and Mobile Application Development
NMANSC	Network and System Computing

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 Majors and Minors (discipline and breadth). 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: On successful completion of this course, students will be able to: 1. 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; 2. 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; 3. 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; 4. 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: 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. PLUS: A study score of at least 20 in Mathematics (any).

Admission Requirements International: 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 (or equivalent). PLUS: A study score of at least 20 in Mathematics (any). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Information Technology or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). AND: A study score of at least 20 in Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Information Technology, students will be required to complete 288 credit points consisting of:

- 96 credit points of First Year Core studies;
- 48 credit points of Graduating Core studies;
- 96 credit points of Major studies;
- 48 credit points of Minor studies (discipline).

First Year Core Units

NIT1101	Web Development and CMS	12
NIT1102	Introduction to Programming	12
NIT1103	Communication and Information Management	12
NIT1104	Computer Networks	12
NIT1201	Introduction to Database Systems	12
NIT1202	Operating Systems	12
NIT1203	Introduction to Project Management	12
NIT1204	Web Application and Server Management	12

Compulsory Minors

NMIITC	Graduating Core

Majors

NMAWMD	Web and Mobile Application Development
NMANSC	Network and System Computing

Minors

NMIASD	Software Development
NMIANM	Network Management
NMIICT	ICT Management
AMITEM	The Entrepreneurial Mindset

Bachelor of Pharmaceutical and Health Science

Course Code: NBPH
Campus: Footscray Park, St Albans.
This course is for Continuing students only.

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 this course, students will be able to: 1. Analyse the fundamental principles underpinning the knowledge and practice of human health and disease, and the development and testing of pharmaceutical products; 2. 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; 3. 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; 4. 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; 5. 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; 6. 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: 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 25 in any other English. PLUS: A study score of at least 25 in Chemistry, AND a study score of at least 25 in one of Biology or Health & Human Development.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Health Sciences or similar. OR: Applicants that completed an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 30 in English (EAL) or 25 in any other English (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent). OR: Completion of a CertIV in related Science/Health.

COURSE STRUCTURE

To attain the Bachelor of Pharmaceutical and Health Science students will be required to complete 288 credit points of Core studies, consisting of:

- 96 credit points of Core First Year studies, and;
- 192 credit points of Professional Core studies.

First Year Core Units

HBM1002	Biological Systems	12
HHH1001	Mathematics and Statistics for Biomedicine	12
RBM1100	Functional Anatomy of the Trunk	12
RBM1200	Functional Anatomy of the Limbs	12
RBM1518	Human Physiology 1	12
RBM1528	Human Physiology 2	12
RCS1601	Chemistry 1A	12
RCS1602	Chemistry 1B	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: Footscray Park.

About this course: 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. 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, students will be able to: 1. Locate, evaluate and apply scientific information efficiently and effectively; 2. Identify and solve problems with intellectual independence using scientific principles in a range of situations taking into consideration social, cultural, economic and environmental factors; 3. Exhibit high levels of numeracy skills in the analysis and interpretation of quantitative scientific data; 4. Communicate effectively in spoken and written forms on a range of scientific and mathematical topics to peers, professional and community groups; 5. Apply an evidence-based research approach, formulate and test hypotheses in a chosen scientific discipline; 6. Respond with social and cultural awareness within local and global environments; 7. 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. 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: 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. PLUS: A study score of at least 20 in Mathematics (any).

Admission Requirements Mature Age: Five years (minimum) work/life experience in the Health Sciences or similar. OR: Applicants that completed an Australian Senior Secondary Certificate more than two years ago.. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). PLUS: A study score of at least 20 in Mathematics (any).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent). OR: Completion of a Certificate IV in a related Science/Health discipline.

COURSE STRUCTURE

To attain the Bachelor of Science students will be required to complete 288 credit points, consisting of:

- 96 credit points (equivalent to 8 units) of First Year Core units;
- 96 credit points (equivalent to 8 units) of Major studies;

AND

- 96 credit points (equivalent to 8 units) of Major studies

OR:

- 2 x 48 credit points (equivalent to 8 units) of two Minor studies.

First Year Core Units

NEM1001	Algebra and Calculus	12
NEM1002	Statistics for Decision Making	12
NSC1210	Skills for the Scientist	12
RBF1150	Global Environmental Issues	12
RBF1310	Biology 1	12

RBF1320	Biology 2	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
BMITAS	Tourism and Aboriginal Sustainability
AMITEM	The Entrepreneurial Mindset

Graduate Diploma in Building Fire Safety

Course Code: NGBF
Campus: City Flinders.

About this course: The Graduate Diploma in Building Fire Safety is designed to augment the concepts behind fire safety engineering, such that graduates have an appreciation and an understanding of what should be included into fire safety aspects of buildings, in addition to acquiring the knowledge catered at the Graduate Certificate level (ETQB: Graduate Certificate in Performance-Based Building and Fire Codes). The course is also expected to provide enhanced opportunities for professional people to develop further technical skills in the fire safety engineering discipline; develop their understanding of legislation and management relevant to this discipline; develop the ability to plan, co-ordinate and apply fundamental principles and techniques to demonstrate cost-effective fire safety system designs for buildings.

Course Objectives: On successful completion of this course, students will be able to: 1. Create solutions to a broad range of complex problems in building fire safety and risk management 2. Analyse the effectiveness of proposed fire safety design solutions through advanced modelling tools 3. Critically evaluate a broad range of fire science and technology topics contextualised for building fire safety 4. Effectively communicate verbally and in writing with professional and community stakeholders 5. Interprete legislation, codes, regulations and standards relevant to building fire safety

Careers: The Graduate Diploma in Building Fire Safety, aims to produce graduates who have the skills and knowledge to become either a Relevant Building Surveyor (RBS), capable of determining compliance of an alternative building design solution. Or substantially improve opportunities for career progression in a relevant discipline, aswell as enabling graduates to pursue further post-graduate study (Masters).

Course Duration: 1 year

Admission Requirements: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Certificate (or equivalent) in a similar discipline OR Applicants with a minimum three (3) years approved work experience will be considered for admission to this course.

COURSE STRUCTURE

To attain the Graduate Diploma in Building Fire Safety, students will be required to complete:

- 96 credit points of Core studies.

Semester 1:

VQB5611	Risk Assessment and Human Behaviour	12
VQB5612	Scientific Principles for Fire Professionals	12
VQB5751	Fire Technology Modelling	12
VQB5761	Fire Safety Systems Modelling	12

Semester 2:

VQB5641	Fire Safety Systems Design	12
VQB5642	Performance Codes Methodology and Structure	12
VQB5771	Fire Safety Engineering Application	24

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, students will be able to: 1. 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. 2. Differentiate research methods to investigate complex project management problems in order to generate solutions. 3. Design, develop and implement comprehensive project management plans which meet stakeholder expectations. 4. 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. 5. 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: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Certificate (or equivalent) in a similar discipline OR Applicants with a minimum three (3) years approved work experience will be considered for admission to this course.

Admission Requirements International: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Certificate (or equivalent) in a similar discipline PLUS IELTS (or equivalent): Overall score of 6.5 (with no band less than 6.0 in Listening, Reading, Writing and Speaking)

COURSE STRUCTURE

To attain the Graduate Diploma in Project Management students will be required to complete:

- 48 credit points of Core studies
- 48 credit points of Elective units.

Students without a degree in a similar discipline will be required to complete EPM5500 Fundamentals of Project Management and EPM5530 Project Management Practice

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 48 credit points from the following:

Semester 1 units

EPM5510	Project Program and Portfolio Management	12
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
EPM5730	Project Stakeholder Management	12
EPM5750	Project Investment Analysis	12

On consultation with the course coordinator, students may select an alternative 12 credit point elective unit at AQF 8/9.

Bachelor of Construction Management (Honours)

Course Code: NHCM
Campus: Footscray Park.

About this course: 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 successful completion of this course, students will be able to: 1. 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; 2. 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; 3. Critically evaluate sources and validity of information and use established processes for information management including international perspectives and codes of practice as appropriate; 4. Advocate design and management objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms; 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks; 6. 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; 7. Advocate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world; 8. 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. The course will also provide skills and knowledge that can be applied in other industries such as mining, petrochemicals and infrastructure development. 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.

Course Duration: 4 years

Admission Requirements: 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. PLUS: Units 3 and 4 with a study score of 20 in one of the following: Biology, Chemistry, Physics or Mathematics (any).

Admission Requirements International: 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 (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in one of the following: Biology, Chemistry, Physics or Mathematics (any). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Construction or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). AND: Units 3 and 4 with a study score of 20 in one of the following: Biology, Chemistry, Physics or Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Construction Management (Honours) students will be required to complete 384 credit points consisting of:

- 96 credit points First Year Core studies;
- 240 credit points Professional Core studies, and;
- 48 credit points from the Building Compliance Minor.

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 NEF4201 Research Project 2.

First Year Core Units

NBC1101	Maths for Builders	12
NBC1103	Basic Structural Mechanics	12
NBC1104	Structural Principles in Construction	12
NBC1111	Fundamentals of Building Construction	12
NBC1112	Building Science	12
NBC1113	Measurement and Estimating	12
NBD1100	Built Environment Communication and Skills	12
NBD1101	Building Design Documentation	12

Year 2, Semester 1

NBC2004	Building and Construction Studies	12
NBC2101	Building and Construction Surveying	12

24 credit points (equivalent to two units) selected from the Building Compliance Minor

Year 2, Semester 2

NEA2201	Building Development and Compliance	12
NBC2005	Building Materials	12
NBC2006	Professional Estimating	12
NBC3005	Construction Law	12

Year 3, Semester 1

NBC3001	High Rise Development and Compliance	12
NBC3006	Construction Site Operations	12
NBC3101	Project Management Practice	12
NBD2002	Building Contract Documentation	12

Year 3, Semester 2

NBC2003	Building Systems and Services	12
NBC3004	Construction Economics	12
NBD3001	Risk and Safety Management	12
NEF3202	Research Methods	12

Year 4, Semester 1

NBC4001	Procurement Management	12
NBC4002	Advanced Construction	12
NBC4101	Construction Management	12
NEF4101	Research Project 1	12

Year 4, Semester 2

NBC4003	Cost Planning and Control	12
NEF4201	Research Project 2	12

24 credit points (equivalent to two units) selected from the Building Compliance Minor

Minors

NMIBCP Building Compliance

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 building, civil, 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 engineering design 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
- structural engineering.
- fire and life safety systems
- sustainable building systems design
- building structures and building construction technology

All students complete a minimum of 12 weeks professional experience to meet the requirements of Engineers Australia.

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the architectural engineering discipline; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. 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; 6. 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); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. 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

- Architectural Engineer
- Building Engineer
- Design Engineer
- Estimator
- Hydraulic Engineer
- Project Engineer
- 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: 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. PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any).

Admission Requirements International: 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 (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Construction or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Engineering (Honours) (Architectural Engineering), students are required to complete 384 credit points consisting of: 96 credit points of First Year Core studies, and; 288 credit points of Professional Architectural Engineering studies Students are required to produce documented evidence of the completion of 12 weeks professional experience. 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, students 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 NEF4201 Research Project 2.

First Year Core Units:

NEM1001	Algebra and Calculus	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
Year 2		
NEA2102	Architectural Design and Theory	12
NEC2102	Solid Mechanics	12
NEC2103	Engineering Materials & Construction	12
NEF2101	Fluid Mechanics 1	12
NEF2201	Building HVAC Systems	12
NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEC2201	Introduction to Structural Engineering Design	12
NEA2201	Building Development and Compliance	12
Year 3		
NEC3101	Structural Analysis	12
NEE3103	Electrical Machines	12
NEF3001	Applied Project 1	12
NEF3101	Project Management	12
NEF3002	Applied Project 2	12
NEF3202	Research Methods	12
NBD3003	Commercial Sustainable Design	12
NEC3203	Structural Engineering Design 1	12
Year 4		
NEF4108	Architectural Lighting and Acoustics	12
NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12
NBD3002	Residential Sustainable Design	12
NEF4201	Research Project 2	12
NEF4205	Sustainable Energy Systems	12
NEF4206	Advanced Engineering Design	12
NEF4207	Engineering Applications	12

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

All students complete a minimum of 12 weeks professional experience to meet the requirements of Engineers Australia.

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the civil engineering discipline; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. 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; 6. 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); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

Careers: Victoria University's Engineering Graduates are renowned in the industry as well-rounded accredited engineers. You will 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 Roles:

- Civil Infrastructure Engineer;
- Civil Design Engineer;
- Construction Engineer;
- Engineering Technician, and;
- Environmental Engineer.

Course Duration: 4 years

Admission Requirements: 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. PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any).

Admission Requirements International: 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 (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Construction or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Engineering (Honours) (Civil Engineering), students will be required to complete a total of 384 credit points consisting of:

- 96 credit points of Core First Year studies;
- 240 credit points of Core Civil Engineering studies;
- 48 credit points of Minor studies (from the list below)

Students are required to produce documented evidence of the completion of 12 weeks professional experience. 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, students 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.

Core First Year Units

NEM1001	Algebra and Calculus	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

Year 2

Semester 1:

NEC2102	Solid Mechanics	12
NEC2103	Engineering Materials & Construction	12
NEC2104	Engineering Surveying	12
NEF2101	Fluid Mechanics 1	12

Semester 2:		
NEC2201	Introduction to Structural Engineering Design	12
NEC2202	Geomechanics	12
NEC2203	Hydraulics	12
NEC2204	Highway Engineering	12
Year 3		
Semester 1:		
NEC3101	Structural Analysis	12
NEC3102	Geotechnical Engineering	12
NEC3103	Hydrology and Water Resources	12
NEF3101	Project Management	12
Semester 2:		
NEC3201	Hydraulic Engineering	12
NEC3202	Civil Engineering Design 1	12
NEC3203	Structural Engineering Design 1	12
NEF3202	Research Methods	12
Year 4		
Semester 1:		
NEC4101	Environmental Engineering 1	12
NEC4172	Urban Development and Transportation	12
NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12
Semester 2:		
NEC4102	Structural Engineering Design 2	12
NEF4201	Research Project 2	12
NEF4206	Advanced Engineering Design	12
NEF4207	Engineering Applications	12
Minors		
NMISTE	Structural Engineering	
NMIEWE	Environmental and Water Engineering	

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.

All students complete a minimum of 12 weeks professional experience to meet the requirements of Engineers Australia.

Course Objectives: On successful completion of this course, students will be able to: 1. 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; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. 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; 6. 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); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. 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: 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. PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any).

Admission Requirements International: 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 (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Construction or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Engineering (Honours) (Electrical and Electronic Engineering), students will be required to complete 384 credit points consisting of:

- 96 credit points of First Year Core studies;
- 288 credit points of Professional Core Engineering units.

Students are required to produce documented evidence of the completion of 12 weeks professional experience. 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, students 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.

First Year Core Units

NEM1001	Algebra and Calculus	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

Year 2

Semester 1

NEE2101	Electrical Circuits	12
NEE2106	Computer Programming for Electrical Engineers	12
NEE2107	Telecommunications	12
NEE2110	Engineering Design and Practice 2A	12

Semester 2

NEE2201	Linear Systems with Matlab Applications	12
NEE2204	Power System Supply Chain Management	12
NEE2205	Analogue Electronics	12
NEE2210	Engineering Design and Practice 2B	12

Year 3

Semester 1

NEE3201	Introduction to Control Systems	12
NEE3103	Electrical Machines	12
NEE3104	Digital Systems	12
NEF3101	Project Management	12

Semester 2

NEE3203	Embedded Systems	12
NEE3207	Analogue and Digital Transmission	12
NEE3208	Signal Processing	12
NEF3202	Research Methods	12

Year 4

Semester 1

NEE4110	Electrical Power Systems, Analysis and Operation	12
NEF4101	Research Project 1	12
NEM4102	Finite Element Analysis	12
NEF4105	Professional Engineering Practice	12

Semester 2

NEE4211	Mobile Networks and Communications	12
NEF4201	Research Project 2	12
NEF4205	Sustainable Energy Systems	12
NEF4206	Advanced Engineering Design	12

Minors

NMIPWR	Power Systems

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. All students complete a minimum of 12 weeks professional experience to meet the requirements of Engineers Australia.

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the mechanical engineering discipline; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the mechanical engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. 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; 6. 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); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. 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: 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. PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any).

Admission Requirements International: 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 (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent). OR: Completion of an Australian Advanced Diploma or Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Manufacturing, Engineering, Project Management or similar. OR: Completion of an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Engineering (Honours) (Mechanical Engineering), students will be required to complete 384 credit points, consisting of:

- 96 credit points of First Year Core studies;
- 288 credit points of Core Mechanical Engineering studies.

Students are required to produce documented evidence of the completion of 12 weeks professional experience. 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, students 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 NEF4201 Research Project 2.

First Year Core Units

NEM1001	Algebra and Calculus	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

Year 2

Semester 1:

NEC2102	Solid Mechanics	12
NEF2101	Fluid Mechanics 1	12
NEM2101	Mechanical Engineering Design	12
NEM2102	Introduction to Engineering Materials	12

Semester 2:

NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEM2104	Numerical Modelling of Mechanical Systems	12
NEM2201	Thermodynamics 1	12
NEM2202	Dynamics	12

Year 3

Semester 1:

NEF3101	Project Management	12
NEM3101	Engineering Analysis and Modelling	12
NEM3103	Thermodynamics 2	12
NEM3203	Stress Analysis	12

Semester 2:

NEF3202	Research Methods	12
NEM3102	Design of Mechanical Systems	12
NEM3201	Manufacturing Materials	12
NEM3202	Fluid Mechanics 2	12

Year 4

Semester 1:

NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12
NEM4101	Mechanical Vibrations	12
NEM4102	Finite Element Analysis	12

Semester 2:

NEF4201	Research Project 2	12
NEF4205	Sustainable Energy Systems	12
NEF4206	Advanced Engineering Design	12
NEM4202	Advanced Engineering Analysis	12

Compulsory Minors

NMIMSM	Modelling and Simulation

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

Course Code: NHES
Campus: Footscray Park.
This course is for Continuing students only.

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 electronic solutions for sports and health applications, 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 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, substations, and electricity generation and distribution;
- design solutions for power distribution, management and smart networks.

Their passion for sports and healthcare and degree specialisation would allow them to work in areas such as 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. All students complete a minimum of 12 weeks professional experience to meet the requirements of Engineers Australia.

Course Objectives: On successful completion of this course, students will be able to: 1. 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; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the electrical and electronic engineering and sports engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. 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; 6. 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); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. 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;
- Biomechanics.

Careers:

Course Duration: 4 years

Admission Requirements: 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. PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any).

Admission Requirements International: 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. PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any). OR: Completion of an Australian Advanced Diploma of Diploma (or equivalent). PLUS: IELTS (or equivalent): Overall score or 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking). OR: Completion of a Foundation course or equivalent.

Admission Requirements Mature Age: Five years (minimum) work/life experience in Telecommunications, Electronics, Community Sports or similar. OR: Applicants that completed an Australian Senior Secondary Certificate more than two years ago. PLUS: Units 3 and 4: a study score of at least 25 in English (EAL) or 20 in any other English (or equivalent). PLUS: Units 3 and 4 with a study score of 20 in Mathematics (any) (or equivalent).

Admission Requirements VET: Completion of an Australian Advanced Diploma or Diploma (or equivalent). OR: Completion of the Certificate IV in Tertiary Preparation (or equivalent).

COURSE STRUCTURE

To attain the Bachelor of Engineering (Honours) (Electrical and Sports Engineering), students will be required to complete 384 credit points consisting of:

- 96 credit points of First Year Core studies;
- 288 credit points of Professional Core Engineering studies.

Students are required to produce documented evidence of the completion of 12 weeks professional experience. 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, students 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.

First Year Core Units

NEM1001	Algebra and Calculus	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

Year 2

Semester 1

AHE2127	Motor Learning	12
NEE2101	Electrical Circuits	12
NEE2106	Computer Programming for Electrical Engineers	12
NEE2107	Telecommunications	12

Semester 2

NEE2201	Linear Systems with Matlab Applications	12
NEE2204	Power System Supply Chain Management	12
NEE2205	Analogue Electronics	12
NEE2210	Engineering Design and Practice 2B	12

Year 3

Semester 1

AHE2102	Sports Biomechanics	12
NEE3104	Digital Systems	12
NEE3201	Introduction to Control Systems	12
NEF3101	Project Management	12

Semester 2

NEE3203	Embedded Systems	12
NEE3207	Analogue and Digital Transmission	12
NEE3208	Signal Processing	12
NEF3202	Research Methods	12

Year 4

Semester 1

AHE3101	Advanced Biomechanics	12
NEE4110	Electrical Power Systems, Analysis and Operation	12
NEF4101	Research Project 1	12
NEF4105	Professional Engineering Practice	12

Semester 2

AHE3126	Motor Control	12
NEE4211	Mobile Networks and Communications	12
NEF4201	Research Project 2	12
NEF4205	Sustainable Energy Systems	12

Bachelor of Science (Honours)

Course Code: NHSC
Campus: Werribee, Footscray Park.
This course is for Continuing students only.

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 this course, 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.

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

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. 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: On successful completion of this course, students will be able to: 1. Conceptually map the most recent theoretical developments in their Engineering specialisation 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 Engineering and innovation. 3. 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. 4. Design, implement and evaluate Engineering projects or research which address complex issues and transmit subsequent findings to specialist and non-specialist audiences. 5. 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: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline OR Applicants without an undergraduate qualification may be admitted to the Graduate Certificate (in the same discipline) based on approved work experience.

Admission Requirements International: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline PLUS IELTS (or equivalent): Overall score of 6.5 (with no band less than 6.0 in Listening, Reading, Writing and Speaking)

COURSE STRUCTURE

To be eligible for the Master of Engineering, students are required to complete 192 credit points in total, consisting of:

- 48 credit points of Common Interdisciplinary studies;
- 48 credit points of Research studies;
- 96 credit points of Core Specialisation studies.

Common Interdisciplinary Units:

Select 48 credit points (equivalent to 4 units) from the following:

EPM5600	Principles of Project Management	12
EPM5610	Project Planning and Control	12
EPM5630	Project Management and People	12
EPM5730	Project Stakeholder Management	12
EPM5740	Project Risk Management	12
BMO6050	Art and Practice of Leadership	12
BMO6506	Work and Organisation Systems	12
BMO6511	Strategic Management and Business Policy	12

Research Units:

NEF6101	Research Thesis 1	24
NEF6102	Research Thesis 2	24

Specialisations

NSPTEL	Telecommunication
NSPELE	Electrical Power

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 successful completion of this course, students will be able to: 1. Conceptually map the most recent developments in IT theory and IT applications and justify their utility in various contexts. 2. Critically apply information technology knowledge and skills to new and uncertain situations in professional practice exhibiting a high level of personal autonomy and accountability. 3. Design, implement and evaluate applied IT research and transmit this knowledge to specialist and non-specialist audiences. 4. 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: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline OR Applicants without an undergraduate qualification may be admitted to the Graduate Diploma based on approved work experience. Upon completion of the Graduate Diploma, graduates will be eligible for admission to this course with credit granted for completed units.

Admission Requirements International: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline PLUS IELTS (or equivalent): Overall score of 6.5 (with no band less than 6.0 in Listening, Reading, Writing and Speaking)

COURSE STRUCTURE

To attain the Master of Applied Information Technology students will be required to complete 192 credit points consisting of:

- 120 credit points of Core units

AND either

- Option 1: 24 credit points of Research Project studies and 48 credit points of Elective Studies

or Option 2: 48 credit points of Research Thesis studies and 24 credit points of Elective Studies

Core units

EPM5600	Principles of Project Management	12
EPM5700	Project Management and Information Technology	12
NIT5081	Fundamentals of Cyber Security	12

NIT5083	Enterprise Security Management	12
NIT5110	Networking Systems	12
NIT5130	Database Analysis and Design	12
NIT5150	Advanced Object Oriented Programming	12
NIT6130	Introduction to Research	12
NIT5082	Cloud Security	12
NIT6150	Advanced Project	12

Select ONE of the following options:

Option 1:

NEF6001	Research Project Part A	12
NEF6002	Research Project Part B	12

Plus 48 credit points of Elective units

Option 2:

NEF6101	Research Thesis 1	24
NEF6102	Research Thesis 2	24

Plus 24 credit points of Elective units

Elective Units:

EPM5500	Fundamentals of Project Management	12
EPM5610	Project Planning and Control	12
EPM5730	Project Stakeholder Management	12
EPM5740	Project Risk Management	12
NIT5084	Cyber Security Law, Regulation and Policy	12
NIT6120	Mobile Applications	12
NIT6160	Data Warehousing and Mining	12
NNT6542	Mobile Network Design	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, students will be able to: 1. 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; 2. Select and defend research methods to investigate complex project management problems in order to generate solutions; 3. Design, develop and implement comprehensive project management plans which meet or exceed stakeholder expectations; 4. Critically analyse organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation; 5. 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; 6. 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: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline OR Applicants without an undergraduate qualification may be admitted to the Graduate Diploma based on approved work experience. Upon completion of the Graduate Diploma, graduates will be eligible for admission to this course with credit granted for completed units.

Admission Requirements International: Completion of an Australian Bachelor degree (or equivalent) in any discipline OR Completion of an Australian Graduate Diploma (or equivalent) in a similar discipline PLUS IELTS (or equivalent): Overall score of 6.5 (with no band less than 6.0 in Listening, Reading, Writing and Speaking)

COURSE STRUCTURE

To attain the Master of Project Management, students will be required to complete 192 credit points, consisting of:

- 96 credit points of Core studies;
- 24 credit points of Research studies;
- 72 credit points of Elective studies.

Core Units:

EPM5500	Fundamentals of Project Management	12
EPM5510	Project Program and Portfolio Management	12
EPM5530	Project Management Practice	12
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

Research Project Units:

NEF6001	Research Project Part A	12
NEF6002	Research Project Part B	12

Elective Units:

Select 72 credit points (equivalent to 6 units) from the following:

BMO6050	Art and Practice of Leadership	12
BMO6506	Work and Organisation Systems	12
BMO6622	Managing Innovation and Entrepreneurship	12
BMO6624	Organisation Change Management	12
EPM5700	Project Management and Information Technology	12
EPM5710	Project Procurement Management	12
EPM5730	Project Stakeholder Management	12
EPM5740	Project Risk Management	12
EPM5750	Project Investment Analysis	12
EPM5760	Project Construction Management	12

Graduate Certificate in Cyber Security

Course Code: NTCS
Campus: Footscray Park.
This course is for Continuing students only.

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 this course, students will be able to: 1. Critically apply cyber security knowledge and skills to new and uncertain situations in professional practice, exhibiting a high level of personal autonomy and accountability; 2. Evaluate cyber security architecture and state-of-the-art technologies including firewalls, virtual private networks, public key infrastructure, digital signature and anti-malwares; 3. Apply commercial tools to secure computers and networks in enterprise and cloud systems to ensure privacy and prevent data loss; 4. 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: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Applicants with a minimum five (5) years approved work experience 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 48 credit points of Core Studies.

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, students will be able to: 1. 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. 2. Differentiate research methods to investigate complex project management problems in order to generate solutions. 3. Design, develop and implement comprehensive project management plans which meet stakeholder expectations. 4. 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. 5. 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: Completion of an Australian Bachelor degree (or equivalent) in a similar discipline OR Applicants with a minimum five (5) years approved work experience will be considered for admission to this course.

COURSE STRUCTURE

To attain the Graduate Certificate in Project Management students will be required to complete:

- 24 credit points of Core studies, and;
- 24 credit points of Elective units.

Students without a degree in a similar discipline will be required to complete EPM5500 Fundamentals of Project Management and EPM5530 Project Management Practice

Core Units:

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

Elective Units

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

Semester 1:

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:

EPM5530	Project Management Practice	12
EPM5710	Project Procurement Management	12
EPM5730	Project Stakeholder Management	12
EPM5750	Project Investment Analysis	12

Bachelor of Information Technology (Network and Systems Computing)

Course Code: SBNS
Campus: Footscray Park.
This course is for Continuing students only.

About this course: The Bachelor of Information Technology (Network and Systems Computing) is a forward-looking course in the area of networks and systems. It is current, relevant and will prepare students for IT industry certifications in the fields of networking, databases, and systems administration. The course will equip students with the skills and support required to gain an entry level position within the IT industry, filling a growing market need for graduates skilled in systems administration with networking expertise.

Course Objectives: The degree is designed to produce graduates who will have a strong industry focus gained through relevant workplace experience in the program combined with an industry capstone project in the final year. The degree will:

- provide a solid foundation in information technology skills and knowledge that can be applied across a wide range of applications;
- provide an infrastructure through which students can gain technical, analytical, and managerial knowledge and interpersonal skills, and develop skills and abilities important for effective participation and leadership in industry;
- emphasise a hands-on approach to learning and create real-world learning experiences with a strong industry focus;
- facilitate preparation for industry certifications from large reputable vendors both locally and overseas;
- offer a solid preparation for different careers in the field of network and systems computing in sectors including government, banking and finance, retail, and manufacturing;
- engage students in lifelong learning and professional development activities that will equip the students as graduates with a competitive edge in their chosen career paths.

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: 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). Persons transferring from

other courses or having overseas or other entrance qualifications of at least equivalent standard should apply for admission in the normal manner.

Admission Requirements Mature Age: Qualifications of at least equivalent standard to Victorian Certificate of Education and appropriate life experiences for mature age students.

Admission Requirements VET: Completion of an appropriate Information Technology TAFE program.

COURSE STRUCTURE

To attain the Bachelor of Informaiton Technology (Network and Systems Computing), students are required to complete 288 credit points.

Year 1, Semester 1

NIT1103	Communication and Information Management	12
NIT1104	Computer Networks	12
NIT2112	Object Oriented Programming	12
NIT3202	Data Analytics for Cyber Security	12

Year 1, Semester 2

NIT1101	Web Development and CMS	12
NIT1201	Introduction to Database Systems	12
NIT1202	Operating Systems	12
NIT1204	Web Application and Server Management	12

Year 2, Semester 1

NIT2201	IT Profession and Ethics	12
NIT2222	Networking Technologies	12
NIT3202	Data Analytics for Cyber Security	12
NIT3112	Advance Web Application Development	12

Year 2, Semester 2

NIT2202	Big Data	12
NIT2102	Cyber Security Essentials	12
NIT2171	Introduction to ICT Management	12
NIT1203	Introduction to Project Management	12

Year 3, Semester 1

NIT2122	Server Administration and Management	12
NIT3122	Enterprise Network Management	12
NIT2124	Network Management	12
NEF3001	Applied Project 1	12

Year 3, Semester 2

NIT3222	Virtualisation in Computing	12
NIT3114	Online Business System Development	12
NIT3274	Small IT Business	12
NEF3002	Applied Project 2	12

Bachelor of Science (Specialisations in Biotechnology, Chemistry Or Environmental Management)

Course Code: SBSC
Campus: Werribee, Footscray Park, Year 1: Footscray Park campus. Year 2 & 3: Werribee campus.
This course is for Continuing students only.

About this course: The Bachelor of Science (Specialisations in Biotechnology, Chemistry or Environmental Management) course offers specialisations in the three science disciplines listed below:

- Biotechnology
- Chemistry
- Ecology & Environmental Management

Students can choose to specialise in one or two of these science disciplines. This is a three year course with a common first year and a choice of sub-specialisations in the latter two years that allows students the flexibility to add other studies of interest to their specialisation. Sub-specialisations can be chosen from health, engineering, science, arts, business and law. Sub-specialisations are subject to the approval of the course coordinator and may be limited by prerequisite requirements and timetable clashes. Science sub-specialisations are listed below.

- analytical chemistry
- cell biology/microbiology
- community science
- computing
- environmental science
- environmental assessment & analysis
- forensic chemistry
- mathematics/statistics
- molecular biology.

The BSc (Specialisations in Biotechnology, Chemistry or Environmental Management) 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 Specialisation Biotechnology involves the use of biological cells and their components for the benefit of society. It includes the application of the latest technologies to solve medical, environmental

and agricultural problems. The biotechnology specialisation prepares students for exciting careers in cutting edge science. It provides in-depth education in many areas of modern biology including genetic engineering, medical research, cloning, forensic biology, environmental biotechnology, microbiology and biochemistry. 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 Specialisation The chemistry specialisation 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 & Environmental Management Specialisation 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 specialisation 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 specialisation develops the knowledge and practical experience for working across social, environmental and economic contexts, to achieve ecological sustainability. Pathways to a Career in Teaching The BSc (Specialisations in Biotechnology, Chemistry or Environmental Management) offers a selection of units in mathematics and science, including six new innovative community science units, which prepare students wishing to pursue careers as maths/science teachers. The community science units are unique and emphasise learning in the workplace through placements in primary and secondary schools and in community education groups. To qualify for teaching in secondary schools graduates from the BSc (Specialisations in Biotechnology, Chemistry or Environmental Management) must apply for and complete the Graduate Diploma in Secondary Education.

Course Objectives: The Bachelor of Science (Specialisations in Biotechnology, Chemistry or Environmental Management) will produce graduates with a thorough knowledge of contemporary science for careers in industry, government and education. The selection of specialisations and sub-specialisations offered allows students the flexibility to customise their learning towards current and future career demands. Via various learning in the workplace and community strategies the course will make graduates 'work ready'. The course allows students wishing to pursue maths/science teaching via the Graduate Diploma in Secondary Education, a number of possibilities with respect to obtaining parts, sub-majors and majors in maths/science teaching specialist areas. Graduates from this course should be able to:

- locate, manage and use scientific information efficiently and effectively
- solve scientific problems effectively in a range of settings including industry and community
- exhibit high levels of numeracy skills in a range of scientific settings
- communicate effectively in spoken and written forms on a range of scientific and mathematical topics to professional and community groups
- apply an evidence-based research approach to a chosen area of science
- respond with social and cultural awareness within local and global environments
- work autonomously and collaboratively as a professional in both industry and community settings.

Careers: The Bachelor of Science (Specialisations in Biotechnology, Chemistry or Environmental Management) will produce graduates with a thorough knowledge of contemporary science for careers in industry, government 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. The course has been designed in collaboration with the College of Education and the science units offered provides pathways for students to pursue maths/science teaching. To qualify for teaching in secondary schools graduates from the BSc (Specialisations in Biotechnology, Chemistry or Environmental Management) must apply for and complete the Graduate Diploma in Secondary Education.

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 Other: Community science units of study include placements within schools and other community settings. Police check: Students may be required to complete a National Police Record Check prior to undertaking Community Science units of study. Working with Children Check: Students must complete a Working with Children Check prior to undertaking Community Science units of study.

COURSE STRUCTURE

To attain the SBSC Bachelor of Science (Specialisations in Biotechnology, Chemistry or Environmental Management) students must complete 288 credit points, consisting of:

- 96 credit points Common Year studies;
- 96 credit points of Specialisation studies, and;
- 96 credit points of Specialisation studies

OR

- 96 credit points Common Year studies;
- 96 credit points of Specialisation studies, and;
- 2 x 48 credit points of sub-specialisations.

Semester One

RBF1150	Global Environmental Issues	12
RBF1310	Biology 1	12
RCS1601	Chemistry 1A	12

RCM1711 Mathematical Foundations 1

Semester Two

RBF1320	Biology 2	12
RCM1114	Introduction to Computing and the Internet	12
RCS1602	Chemistry 1B	12
RCM1613	Applied Statistics 1	12

List A: Specialisations

Biotechnology Specialisation

Year 2

Semester One

RBM2133	Cell and Molecular Biology	12
RBM2560	Medical Biochemistry	12

Choose Year 2 sem 1 units of another Specialisation from List A

OR

Choose Year 2 sem 1 units of two Sub-specialisations from List B

Semester Two

HBM2105	Medical Microbiology and Immunity	12
HBM2106	Human Genetics	12

Choose Year 2 sem 2 units of another Specialisation from List A

OR

Choose Year 2 sem 2 units of two Sub-specialisations from List B

Year 3

Select NEF3001 Applied Project 1 in one Specialisation in consultation with the Course Coordinator.

NEF3001	Applied Project 1	12

Choose other units to the value of 36 credit points in semesters 1 and 2 from that Specialisation in consultation with the Course Coordinator.

Semester One

RBM3720	Immunology	12

Choose Year 3 sem 1 units of another Specialisation from List A

OR

Choose Year 3 sem 1 units of two Sub-specialisations from List B

Semester Two

NEF3002	Applied Project 2	12
HBM3205	Clinical Genetics and Cellular Basis of Disease	12

Choose Year 3 sem 2 units of another Specialisation from List A

OR

Choose Year 3 sem 2 units of two Sub-specialisations from List B

Chemistry Specialisation

Year 2

Semester One

NPU3101	Pharmaceutical Regulatory Processes	12
NPU2101	Analytical Methods 1	12

Choose Year 2 sem 1 units of another Specialisation from List A

OR

Choose Year 2 sem 1units of two Sub-specialisations from List B

Semester Two

NPU2103	Organic Synthesis	12
NPU3103	Techniques in Pharmaceutical Synthesis	12

Choose Year 2 sem 2 units of another Specialisation from List A

OR

Choose Year 2 sem 2 units of two Sub-specialisations from List B

Year 3

Select NEF3001 Applied Project 1 in one Specialisation in consultation with the Course Coordinator.

NEF3001	Applied Project 1	12

Choose other units to the value of 36 credit points in semesters 1 and 2 from that Specialisation in consultation with the Course Coordinator.

Semester One

NPU2104	Drug Discovery and Development	12
NPU3104	Drug Testing and Analysis	12

Choose Year 3 sem 1 units of another Specialisation from List A

OR

Choose Year 3 sem 1 units of two Sub-specialisations from List B

Semester Two

NEF3002	Applied Project 2	12
NPU2102	Analytical Methods 2	12

Choose Year 3 sem 2 units of another Specialisation from List A

OR

Choose Year 3 sem 2 units of two Sub-specialisations from List B

Ecology & Environmental Management Specialisation

Year 2

Semester One

NPU2110	Australian Landscapes and Biota	12
RBF2640	Australian Animals	12

Choose Year 2 sem 1 units of another Specialisation from List A

OR

Choose Year 2 sem 1 units of two Sub-specialisations from List B

Semester Two

RBF2610	Fundamentals of Ecology	12
RBF2620	Australian Plants	12

Choose Year 2 sem 2 units of another Specialisation from List A

OR

Choose Year 2 sem 2 units of two Sub-specialisation from List B

Year 3

Select NEF3001 Applied Project 1 in one Specialisation in consultation with the Course Coordinator.

NEF3001	Applied Project 1	12

Choose other units to the value of 36 credit points in semesters 1 and 2 from that Specialisation in consultation with the Course Coordinator.

Semester One

RBF3110	Marine & Freshwater Ecology	12
RBF3620	Conservation and Sustainability	12

Choose Year 3 sem 1 units of another Specialisation from List A

OR

Choose Year 3 sem 1 units of two Sub-specialisations from List B

Semester Two

RBF3210	Environmental Rehabilitation	12
NPU3106	Conservation Genetics	12

Choose Year 3 sem 2 units of another Specialisation from List A

OR

Choose Year 3 sem 2 units of two Sub-specialisations from List B

List B: *Sub-specialisations

Molecular Biology

Year 2

RBM2560	Medical Biochemistry	12
HBM2106	Human Genetics	12

Year 3

HBM3205	Clinical Genetics and Cellular Basis of Disease	12
HBM2105	Medical Microbiology and Immunity	12

Cell Biology/Microbiology

Year 2

RBM2133	Cell and Molecular Biology	12
HBM2105	Medical Microbiology and Immunity	12

Year Three

RBM3720	Immunology	12
RBM2560	Medical Biochemistry	12

Analytical Chemistry

Year Two

NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12

Year Three

NPU2104	Drug Discovery and Development	12
NPU2102	Analytical Methods 2	12

Forensic Chemistry

Year Two

NPU3101	Pharmaceutical Regulatory Processes	12

OR

NPU2101	Analytical Methods 1	12
NPU3103	Techniques in Pharmaceutical Synthesis	12

Year Three

NPU3104	Drug Testing and Analysis	12
NPU2103	Organic Synthesis	12

Computing

Year Two

NIT3112	Advance Web Application Development	12
NIT1201	Introduction to Database Systems	12

Year Three

NIT1202	Operating Systems	12
NIT1203	Introduction to Project Management	12

Environmental Science

Year Two

RBF2640	Australian Animals	12
RBF2620	Australian Plants	12

Year Three

RBF3110	Marine & Freshwater Ecology	12
RBF3210	Environmental Rehabilitation	12

Mathematics/Statistics

Year Two

NEM1001	Algebra and Calculus	12
NEM1002	Statistics for Decision Making	12

Year Three

RCM2713	Modelling for Decision Making	12
RCM2611	Linear Statistical Models	12

*Other sub-specialisations may be chosen from the College of Engineering and Science in consultation with the Course Coordinator.

Majors/Minors

NMABCH Biological Chemistry

Locations: Footscray Park

The Biological Chemistry major is aimed at encouraging students to expand their knowledge in the areas of both biology and chemistry. The biology component will introduce you to a wide range of biology topics and allow you to develop a deep understanding of the interrelationships between the various facets of life. Topics include the investigation of life at the molecular, genetic and cellular levels and and how biology is used in commercial applications. The chemistry component 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. The advanced units will introduce students to instrumental analytical chemistry and the theoretical and practical aspects of synthetic organic chemistry. These units provide basic training in the preparation, purification and characterisation of organic compounds and their complimentary modern chromatographic and spectroscopic methods of analysis. The major will be 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. This will teach you how to analyse both data and the literature and apply critical thinking skills to defend the ideas you have developed. These studies will allow you to have a basic understanding of the field of biological and chemical science, allowing for future work in teaching or the broader field of science.

HBM2106	Human Genetics	12
HBM3205	Clinical Genetics and Cellular Basis of Disease	12
NEF3001	Applied Project 1	12
NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12
NPU2104	Drug Discovery and Development	12
NPU3104	Drug Testing and Analysis	12
RBM2560	Medical Biochemistry	12

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: NEF3001 Applied Project 1 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. NEF3002 Applied Project 2 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.

HBM2105	Medical Microbiology and Immunity	12
HBM2106	Human Genetics	12
HBM3205	Clinical Genetics and Cellular Basis of Disease	12
RBM2133	Cell and Molecular Biology	12
RBM2560	Medical Biochemistry	12
RBM3720	Immunology	12
NEF3001	Applied Project 1	12
NEF3002	Applied Project 2	12

NMACHE Chemistry

Locations: 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. NEF3002 Applied Project 2 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
NPU2104	Drug Discovery and Development	12
NPU3101	Pharmaceutical Regulatory Processes	12
NPU3104	Drug Testing and Analysis	12
RCS2503	Forensic Chemistry 2	12
NEF3002	Applied Project 2	12

NMAEBI Environmental Biology

Locations: Footscray Park

The world around us all is changing at an ever increasing pace, and Environmental Biology 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. Additional areas of study include the biochemical and genetic basis for life and how this knowledge is applied in our daily lives in industry. As well as its focus on the Sciences this major incorporates ideas from a broad range of disciplines - from geography to economics and politics, in addition to the philosophies and ethics that underpin activity in these areas.

HBM3205	Clinical Genetics and Cellular Basis of Disease	12
HBM2106	Human Genetics	12
RBM2560	Medical Biochemistry	12
RBF2620	Australian Plants	12
RBF2640	Australian Animals	12
RBF3110	Marine & Freshwater Ecology	12
RBF3210	Environmental Rehabilitation	12
NEF3001	Applied Project 1	12

NMAECH Environmental Chemistry

Locations: Footscray Park

The Environmental Chemistry major allows students to expand their knowledge in the areas of both ecology and chemistry. 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. The chemistry component will introduce you to the principles and practices of modern chemistry. The units will introduce students to instrumental analytical chemistry and the theoretical and practical aspects of synthetic organic chemistry. These units provide basic training in the preparation, purification and characterization of organic compounds and their complimentary modern chromatographic and spectroscopic methods of analysis. These studies will allow you to have a basic understanding of the field of ecology and chemical science, allowing for future work in teaching or the broader field of science.

NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12
NPU2104	Drug Discovery and Development	12
NPU3104	Drug Testing and Analysis	12
RBF2620	Australian Plants	12
RBF2640	Australian Animals	12
RBF3110	Marine & Freshwater Ecology	12
RBF3210	Environmental Rehabilitation	12

NMAENV Ecology and Environmental Management

Locations: 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, VU Sydney

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 Information Technology 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.

NIT2122	Server Administration and Management	12
NIT2124	Network Management	12
NIT2202	Big Data	12
NIT2222	Networking Technologies	12
NIT3114	Online Business System Development	12
NIT3122	Enterprise Network Management	12
NIT3202	Data Analytics for Cyber Security	12
NIT3222	Virtualisation in Computing	12

NMAWMD Web and Mobile Application Development

Locations: Footscray Park, VU Sydney

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 Information Technology 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.

NIT2112	Object Oriented Programming	12
NIT2113	Cloud Application Development	12
NIT2202	Big Data	12
NIT2213	Software Engineering	12
NIT3112	Advance Web Application Development	12
NIT3114	Online Business System Development	12
NIT3202	Data Analytics for Cyber Security	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
NPU2103	Organic Synthesis	12
NPU2104	Drug Discovery and Development	12

NMIANM Network Management

Locations: Footscray Park, VU Sydney

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	Virtualisation in Computing	12

NMIASC Services and Compliance

Locations: Footscray Park

Controlling and auditing building from design to construction is critical. This minor developed so students have more career choices. With this minor students can work as services designer or can evaluate designers work to make sure it compliances with federal, state and local regulation. Controlling the project from conceptual design to final construction becoming more and more important in Australia and many other countries around the world.

NEA2201	Building Development and Compliance	12
NBC3001	High Rise Development and Compliance	12
NBC3004	Construction Economics	12

NBC4001	Procurement Management	12

NMIASD Software Development

Locations: Footscray Park, VU Sydney

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

NMIAST Structure and Services

Locations: Footscray Park

There is a growing demand for effective planning, analysis, design, construction and management of physical infrastructures such as bridges, buildings, transport systems, water supply systems and other essential and sustainable community infrastructure as well as demand for building services design. To enhance your knowledge in structural design as well as building services design and increase your employability, this minor developed to provide advanced knowledge and skills in structural engineering. Internationally renowned experts will be delivering weekly lectures, detailing the analysis and design of steel, steel-concrete composite and pre stressed concrete structures. There will also be a focus on concepts of structural dynamics and the Finite Element Method, reflecting on the latest research findings. This minor features design specific units aimed at providing practical experience in design of real world structural engineering projects. On successful completion of this minor, the students will be specialized in building structure and services design.

NEC2201	Introduction to Structural Engineering Design	12
NEC3101	Structural Analysis	12
NEC3203	Structural Engineering Design 1	12
NEC4102	Structural Engineering Design 2	12

NMIBCP Building Compliance

Locations: Footscray Park

The minor in Building Compliance explores in more depth effective building surveying strategies over the course of building construction process. The focus of this specialist area is on the building surveying process, interpreting building and construction legislation, codes and standards for residential and commercial buildings, performance-based solutions, environmentally sustainable building services and energy efficient buildings and cities of tomorrow.

NBC2002	Building Regulations	12
NBC2109	Performance Based Solutions for Building	12
NBC3003	Building Services Management	12
NBC3204	Complex Construction	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.

AHE2102	Sports Biomechanics	12
AHE2127	Motor Learning	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
HBM2105	Medical Microbiology and Immunity	12
RBM2133	Cell and Molecular 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.

HBM2105	Medical Microbiology and Immunity	12
RBM2133	Cell and Molecular Biology	12
RBM2560	Medical Biochemistry	12
RBM3720	Immunology	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 provide 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

NMIEWE Environmental and Water Engineering

Locations: Footscray Park

Planning, analysis, design, construction and environmental management of buildings, transport systems, water supply/wastewater/flood protection systems and other essential and sustainable community infrastructure are key elements of environmental and water engineering. This minor is aimed at providing in-depth knowledge and understanding of environmental issues and the ability to develop and implement systems and procedures to ensure compliance with legal environmental requirements, and appreciate the importance of risk management and sustainable development. You will obtain skills and expertise in solid and hazardous waste management, air and noise pollution management, and coastal engineering. Expertise in water engineering will be obtained through designing of several projects related to water/wastewater/stormwater treatment, hydrology and water resources, and pumping and gravity reticulation systems. Invited industry guests will detail their design project experiences and discuss the challenges facing our discipline today. Graduating with a minor in environmental and water engineering demonstrates an ability to address environmental issues and, apply principles of hydrology and hydraulics principles to real world designs. In addition, the minor also covers the development of professional engineering skill-attributes such as communication and

interpersonal skills, teamwork, research skills, formulating databases and technical report writing.

NEA4203	Commercial Sustainable Design	12
NEC4172	Urban Development and Transportation	12
NEF4206	Advanced Engineering Design	12
NEF4207	Engineering Applications	12

NMIICT ICT Management

Locations: Footscray Park, VU Sydney

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, VU Sydney

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.

NIT2102	Cyber Security Essentials	12
NIT2201	IT Profession and Ethics	12
NEF3001	Applied Project 1	12
NEF3002	Applied 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.

HBM2105	Medical Microbiology and Immunity	12
HBM2106	Human Genetics	12
HBM3205	Clinical Genetics and Cellular Basis of Disease	12
RBM2560	Medical Biochemistry	12

NMIMSM Modelling and Simulation

Locations: Footscray Park

In engineering, the design and development of new mechanical devices, systems and processes, modelling and simulation is becoming increasingly important. This exploits the combining of the various principles that underpin Mechanical Engineering into powerful engineering development and design tools using multi-physics.
The minor reinforces the already existing theme of Modelling and Simulation and will ensure that students have information at the leading edge of industry practice and innovation while providing graduates with a significant level of future-proofing for their careers.

NEM2104	Numerical Modelling of Mechanical Systems	12
NEM3101	Engineering Analysis and Modelling	12
NEM4102	Finite Element Analysis	12
NEM4202	Advanced Engineering Analysis	12

NMIMST Mathematics/Statistics

Locations: 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.

RCM2611	Linear Statistical Models	12

RCM2713	Modelling for Decision Making	12
RCM2911	Linear Optimisation Modelling	12
RCM3711	Computational Methods	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

NMIPWR Power Systems

Locations: Footscray Park

The energy sector has seen rapid growth over recent years, driven by the continuous demand for electrical power, climate change concerns and popularity of alternative methods of energy generation, substituting for fossil fuel based generation. The electric power industry including the generation, distribution, transmission, and retail sectors continues to be the backbone of the industrial world, supplying essential energy to industrial, manufacturing, commercial and residential customers. This minor prepares students for careers in the electric power industry equipping them with broad and coherent knowledge, and specialised skills that will enable them to gain employment and work in this industry. Students will be provided with engineering knowledge on alternative and traditional power generation methods, and they will learn about the operation, design and planning of distribution and transmission networks. This minor will enable students develop skills in the protection of electrical networks against faults, and allow students to understand the most contemporary concepts in this sector including smart grids, energy storage, renewables, and microgrids.

NEE4110	Electrical Power Systems, Analysis and Operation	12
NEE4212	Electric Energy Systems Protection and Communication	12
NEF4205	Sustainable Energy Systems	12
NEF4206	Advanced Engineering Design	12

NMISTE Structural Engineering

Locations: Footscray Park

There is a growing demand for effective planning, analysis, design, construction and management of physical infrastructures such as bridges, buildings, transport systems, water supply systems and other essential and sustainable community infrastructure. To prepare you for this challenge, this minor is intended to provide advanced knowledge and skills in structural engineering. Internationally renowned experts will be delivering weekly lectures, detailing the analysis and design of steel, steel-concrete composite and prestressed concrete structures. There will also be a focus on concepts of structural dynamics and the Finite Element Method, reflecting on the latest research findings. This minor features design specific units aimed at providing practical experience in design of real world structural engineering projects. For which, external civil engineering organisations and consultants are invited to present authentic and contemporary engineering design projects to enhance learning. A minor in structural engineering will ensure that a graduate has the ability to undertake complex structural analysis and design tasks in industry. In addition, the minor also covers the development of professional engineering skill-attributes such as communication and interpersonal skills, teamwork, research skills, formulating databases and technical report writing.

NEC4102	Structural Engineering Design 2	12
NEF4206	Advanced Engineering Design	12
NEC4202	Structural Engineering Design 3	12
NEF4207	Engineering Applications	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.

HBM2106	Human Genetics	12

HBM3205	Clinical Genetics and Cellular Basis of Disease	12
NEF3001	Applied Project 1	12
RBM2560	Medical Biochemistry	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.

NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12
NPU2104	Drug Discovery and Development	12
NPU3104	Drug Testing and Analysis	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.

NNM6001	Electrical Power Systems, Analysis and Operation	12
NNM6002	Electric Energy Systems Protection and Communication	12
NNM6003	Overhead and Underground Power Line Design	12
NNM6004	Alternative Energy Systems and Power Electronics	12
NNM7002	Transient Analysis, Stability and Surge Protection	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

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.

NIT5110	Networking Systems	12
NIT6120	Mobile Applications	12
NNT6501	Advanced Communication System Design 1	12
NNT6502	Advanced Communication System Design 2	12
NNT6510	Communication Theory	12
NNT6531	Radio Frequency Engineering	12
NNT6532	Satellite Network Design	12
NNT6542	Mobile Network Design	12

UNITS

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: Lecture3.0 hrsThirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Project Management Institute (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, D., (2013) 1st ed. 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: Lecture3.0 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%.

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: Lecture3.0 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 Gido, J & Clements (2015) 7 th ed Successful Project Management Cengage Learning Australia Kloppenborg, TJ 2015 3rd ed Contemporary project management Cengage Learning 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, J.K., (2012) 3rd ed. Project Management: Achieving Competitive Advantage Pearson Education Limited, Essex, UK Bender, M.B., (2010) 1st ed. 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 Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).
Required Reading: Formal class notes will be provided to students for each unit of study. These notes are reviewed and updated regularly. Project Management Institute (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
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: Nil.

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. Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London Recommended Text: Veal A.J., (2005) Business Research Methods: A Managerial Approach 2nd. ed. Pearson NSW

Assessment: Project, Individual Research Project: selection and literature review (2000 words), 20%. Report, Research Proposal: submission in report format (4000 words), 40%. Test, Quiz (approx 1 hour), 20%. Presentation, Final Formal Research Proposal Presentation (approx 15 minutes), 20%.

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: Lab 3.0 hrs 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. Kathy Schwalbe (2013) 7th ed. Information technology project management Cengage Learning, Boston MA. 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; 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%.

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: Lecture3.0 hrsThirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.Freeman, R.E. and Harrison, J.S., (2010) 1st ed. Stakeholder Theory: The state of the art Cambridge University Press, Cambridge Project Management Institute (2013) 5th ed. Guide to Project Management Body of Knowledge Project Management Institute Recommended reading: Donaldson, D. & Preston, L.E. (1995), The stakeholder theory of the corporation: Concepts, evidence, and implications. Academy of Management Review, vol. 20, no.1, pp. 65-91. Jensen, M.C. (2010), Value maximization, stakeholder theory, and the corporate objective function. Journal of Applied Corporate Finance, vol. 22, no. 1, pp. 32-42. Freeman, R.E., Donaldson, T., Preston, L.E., Wicks, A.C. & Parmar, B., (2004), Stakeholder theory and "the corporate objective revisited". Organization Science, vol. 15, no. 3, pp. 364-369. Brenner, S.N. (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: Lecture3.0 hrsThirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).

Required Reading: Crouhy, M. Galai, D. & R. Mark., (2006) 1st ed. Essentials of risk management McgGraw-Hill Publishing Company Hopkin, P., (2010) 1st ed. Risk Management Dewey Publications Loosemore, M. Raftery, J. Reilly, C. & Higgon, D., (2012) 2nd ed. Risk Management in Projects Routledge

Assessment: Assignment, Project Risk Assignment & Presentation, 60%. Examination, Final Examination (2 hours), 40%.

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 topicsRichard 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%.

NBC2001 Building Planning Process

Locations: Footscray Park.

Prerequisites: Nil.

Description: Private and municipal building surveyors carry out the statutory role of ensuring that proposed residential and commercial building projects meet relevant compliance requirements prior to issuing planning permits. This unit is concerned with the fundamental planning considerations for residential buildings in classes 1 and 10 and commercial buildings in classes 2 to 9 as defined in the National Construction Code (NCC) and up to three storeys and not more than 2000 square metres in floor area. It 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: Class 3.0 hrsContact time 33 hours: Weeks 1-3: 3 x 3 hour class Week 4: 2 x 3 hour class

Required Reading: National Construction Code Series (2016) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code Series (2016) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code (2016) Volume 2 Energy efficiency provisions ABCB Publications, Canberra National Construction Code (2016) Volume 1 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: Test, Quizzes (1000 words, 15% each), 30%. Assignment, Two (2) Team design projects and oral presentations (2000 word equivalent, 35% each), 70%.

NBC2002 Building Regulations

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to provide students with understanding of the National Construction Code (NCC) and associated legislation when applied to buildings up to three storeys and not more than 2000 square meters. 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 buildings upto three storeys; 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: Class3.0 hrsContact time 33 hours: Weeks 1-3: 3 x 3 hour class Week 4: 2 x 3 hour class
Required Reading: National Construction Code Series (2016) 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%.

NBC2003 Building Systems and Services

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 services systems associated with residential, 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: HVAC; electrical supply; gas supply; natural and artificial lighting; security and communications, ; hydraulic service supply and disposal systems; fire protection; vertical transportation; and acoustics. Comfort conditions, indoor air quality and total building performance will also be included in the unit.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret regulatory and technical requirements relevant to reticulated (electrical, water, gas, sewerage and drainage, telecommunications) and designed building services (HVAC, fire, internal transportation) installations; 2. Interpret building acoustic requirements using industry regulations, standards and codes; 3. Develop energy efficient and sustainable design with respect to building services, including lighting, power, heating, cooling, mechanical services, hot water, and water usage; 4. Analyse design documentation and carry out on-site inspections of services installations and assess their compliance with relevant statutes, codes and standards. 5. Conceptualise factors affecting human thermal comfort and indoor air quality; and 6. Effectively collaborate with others to conduct total building performance evaluations in all building types.
Class Contact: Class3.0 hrsContact time 33 hours: Weeks 1-3: 3 x 3 hour class Week 4: 2 x 3 hour class
Required Reading: National Construction Code Series (2016) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2016) Volume 1 Energy Efficiency Provisions ABCB Publications, Canberra National Construction Code (2016) Volume 2 Energy Efficiency Provisions ABCB Publications, Canberra Handbook (2016) Using on-site renewable and reclaimed energy sources ABCB Publications, Canberra
Assessment: Assignment, Individual tutorial assignment (1000 word equivalent), 30%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%. Test, Three (3) Online Quizzes (10% each), 30%.

NBC2004 Building and Construction Studies

Locations: Footscray Park.
Prerequisites: NBC1111 - Fundamentals of Building ConstructionNil
Description: This unit extends on the content of two units: Fundamentals of Building Construction and Building Science. 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 NCC; 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: Class3.0 hrsContact time 33 hours: Weeks 1-3: 3 x 3 hour class Week 4: 2 x 3 hour class
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%.

NBC2005 Building Materials

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit introduces the students to the behaviour, properties, performance and limitations of the most widely used construction materials. The important link between ecologically sustainable design and construction material choice is explored.
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 building construction work 2. Demonstrate an appropriate knowledge of other

construction and building materials such as masonry, aluminium, glass, polymers and composites 3. Identify the application and installation requirements of construction materials and components to avoid component failure 4. Distinguish those factors based on materials structure and performance which influence the choice and selection of sustainable materials for adequate performance 5. Describe the importance of the OH&S and environmental requirements for working in a construction site with specific materials

Class Contact: Class3.0 hrsContact time 33 hours: Weeks 1-3: 3 x 3 hour class Week 4: 2 x 3 hour class

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, Team Report and Presentation (1000 words equivalent)., 30%. Report, Team Report and Presentation (750 words equivalent), 20%. Examination, End of Semester Exam (2 hours), 50%.

NBC2006 Professional Estimating

Locations: Footscray Park.

Prerequisites: NBC1113 - Measurement and EstimatingNil

Description: This unit extends on Measurement and Estimating, as 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: Lecture1.0 hrTutorial2.0 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%.

NBC2101 Building and Construction Surveying

Locations: Footscray Park.

Prerequisites: NBC1101 - Maths for BuildersNBC1103 - Basic Structural Mechanics

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: Lecture1.0 hrTutorial2.0 hrsStudents will be expected to participate in 6 hours of site visits per the simulated part of the project assessment.

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 (Practical Team Exercise and Report) (1000 words), 30%. Assignment, Fieldwork (Practical Team Exercise and Report) (1000 words), 30%. Examination, End of Semester Examination (2 hours), 40%.

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: Class3.0 hrsContact time 33 hours: Weeks 1-3: 3 x 3 hour class Week 4: 2 x 3 hour class

Required Reading: National Construction Code (2016) Performance Requirements extracted from the National Construction Code 2016 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, Individual tutorial assignments (1000 word equivalent, 15% each), 30%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%.

NBC3001 High Rise Development and Compliance

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit will provide students with knowledge of the specialist forms of construction and complex statutory controls and their relevance to high-rise buildings. Students will learn how integrated design and development of building systems, structure and services can be facilitated using Building Information Modelling (BIM). They learn how to analyse, interpret and present the fundamentals of conventional and innovative construction details. They learn how to identify and specify Federal, state and city council local mandatory regulation and how to apply them in design and development of high rise buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse, interpret and present the fundamentals of conventional and innovative construction details for buildings; 2. Identify and specify compliance requirements for design and development of high rise buildings; 3. Interpret and apply federal, state and local building regulations, codes and standards in high rise building design and development; 4. Learn integrated design and development of building systems, structure and services and how this integration can be facilitated using Building Information Modelling (BIM); and 5. Critically review and building regulatory procedures, codes and standards to present graphical and written designs and specifications details for different high rise development scenarios.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: National Construction Code (current version) Volume One Building Code of Australia (BCA) ABCB Publications, Canberra National Construction Code (current version) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra The following text are recomended: Ching, FDK, Onoye, BS, Zuberbuhler, D, (2013) Building structures illustrated: patterns, systems and design John Wiley & Sons, Inc, Hoboken, New Jersey

Assessment: Assignment, Individual report (1000 words), 20%. Case Study, Design project (teams of 4 students) and oral presentation (2000 word equivalent), 35%. Examination, Two hour Examination (open book, building codes allowed), 45%. 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.

NBC3002 Advanced Building Surveying

Locations: Footscray Park.

Prerequisites: NBC2002 - Building RegulationsNBC2001 - Building Planning Process

Description: The National Construction Code (NCC) and associated legislation relevant to High Rise Construction (buildings taller than 3 storeys) will be examined and applied in this unit. 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 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: Lecture1.0 hrTutorial2.0 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 (2016 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.

NBC3003 Building Services Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to provide students with knowledge of Building Energy Management Systems (BEMS), building services maintenance and management strategies for non-residential buildings under the National Construction Code (NCC). Students will learn energy efficient design principles, including the use of energy budgets for building fabric and services, use of passive and active design principles and use of computer software to assess building energy efficiency.

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. Articulate the importance of building services maintenance and management in terms of function, procedures and operations; 3. Develop customised solutions to strategic and operational building services management goals; 4. Critically review the implications of energy efficient design principles upon architectural and services designs and apply appropriate energy budgets for building fabric and services; and 5. Assess building energy efficiency via industry-standard computer software.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2016) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2016) Volume 1 Energy Efficiency Provisions ABCB Publications, Canberra National Construction Code (2016) Volume 2 Energy Efficiency Provisions ABCB Publications, Canberra

Assessment: Assignment, Individual tutorial assignment (1000 word equivalent), 30%. Case Study, Team design projects and oral presentations (3000 word equivalent), 40%. Test, Two (2) online quizzes (15% each), 30%.

NBC3004 Construction Economics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit develops students understanding of fundamental micro and macro-economic principles. It consists of the application of the techniques and expertise of economics to the study of the construction company, the construction process and the construction industry.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Construct the feasibility studies for construction projects and business; 2. Arbitrate and assess the market mechanism (demand, supply and equilibrium process) for construction firms (including inter-state and international companies) and understand how this affects leadership and communication within construction businesses; 3. Compose and evaluate key financial accounting data (costs, revenues and pricing) in order to make strategic business decisions for construction firms; 4. Design and integrate key business strategies for the successful operation of construction businesses including management, marketing, personnel and resources strategies; and 5. Elucidate the property development process, its investment risks and return on investment.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: No required texts. Recommended reading list as below:Harris, F & McCaffer, R (2013) 7th edition Modern Construction Management Blackwell Science, Oxford Samson, D & Daft, RL (2009) Fundamentals of Management Cengage Learning, South Melbourne. Miles. M E; Berens, G and Weiss, M A (2000) 3rd edition Real estate development: principles and process, Urban Land Institute.

Assessment: Test, Class Test (500 words equivalent), 20%. Assignment, Individual assignment report (1000 words equivalent), 20%. Report, Group report and presentation (1500 words equivalent), 30%. Examination, Final Exam (2hrs exam), 30%.

NBC3005 Construction Law

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit provides students with an understanding of the Australian legal system, the regulatory framework surrounding the construction industry, and the key principles of the law of contract.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the Australian legal system for construction industry; 2. Demonstrate a workable knowledge of the key statutes regulating the construction industry; 3. Establish a feasible knowledge of the fundamental principles of contract law in construction industry; 4. A thorough understanding of the contents of the contract like offer and acceptance and T&C (Terms and Conditions), standard forms of building contracts, responsibilities of employer, contractor and superintendent in construction contracts; 5. Critically appraise and advise on, from a legal standpoint, case scenarios relevant to statutory and contract law for construction projects.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: No required text. Recommended readings are as belowCoggins J, Davie T, Earls T, Evans P 2016 1st edition Understanding Construction Law LexisNexis Butterworths. Bailey I, and Bell M (2011) 3rd edition Construction Law in Australia Thomson Reuters, Pyrmont, NSW.

Assessment: Test, Two In-class tests (1000 words equivalent), 30%. Assignment, Individual assignment (1000 words equivalent), 30%. Examination, Exam (2hrs exam), 40%.

NBC3006 Construction Site Operations

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit provides students with the necessary skills and knowledge to set up and manage all resources and services necessary for the efficient and safe operation of a construction site.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Present and conceptualise a practical understanding of the Site establishment, preparation and protection 2. Design for site organisation and management (personnel, workforce management, site accommodation and amenities, materials coordination, managing plant and equipment, storage and circulation, attendance to trades) 3. Adapt the legislative and regulatory requirements including work health and safety legislation, codes of practice for safe working in the construction industry; safety inductions and safe work method statements (SWMS) 4. Critically reflect and evaluate the hazard and risk identification; review and control measures; and personnel protection

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: No required text. The recommended readings for this unit are as below Rapp, R. R., & Benhart, B. L. (2015) Construction Site Planning and Logistical Operations: Site-Focused Management for Builders Purdue University Press Griffith, Alan & Watson, Paul 2004 Construction management : principles and practice Palgrave Macmillan, Basingstoke

Assessment: Test, In-class test (500 words equivalent), 20%. Assignment, Group assignment report (2000 words equivalent), 40%. Examination, Final exam (2hrs exam), 40%.

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: Lecture3.0 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%.

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: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2016) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code Series (2016) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code Series (2016) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2016) Volume 1 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 (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%.

NBC4001 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%.

NBC4002 Advanced Construction

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit extend and consolidate the student's technical knowledge and skills of modern construction and project management techniques to complex construction projects. The unit covers the current practices and approaches used in the construction industry including sustainable construction, lean construction and prefabrication.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate techniques used in construction project management and administration, including complex projects in terms of constructability and construction methods; 2. Evaluate the principles and exemplify approaches for the implementation of sustainable construction; 3. Design for efficient management of resources and present familiarity with the use of software in the application of project management planning techniques and tools; 4. Cross-examine the theoretical knowledge of the lean construction, prefabrication and simulation in construction.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: There is no required text for this unit. The recommended readings

are as below Harris, F & McCaffer, R 2006 6th ed. Modern Construction Management Blackwell Science, Oxford. Wilkinson, S, Kelly, J & Morledge, R 2002 Best value in construction Blackwell Science, Oxford Langston, C & Ding, G, (eds.) 2001 2nd ed. Sustainable Practices in the Built Environment Butterworth- Heineman: Oxford

Assessment: Test, In-class test (1000 words equivalent), 20%. Assignment, Group assignment (1000 words equivalent), 20%. Report, Individual report (2000 words equivalent), 30%. Examination, Final exam (2hrs exam), 30%.

NBC4003 Cost Planning and Control

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%.

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: 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. 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%.

NBD2001 Architectural History and Analysis

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces you to the diverse developments of world architecture from the eighteenth to the early twentieth century, examining the theoretical, historical and cultural contexts of the discipline. The unit introduces you to influential architectural projects, theoretical writings and design practices from across this period. Students will examines the influence on Australian architects, the developments of movements within this country to develop a foundational knowledge of the world and Australian architectural history.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse key world architectural works, cultural movements and ideas, their theoretical and cultural context and relate their relevance to design; 2. Review and investigate a selected range of social, cultural and political factors to evaluate how they have shaped Australian architecture. 3. Professionally communicate complex design ideas through verbal, visual and written means; and 4. Critically analyse, evaluate and make informed judgement on a wide range of architectural problems and situations.

Class Contact: Class 2.0 hrs Lab 1.0 hr Contact time 33 hours: Weeks 1-3: 3x2hr class and 3x1hr lab Week 4: 2x2hr class and 2x1hr lab

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. Case Study, One (1) Case study, 25%. Portfolio, Architectural Analysis, 25%. Presentation, One (1) Individual Oral presentation (15 minutes), 10%. Report, One (1) Team Report on History of Architecture, 40%.

NBD2002 Building Contract Documentation

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design DocumentationNBD1100 - 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: Class3.0 hrsLab1.0 hrContact time 44 hours: Weeks 1-3: 3 x 3 hour class and 3 x 1 hour lab Week 4: 2 x 3 hour class and 2 x 1 hour lab
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%.

NBD2100 Built Environment 1

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design DocumentationNBD1100 - Built Environment Communication and SkillsNBC1112 - Building Science
Description: This unit will introduce you to a range of key concepts in physical and social sustainability principles; Environmental Perception, Environmental Psychology and Environment Behaviour, that you can apply within buildings and communities through a design-based project. The unit uses precedent studies to generate diversity in students' design approach to architecture. Spatial design and designing for effective circulation, disabled access and emergency egress is also covered.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Propose methods for improving the physical and social sustainability of the built environment using information, technology, logic and ethical decision making; 2. Integrate concepts of environmental perception, environmental psychology and Environment Behaviour Studies (EBS) in design; 3. Evaluate circulation patterns within proposed spatial designs including disabled access and emergency egress; 4. Communicate effectively with a range of skilled professionals, including architects, builders and engineers; 5. Develop responsibility to effectively contribute to group outcomes while maintaining accountability for own learning and work.
Class Contact: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One (1) Team Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Team Presentation (fifteen (15) minutes), 10%.

NBD3001 Risk and Safety Management

Locations: Footscray Park.
Prerequisites: Nil.
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: Tutorial1.0 hrWorkshop2.0 hrsContact time 33 hours: Weeks 1-3: 3x2hr workshop and 3x1hr tutorial Week 4: 2x2hr workshop and 2x1hr tutorial
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 (1500 words equivalent), 30%. Assignment, Project Risk Assignment & Presentation (1500 words equivalent), 30%. Examination, Final Examination (2 hours), 40%.

NBD3002 Residential Sustainable Design

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 residential 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.
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 justifying recommendations based on the need to address climate change in 21st century; 2. Critically assess interactions between buildings and their surroundings and evaluate the impact of alternative design approaches; 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. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks; and 5. Effective, persuasive, evidence-based advocacy of actions to a variety of audiences.
Class Contact: Lecture 1.0 hr Tutorial 3.0 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: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One (1) Team Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Team Presentation (15 minutes), 10%.

NBD3003 Commercial Sustainable Design

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. Students will design green commercial 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. 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. 5. Work and communicate individually and with others effectively on a range of built environment-related topics;
Class Contact: Lecture 1.0 hr Tutorial 3.0 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: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One Team portfolios, poster and physical model., 40%. Presentation, One (1) Team Oral Presentation (15 minutes), 10%.

NBD3100 Built Environment 2

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design Documentation NBD1100 - Built Environment Communication and Skills NBC1112 - Building Science
Description: This unit will introduce you to a range of key concepts in environmental sustainability principles. This unit acknowledges regional, national and international environmental responsibilities by introducing students to principles of environmental design. It explores relationships between climate and design using passive techniques that influence the environmental performance of small scale buildings in the local context. 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. 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. Assess human comfort needs and apply relevant design solutions for climatic condition for particular Australian climate zones; 3. Critically review building materials and evaluate the environmental performance of the buildings; 4. Demonstrate high level graphical illustration skills to communicate finalised designs to a wide audience; and 5. Communicate effectively with a range of skilled professionals, including government officials, architects, builders and engineers.
Class Contact: Lab 2.0 hrs Tutorial 1.0 hr Contact time 33 hours: Weeks 1-3: 3x2hr lab and 3x1hr tutorial Week 4: 2x2hr lab and 2x1hr tutorial
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: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One (1) Team Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Team Presentation (fifteen (15) minutes), 10%.

NBD3200 Urban Design and Development

Locations: Footscray Park.
Prerequisites: Nil.
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. Students will engage in independent and collaborative analysis to inform their ideas and proposals and will develop their understanding of the fundamentals of the project briefing and design process through a design-based project. 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. Students will develop urban design plans and city models which will be presented and critiqued.
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; 5. Adapt knowledge and skills to

include diverse cultural needs and sustainable communities in urban design. 6. Design and develop the urban design plans which demonstrates the understanding on the sustainable neighbourhood design; and 7. Work and communicate individually and with others effectively on a range of built environment-related topics;

Class Contact: Lecture2.0 hrsTutorial2.0 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: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, Team portfolio, poster and physical model which represent students' skills in urban design and development., 40%. Presentation, One (1) Team Oral Presentation (15 Minutes), 10%.

NEA2102 Architectural Design and Theory

Locations: Footscray Park.

Prerequisites: Nil.

Description: Architectural design and theory includes two components: Component A (Theory) and Component B (Design). Component A: Theory, Students must undertake study in areas of architectural theory including the language of Architecture (form and order, hierarchy, scale composition and proportion); the human body and anthropometrics; and drawing upon historical precedents evident in contemporary Architecture. Component B: Design, introduces students to Architectural Design by exploring the complex process of thinking, where experience, meaning and philosophy are positioned as essential to the aesthetic, spatial and physical resolution of design. This subject immerse students into the architectural design process, including its theoretical, aesthetical, technical, professional and contextual basis. Students will develop a wide range of visual literacy, theory, and communication skills through the conceptual design process.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review and Synthesise a body of practical and theoretical knowledge to apply to the design process; 2. Apply design knowledge to an architectural problem at an introductory level and demonstrate design skills through an iterative and considered design process, to resolve ideas from concept formation through to simple design development; 3. Communicate design ideas at an introductory level, demonstrating through the building design & its representation; 4. Produce two and three-dimensional drawings as determined by the project brief; 5. Articulate the design rational, process and purpose coherently and through a medium that is universally recognised by other professionals as well as relevant stakeholders; and 6. Work individually and with others, and communicate effectively with others orally and in writing on a range of built environment-related topics using appropriate language.

Class Contact: Lab3.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr lab and 3x1hr tutorial and 1x1hr seminar Week 4: 2x3hr lab and 2x1hr tutorial and 1x1hr seminar

Required Reading: A 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 four major section as listed below that illustrate the importance of architectural design, theory, skills in abstract thinking and visual communication and skills in three-dimensional 'spatial' problem solving and model making. Report, Report (1500 words), 25%. Portfolio, Individual Portfolio , 25%. Portfolio, Team portfolio, poster and physical model (three members in a team) , 40%. Presentation, Team Oral Presentation (fifteen (15) minutes), 10%.

NEA2201 Building Development and Compliance

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit aims to give students sufficient skill and knowledge of the various forms of building development that can be encountered in suburban settings, ranging from domestic building projects. In this unit students learn how to identify and use Federal, State and local council required codes and standards relevant to low rise and medium rise buildings and how to apply these mandatory constrains in building design from start of design process to building construction completion stage. They will learn how develop construction details to response to governmental mandatory requirement. They also learn about various building trades, professions and authorities involve in building design and construction and how they communicate and how this communication can be facilitated using advanced methods such as Building Information Modelling (BIM).

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Assess the involvement of various building trades, professions and authorities in building design and construction; 2. Identify and specify compliance requirements for design and development of low rise and medium rise buildings; 3. Interpret and apply federal, state and local building regulations, codes and standards in low rise and medium rise building design and development; 4. Communicate with other professionals in building design and construction process using advanced methods such as Building Information Modelling (BIM); and 5. Develop and design new innovative and conventional building construction details according to international and Australian standards.

Class Contact: Lab2.0 hrsSeminar1.0 hrTutorial2.0 hrsContact time 48 hours: Weeks 1-3: 3x2hr lab and 3x2hr tutorial and 1x1hr seminar Week 4: 2x2hr lab and 2x2hr tutorial and 1x1hr seminar

Required Reading: Australian Building Codes Board (ABCB), (current version) Volume One Code of Australia (BCA) ABCB Publications, Canberra Australian Building Codes Board (ABCB), (Current version) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra The following text is recommended: Ching, F.D.K., (2008) Building construction illustrated 4th ed. John Wiley & Sons, Inc, Hoboken, New Jersey

Assessment: Assignment, Individual report (1000 words equivalent), 20%. Case Study, Design project (teams of 4 students) and oral presentation (2000 word equivalent), 30%. Examination, Three hour Examination (open book), 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.

NEA3102 Building Electrical Systems

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical CircuitsOR 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: Lecture 2.0 hrs Tutorial 2.0 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%.

NEA4102 Residential Sustainable Design

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 environmental residential 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 and active measures of renewable energy usage.

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 design approaches to the design of green residential buildings in response to climate change issues in 21st century; 2. Develop and critically assess alternative approaches for designing environmentally sustainable residential buildings based on environmental, structural, cultural and legal constraints 3. Appraise international and Australian federal, state and local building regulations and integrate governments and accredited Non-Profit Organizations (NGOs) policies in building environmentally sustainable design process; 4. Work collaboratively and effectively as a member and/or leader of a team; and 5. Effective collaborative and individual communication using range of oral ad paper-based methods.

Class Contact: Lecture 1.0 hr Tutorial 3.0 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: Presentation, Team Presentation (5 minutes per team member), 10%. Project, Team Poster (2 A0 size pages), 35%. Portfolio, Individual Portfolio, 35%. Creative Works, Physical Model, 20%.

NEA4203 Commercial Sustainable Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: Global warming has reinforced the importance of designing green buildings with lowering the energy consumption of existing buildings. In this unit, students will become familiar with principles of environmentally sustainable design. Student will design green commercial buildings. This unit also covers an introduction to building performance analysis tools (Australian and international energy assessment tools); Students learn computer simulation modelling of building performance including thermal comfort, natural ventilation, natural lighting and computational fluid dynamics (CFD). Students will analyse their alternative design scenarios to optimise the thermal and lighting performance of the designed buildings.

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 commercial buildings justifying recommendations based on the need to address climate change issues in 21st century; 2. Adopt a critical approach to designing commercial 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, and natural lighting using Australian and international analysis tools; 4. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks; and 5. Demonstrate adequate level of individual and collaborative communication skills through face to face workshops, oral presentations and printed posters.

Class Contact: Lecture 1.0 hr Tutorial 3.0 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: Presentation, Team Presentation (5 minutes per team member), 10%. Project, Team Poster (three A1 pages), 35%. Portfolio, Individual Portfolio, 35%. Creative Works, Physical Model, 20%.

NEA4204 Architectural Lighting and Acoustics

Locations: Footscray Park, City Flinders.

Prerequisites: Nil.

Description: This subject consists of two distinct themes, the first is Architectural

Lighting of buildings and the second is Building Acoustics. They are taught in parallel by different academic (and sessional academic) staff. Part A Light and the visible portion of the electro-magnetic spectrum. Visual performance characteristics of the human eye. Photometric concepts and units of measurement. Direct and indirect surface illuminance calculations. Electric lamp technology, including incandescence, gaseous/vapour discharges. Principles of Colourimetry. The CIE classification system/colour rendering indices. User 'quality' assessment of illuminated spaces including control of glare. Daylight as an alternative to electric light. CIE and other models of sky luminance as a means to simple daylight estimation. Surveys of existing building illumination systems and practical (actual) illumination of buildings using a range commercial luminaires and lamps. Part B Acoustic principles applicable to Building Acoustics such as the decibel scale, sound power vs sound pressure, and wave propagation. Description of laboratory and field testing sound insulation values, identifying sound transmission paths in buildings, and subjective descriptors of sound insulation. Down-duct noise calculations, sizing of duct attenuators, and regenerated noise from duct elements. Sabine absorption calculations, description of early and late reflections, and room design for speech intelligibility.These topics will be discussed in context with National Construction Code, Australian Standard, Environmental Protection Agency, and Green Star acoustic criteria.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate the artificial lighting needs of residential, commercial and industrial buildings in accordance with Australian standards, current 'best practice'' and the minimisation of electrical energy usage; 2. Select and determine the size of luminaries, lamps, their control devices for a range of residential, commercial and industrial buildings. Predict illumination levels at relevant positions from installed lighting systems, using manual and computer calculation methods; 3. Recommend suitable maintenance programs for artificial lighting systems to achieve required illumination levels throughout the life of the lamps employed in the system; 4. Estimate the contribution that natural daylight can provide to the interior illumination of buildings, through the architecture of the building fabric and façade; 5. Evaluate the range of solutions and equipment for designing building acoustic systems, and be able to distinguish the applicability of alternate systems for a given building; 6. Select appropriate forms of specification (for tendering) for the installation of building acoustic systems;

Class Contact: Lecture2.0 hrsTutorial2.0 hrsStudents complete six (6) hours of site visits relative to their assignment and portfolio completion. Lectures and Tutorials are conducted for 2 hours each week from week 1 - 4 of the semester, then recommence at weeks 11 and 12.

Required Reading: Australian Standards (current version) AS 3080; AS 4428; AS60849; AS2201 Australian Standards Australian Standards 1680 (current version) Code for Interior Lighting Australian Standards Australian Standards (current version) Acoustics - Recommended design sound levels and reverberation times for building interiors Australian Standards The following texts are recommended only: Marshall Long (2014) Architectural Acoustics 2nd ed. Elsevier Science Publishing Co Inc Helms, R. and Belcher, M. Clay. (2005) Lighting for Energy Efficient Luminous Environments Prentice-Hall

Assessment: Assignment, Assignment 1 - Domestic lighting project (1000 words per person equivalent), 30%. Portfolio, Portfolio 1 - Practical lighting (Industry), 20%. Assignment, Assignment 2 - Acoustic report (1000 words per person equivalent), 30%. Portfolio, Portfolio 2 - Acoustic, 20%.

NEC2102 Solid Mechanics

Locations: Footscray Park.

Prerequisites: NEF1102 - Engineering Physics 1NEF1205 - Engineering FundamentalsNEM1001 - Algebra and Calculus

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: Seminar1.0 hrTutorial1.0 hrWorkshop3.0 hrsContact time 48 hours: Weeks 1-3: 3x3hr workshop and 3x1hr tutorial and 1x1hr seminar Week 4: 2x3hr workshop and 2x1hr tutorial and 1x1hr seminar

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%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.1, 1.2, 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 6) which are not assessed within the assignments and project. As the test and examination are the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

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: Class2.0 hrsLab2.0 hrsTutorial1.0 hrContact time 48 hours: Weeks 1-3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 2x2hr lab and 1x1hr seminar

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: Engineering Surveying is a key facet of all civil engineering practice. This unit of study promotes students' knowledge and skills in the sub-discipline of surveying - including the ability to select and operate basic and specialised surveying equipment appropriate to specific engineering tasks. Students learn to perform an engineering survey and critically analyse survey data results to inform subsequent design and construction considerations. The development of survey practices from their origins to contemporary contexts is also addressed. Students work in small teams to carry out (typically) eight fieldwork projects drawn predominantly from the areas of building and road engineering. Each survey project involves project analysis, calculations, practical use of surveying equipment and project evaluation. Topics include: 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 the Victorian land title system.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Select, justify and use a range of survey equipment appropriate to specific design and construction tasks; 2. Collect and record observational data according to established principles and regulations and critically analyse results to inform subsequent practice; 3. Design and set out circular curves, e.g. road alignments; 4. Produce appropriate scale contour maps of differing terrains; 5. Calculate areas and volumes of polygonal shapes for infrastructure design and construction; 6. Formulate and test solutions to specific survey problems, working both autonomously and as a member of a team.

Class Contact: Class2.0 hrsLab2.0 hrsSeminar1.0 hrContact time 48 hours: Weeks 1-3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 2x2hr lab and 1x1hr seminar

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 (six (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

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: Class3.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr tutorial and 1x1hr seminar Week 4: 2x3hr class and 2x1hr tutorial and 1x1hr seminar

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

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: Class3.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr tutorial and 1x1hr seminar Week 4: 2x3hr class and 2x1hr tutorial and 1x1hr seminar

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: 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%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.1, 1.3 and 2.2 for the Examination. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment) in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC2203 Hydraulics

Locations: Footscray Park.

Prerequisites: NEF2101 - Fluid Mechanics 1

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: Class2.0 hrsLab1.0 hrWorkshop1.0 hrContact time 48 hours: Weeks 1-3: 3x2hr class and 3x1hr workshop and 3x1hr lab and 1x1hr seminar Week 4: 2x2hr class and 2x1hr workshop and 2x1hr lab and 1x1hr seminar

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%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within the report, assignment or practicum. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC2204 Highway Engineering

Locations: Footscray Park.

Prerequisites: NEC2104 - Engineering Surveying

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: Class3.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr tutorial and 1x1hr seminar Week 4: 2x3hr class and 2x1hr tutorial and 1x1hr seminar

Required Reading: Lecturer will provide reading materials as required.

Assessment: Assignment, Assignment 1: site investigations and road curves (Group poster and presentation - 1000 words), 25%. Assignment, Assignment 2: pavement design calculation & drawings (Individual report - 1000 words), 25%. Examination, End-of-Semester Exam (2 hours), 50%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within both assignments. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC3101 Structural Analysis

Locations: Footscray Park.

Prerequisites: NEC2102 - 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. Appraise a range of approximate solutions for common structures; and 5. Solve problems, undertake standard structural Engineering analyses and write technical reports.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Hibbler R.C., (2015) 9th ed. 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 (2 hours), 35%.

NEC3102 Geotechnical Engineering

Locations: Footscray Park.

Prerequisites: NEC2202 - Geomechanics

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. (2014) 9th edn, Elements of Soil Mechanics, Wiley Blackwell A significant number of other texts, 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.

Assessment: 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%. The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment) in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC3103 Hydrology and Water Resources

Locations: Footscray Park.

Prerequisites: NEC2203 - 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 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, Drainage /detention system/RORB, 15%. Test, Mid-semester test, 25%. Examination, End of Semester Exam (2 hours duration), 50%. Word count requirements of the assignments and the duration of the test may vary from year to year, depending on the design presenters and level of complexity. .

NEC3201 Hydraulic Engineering

Locations: Footscray Park.

Prerequisites: NEC2203 - Hydraulics

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: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: The below texts are recommended only.Vesilind, P., Morgan, S. and Heine, L.G. (2010) 3rd (SI) edn Introduction to Environmental Engineering Cengage Alfred R. Golzé (1977) Handbook of Dam Engineering New York : Van Nostrand Reinhold Co Mays, Larry W. (2010) 2nd ed. Water resources engineering Hoboken, NJ : John Wiley Lechte, P., Shipton, R. (2017) NEC3201 Hydraulic Engineering - Course Notes and Tutorial Problem -

Assessment: Test, In-class test (30 minutes), 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%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment). In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC3202 Civil Engineering Design 1

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC2204 - Highway Engineering

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 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

Class Contact: Lecture1.0 hrTutorial3.0 hrs

Required Reading: Reading material relevant to particular designs will be discussed with individual supervisors in seminars at the start of each design.

Assessment: Presentation, Oral presentation (6-7 minutes) on aspects of a particular design, 5%. Test, Mid term test on SOURCE (1.5 hours), 15%. Assignment, Two team-based design reports (2500 each), 60%. Examination, End-of-Semester Exam on Road (1.5 hours), 15%. Workshop, Team weekly briefing on progress, 5%.

NEC3203 Structural Engineering Design 1

Locations: Footscray Park.

Prerequisites: NEC2201 - Introduction to Structural Engineering Design

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: Lecture2.0 hrsTutorial2.0 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%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.1, 1.2, 1.3, 2.1 and 2.3. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within the mid-semester test, homework problems or project. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC4101 Environmental Engineering 1

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC3201 - Hydraulic EngineeringNEC2203, including 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: Lecture 2.0 hrs Tutorial 2.0 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%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 3) which are not assessed within the test or assignments 1 and 2. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit.

NEC4102 Structural Engineering Design 2

Locations: Footscray Park.

Prerequisites: NEC2201 - Introduction to Structural Engineering Design NEC3203 - Structural Engineering Design 1

Description: This unit introduces the analysis and design of steel and steel-concrete composite structures. Topics include: wind loads, local buckling of thin steel plates, steel webs in shear and bearing, steel members under axial load and bending, steel connections, finite element 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 and provide professional recommendations for implementation in a variety of conditions; 2. Design steel members under combined actions and steel connections; 3. Analyse frames and trusses using finite element software; 4. Use the plastic method to analyse steel beams and simple steel frames; and 5. Design composite slabs, composite beams and composite columns.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 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. AS/NZS 1170.2 (2011). Australian/New Zealand Standard for Structural Design Actions, Part 2: Wind Actions, Sydney, NSW, Australia: Standards Australia and Standards New Zealand. AS 4100 (1998). Australian Standard for Steel Structures, Sydney, NSW, Australia: Standards Australia. AS 2327.1 (2003). Australian Standard for Composite Structures, Part 1: Simply Supported Beams, Sydney, NSW, Australia: Standards Australia.

Assessment: Assignment, Assignment 1 (Report maximum 35 A4 pages including design calculations and drawings), 20%. Assignment, Assignment 2 (Report maximum 35 A4 pages including design calculations and drawings), 20%. Test, Homework Problems, 10%. Examination, 3 hours restricted exam, 50%. The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, a student must achieve a minimum mark of 40% in the examination and 50% in the overall unit assessment in order to pass the unit.

NEC4172 Urban Development and Transportation

Locations: Footscray Park.

Prerequisites: NEC2204 - Highway Engineering

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 greenfield and infill urban developments incorporating appropriate residential, commercial, industrial, open space / recreational areas and transport networks, as well as detailed layout plans for residential subdivision street schemes with service and traffic management arrangements; 3. Select and apply relevant transport planning techniques including traffic surveys and analysis, demand assessment and management, modal split and trip assignment modelling, freight needs assessment, and modelling of complex signalized intersection; 4. Evaluate plans and solutions to problems against technical, environmental, economic and social criteria; 5. Demonstrate professional capabilities to collaborate effectively in a small team with responsibilities and accountability for your own learning and development of appropriate technical reports.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: The Lecturer will provide Teaching and Learning material as required.

Assessment: Assignment, Assignment 1: Individual Transport planning assignment (1500 words), 25%. Assignment, Assignment 2: Team-based design/modelling assignment (2000 words), 25%. Examination, End-of-semester exam (2 hours), 50%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning

Outcomes (LO) (2 to 4) which are not assessed within both assignments. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit.

NEE2101 Electrical Circuits

Locations: Footscray Park.
Prerequisites: NEF1205 - Engineering Fundamentals
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.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Comprehensively analyse RC and RL circuits; 2. Analyse 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. Analyse 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
Class Contact: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar
Required Reading: The below text is recommended only.Alexander, C.K. and M.N.O. Sadiku. (2016). 6th ed. Fundamentals of Electric Circuits. McGraw-Hill.
Assessment: Test, Two Tests (1 hour each), 20%. Laboratory Work, Two Team Reports (2000 words), 20%. Examination, Examination (3 hours), 60%.

NEE2106 Computer Programming for Electrical Engineers

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces students to basic fundamental programming concepts using a high level language (C++). Topics covered include data types, variables, operators, control structures, functions, arrays, and files. The unit equips students with practical skills that would enable them practice developing, compiling, running, testing and debugging program codes. Students will construct program codes to apply programming concepts to the solution of electrical engineering problems. Students will also develop skills in MATLAB script programming, including Graphical User Interface (GUI) development in MATLAB.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Experiment with the use of arrays, functions, object oriented structures, and control structures in computer programming; 2. Apply core principles and fundamentals of programming in writing simple computer programs; 3. Demonstrate practical abilities in coding, testing and debugging simple algorithms in a practical setting; 4. Write computer programs to solve simple engineering problems; 5. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.
Class Contact: Class2.0 hrsLab2.0 hrsSeminar1.0 hrContact time 48 hours: Weeks 1-3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 2x2hr lab and 1x1hr seminar
Required Reading: Liang, Y. D., (2014). 3rd ed, Introduction to Programming with C++. Pearson. Lent, C. S. (2013). 1st ed, Learning to Program with MATLAB: Building GUI Tools. Wiley.
Assessment: Laboratory Work, Six Laboratory Based Problem Solving and Programming Sessions, 30%. Test, Test (1 hour), 20%. Examination, Examination (3 hours), 50%.

NEE2107 Telecommunications

Locations: Footscray Park.
Prerequisites: NEF1201 - Engineering Mathematics 2
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. The unit will provide the support for students requiring basic knowledge of analogue and digital transmission in order to handle concurrently studied Engineering Design projects that involve various aspects of analogue and digital transmission in communication systems. Consequently, the syllabus is a collection of specialised tutorials and workshops, the emphasis and sequence of which accommodates the demands of any concurrent PBL exercises. Optical systems as well as optical transmission infrastructure are covered here. 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 analogue and digital signals; and 8. Outline the assessment of performance in digital communication systems in terms of bit error probability.
Class Contact: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar
Required Reading: There are a number of other textbooks that can be used in conjunction with the required text below. Some of these texts are available online by

subscription. Students please check with the Main library.Wong, K.D., (2012). 1st ed. Fundamentals of communication engineering technologies. Wiley. Haykin, S. & Moher, M., (2009). 5th ed. Communication systems. Wiley. N.Benvenuto et al (2007). 1st ed. Communication systems: Fundamentals and Design Methods. Wiley. Many other sources of important information are available online.www.ieee.org/explore

Assessment: Laboratory Work, Two Laboratory Team Reports (1500 words each), 10%. Test, Test (1 hour), 15%. Project, Project Report (2000 words; team of two), 25%. Examination, Examination (3 hours), 50%.

NEE2110 Engineering Design and Practice 2A

Locations: Footscray Park.

Prerequisites: NEF1204 - Introduction to Engineering Design

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 the units Electrical Circuits and Computer Programming for Electrical Engineers. Student teams will be coached or mentored by an Electrical Engineering staff member whilst resolving these problems. Staff from these units will advise students with technical aspects of the problems. A language and communication staff member will assist with the development of communications and other generic skills in tutorial classes. 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: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar

Required Reading: Only one of the two technical readings is used depending on the requirements of the PBL projects.Timmis, Harold, (2011) Practical Arduino Engineering Berkeley, CA: Apress Yang, Yik, (2014) LabVIEW Graphical Programming Cookbook Birmingham, U.K: Packt Publishing. The following books are for recommended readings. A Guide to Writing as an Engineer, David F. Beer, David A. McMurrey (2014), 4th Edition, Wiley.

Assessment: Presentation, Oral Presentation (20 min, 3-4 people per team), 20%. Project, Project Demonstration (1 hour), 10%. Report, Team Technical Report (3000 words), 20%. Examination, Examination (3 hours), 50%.

NEE2201 Linear Systems with Matlab Applications

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2NEE2101 - Electrical Circuits

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. Adapt and apply Fourier series, Fourier transforms, and Laplace transforms to the analysis of signals and linear time-invariant systems; 2. Apply the Fourier series and Fourier transforms to the frequency-domain analysis of linear time-invariant systems; 3. Apply the Laplace transforms to the time-domain analysis of linear time-invariant systems described by linear differential equations and by state variables; and 4. Fluently employ MatLab commands and Simulink to analyse and evaluate linear time-invariant systems using Fourier series, Fourier transforms, and Laplace transforms.

Class Contact: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar

Required Reading: Alexander, C.K. and Sadiku, M.N.O., (2013) 5th ed. Fundamentals of Electric Circuits, McGraw-Hill. Paluszek, M., (2015) MATLAB recipes : a problem-solution approach Berkeley, CA : Apress

Assessment: Test, One Semester Test (2 hours), 20%. Report, Three Laboratory Team Reports (2000 words each), 30%. Examination, Examination (3 hours), 50%.

NEE2204 Power System Supply Chain Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit explores two key areas - Power System 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, modelling and performance evaluation of transmission line is exemplified and contextualised with the power circle diagram. Power transfer through transmission lines are studied and reactive power compensation through traditional and more advanced power electronic devices is explored. Steady-state analysis of transmission lines is performed, and travelling wave phenomenon studied to assess performance of transmission lines. Economic and environmental aspects of transmission lines are also briefly debated in this unit. Transmission line parameters and ferranti effect will also be explored.

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: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar

Required Reading: Glover J.D., Sarma, M.S. & Overbye T.J. (2017). 6th ed, Power System Analysis and Design, Cengage Learning, USA. Recommended Reading: 1. Saadat, H. (2011). Power System Analysis, 3rd ed., McGraw Hill. 2. Kothari, D.P. and Nagrath, I.J. (2008), Power System Engineering, 2nd ed., McGraw Hill.

Assessment: Test, Test (1 hour), 20%. Laboratory Work, Three Lab Reports (Team of two, 1500 words), 30%. Examination, Examination (3 hours), 50%.

NEE2205 Analogue Electronics

Locations: Footscray Park.

Prerequisites: NEF1205 - Engineering Fundamentals

Description: This unit introduces operational amplifiers as a major building block of analogue electronics. The ideal op-amp model will be covered and the fundamental op-amp circuits discussed, e.g single ended amplifiers, differential amplifiers, integrators and differentiators, summing and instrumentation amplifiers. The non-ideal characteristics of the op-amp such as saturation, input offset voltage, input bias currents, finite open loop gain and finite gain bandwidth will then be covered. The final part of the unit introduces semiconductor discrete devices at an introductory level. These include for example, zener diodes, BJTs and MOSFETS. Practical issues of biasing and amplifier configuration will be covered from the perspective of a single device type i.e. either BJT or MOSFET.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss the ideal op-amp model and use it to analyze op-amp circuits; 2. Appraise the non-ideal op-amp properties and compensation methods; 3. Discuss the characteristics of semiconductor devices (Diodes, Bipolar and Metal Oxide Transistors); 4. Analyse and design a single-stage BJT and CMOS FET amplifiers; 5. Discuss the differences between the linear op-amp device and discrete semiconductor devices as amplifiers.

Class Contact: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar

Required Reading: Sedra, A. & Smith, K., (2009). 6th ed. Microelectronic Circuits. Oxford University Press.

Assessment: Test, Test (1 hour), 20%. Laboratory Work, Three Laboratory Based Problem Solving Sessions (1500 words report per lab), 30%. Examination, Examination (3 hours), 50%.

NEE2210 Engineering Design and Practice 2B

Locations: Footscray Park.

Prerequisites: Nil.

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 units Linear Systems with Matlab Applications and Analogue Electronics. Teams of students will have an Electrical Engineering staff member as a 'coach/mentor or supervisor' whilst working on these problems. 'Specialist' staff from these units will be available to assist students with technical aspects of the problems. A language and communication staff member will assist with the development of communications on a weekly basis. Staff members will be available to provide workshops or seminars 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: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar

Required Reading: The following books are recommended readings: Williams. A., (2013). Analog Filter and Circuit Design Handbook 1st ed., McGraw-Hill Education. A.S. Sedra, K.C. Smith (2010). Microelectronic Circuits. 6th ed., Oxford University Press.

Assessment: Test, Project-Based Mid Semester Test (1 hour), 20%. Presentation, Oral Presentation and Project Demonstration (30 mins), 20%. Report, Technical Team Report (3000 words), 20%. Portfolio, Individual Portfolio Report (2500 words), 40%.

NEE3103 Electrical Machines

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical CircuitsNEE2101 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: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures , 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work.

Required Reading: Chapman, S. J. (2012) 5th ed. Electric Machinery Fundamentals McGraw-Hill. Herman, S. L. (2016) 4th ed. Electrical Transformers and Rotating Machines Cengage Learning.

Assessment: Laboratory Work, Three Laboratory Reports (1500 words each; Team of Two), 20%. Test, Mid-semester Test (1 hour), 20%. Examination, End-of-Semester Examination (3 hours), 60%.

NEE3104 Digital Systems

Locations: Footscray Park.

Prerequisites: NEF1205 - Engineering Fundamentals

Description: This unit starts with the 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. Other digital circuits such as memory, ADC/DAC and arithmetic operation circuits will be covered at an introductory level. Student designs are tested in logic simulation software and implemented on Field Programmable Logic Arrays (FPGA).

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply boolean algebra to implement logic circuits using basic logic gates; 2. Use reduction techniques e.g. K-maps to design simple logic circuits; 3. Apply flip-flops and analyze their use in counters; 4. Discuss the operation of digital systems such as arithmetic units, memory and ADCs.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures , 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.

Required Reading: M. M. Mano and Michael D. Ciletti (2013). 5th ed., Digital Design. Pearson.

Assessment: Laboratory Work, Three Lab Reports (1500 words each), 30%. Test, Mid-Semester Test (1 hour), 20%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE3201 Introduction to Control Systems

Locations: Footscray Park.

Prerequisites: NEE2201 - Linear Systems with Matlab Applications NEE2201 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: Lab 2.0 hrs Lecture 2.0 hrs Workshop 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures , 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work.

Required Reading: R.C. Dorf & R.H. Bishop (2017). 13th ed., Modern Control Systems. Upper Saddle River, N.J. Prentice Hall.

Assessment: Laboratory Work, Three Lab Reports (1500 words each), 30%. Test, Two Semester Tests (1 hour each), 20%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE3203 Embedded Systems

Locations: Footscray Park.

Prerequisites: NEE2106 - Computer Programming for Electrical Engineers NEE2106 OR NEE2102 OR ENE2202

Description: This unit introduces students to in depth study of embedded systems focusing on microcontrollers, embedded programming techniques and embedded system design. Hardware content will cover microcontroller peripherals e.g.,memory, timers, analogue to digital convertors (ADC), pulse width modulation (PWM), standard communication with external devices e.g., USART, SPI, I2C. Software programming techniques such as polling and interupts will be introduced. Project and lab work will be used to illustrate embedded systems design techniques, while case study examples will illustrate state of the art applications such as Internet of Things, industrial automation, and robotics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the principles involved in embedded hardware and software design; 2. Discuss the primary components in an embedded systems; 3. Implement a real-time, embedded industrial control system using an embedded microcontroller with associated interface; 4. Implement an communications device to the embedded microcontroller application.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures, 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.

Required Reading: Marwedel, P. 2011. Embedded System Design: Embedded

Systems Foundations of Cyber-Physical Systems, Springer. Forouzan. B., Fagan. S. C., 2012. 5th ed. Data Communication and Networking, McGraw Hill.
Assessment: Laboratory Work, Three Laboratory Based Problem Solving Session Reports (1500 words each), 30%. Presentation, Oral (Group presentation of 20 minutes), 20%. Project, Two Project Team Reports (3000 words each), 50%.

NEE3207 Analogue and Digital Transmission

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit has been 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: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures , 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.
Required Reading: There are a number of other textbooks that can be used in conjunction with the required text below. Some of these texts are available online by subscription. Students please check with the Main library. Many other sources of important information are available online.www.ieee.org/exploreZimmer, R. & Tranter, W. (2014) 7th ed. Principles of Communication Wiley.
Assessment: Laboratory Work, Two Laboratory Team Reports (1500 words each), 20%. Test, Mid-Semester Test (1 hour), 30%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE3208 Signal Processing

Locations: Footscray Park.
Prerequisites: NEE2201 - Linear Systems with Matlab Applications
Description: The unit covers analogue and digital signal processing techniques. In the analogue section, the frequency response of amplifiers and feedback configurations will be covered, followed by filter design including filter families such as Bessel, Butterworth, Chebyshev and Elliptic filters. The topic of oscillators and waveform shaping will be covered starting with oscillation criterion, followed by popular topologies such as RC,and LC oscillator families. 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 the introduction to discrete-time signals and systems, the z-transform and its properties, sampling of continuous-time signals, anti-aliasing filters analogue to digital signal conversion, 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. Discrete Fourier Transform (DFT) and its computation with Matlab and Wavelet Transform in Matlab will also be introduced.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate analysis and design calculations for amplifiers; 2. Design analogue active filter circuits to meet performance criteria of specific application. This includes the selection of suitable circuit topologies for circuit realisation; 3. Analyse oscillator circuits and develop oscillator circuits to achieve specific characteristics and performance; 4. Perform signal to noise ratio analysis of analogue to digital signal conversion processes; 5. Calculate mathematical representations of discrete-time signals and systems; 6. Design and implement finite impulse response (FIR) filters and infinite impulse response (IIR) filters.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures , 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.
Required Reading: Oppenheim, A.V. & Schafer, R.W., (2009) 3rd ed. Discrete-Time Signal Processing Prentice-Hall
Assessment: Test, Two Class Tests (1 hour each), 20%. Laboratory Work, Four Lab Reports (1500 words each; Team of Two), 40%. Examination, Final Exam (3 hours), 40%.

NEE4110 Electrical Power Systems, Analysis and Operation

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit will analyse electricity distribution in the deregulated Australian power industry to critically examine the planning, design and operation of electrical transmission and distribution networks. Network calculations and the bus-admittance matrix will be covered. The concept of load flow analysis and its use in network planning and analysis will be explored. Contemporary approaches including Gauss-Seidel, Newton-Raphson, and Fast Decoupled load flow analysis methods and their application to the solution of complex networks will demonstrate alternative and complementary strategies in the operation, design and planning of electrical distribution and transmission networks. The subject addresses electrical insulation properties and characteristics, insulator selection and 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 are investigated as enduring challenges to be addressed through networks. The unit also considers the impact of breakdown in gases, liquids and solids on the provision of reliable electrical insulation in electrical networks.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Examine and evaluate different techniques of load flow solutions including calculations of voltage, angles, losses, generated reactive power, and slack power; 2. Model accurately a multi-bus system and carry out load flow studies; 3. Justify the selection and application of contemporary engineering methods to propose solutions to complex power system problems; 4. Analyse electrical insulation properties and characteristics including: insulator selection, insulation co-ordination in electric energy networks to optimise operational reliability; 5. Explore impacts of

overvoltages, and lightning on transmission and distribution networks, 6. Investigate surge propagation and circuit interruption theories and circuit breaker operation on reliable insulation and protection of electrical networks;
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures , 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.
Required Reading: Glover, J.D., M.S. & Overbye, T.J., (2016) 6th ed. Power System Analysis and Design Cengage Learning Saadat, H. (2011) 3rd ed. Power System Analysis PSA Publishing LLC. Arora, R. and Mosch, W. (2011) 1st ed. High Voltage and Electrical Insulation Engineering Wiley.
Assessment: Laboratory Work, Four Laboratory Reports (Team of two; 1500 words per lab report), 20%. Project, Project Report (Team of two; 2500 words), 20%. Examination, Final Examination - Closed Book (3 hours), 60%.

NEE4211 Mobile Networks and Communications

Locations: Footscray Park.
Prerequisites: NEE3207 - Analogue and Digital Transmission
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; 5. Develop procedures for the operation and identification of strengths and weaknesses of popular wireless multiple access techniques.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Total of 48 hours, comprising of 12 x 2 hour lectures, 12 x 1 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.
Required Reading: These three text books complement the teaching of this unit.Holma, H., & Toskala, A. (2009) 6th ed. LTE for UMTS, OFDMA and SC-FDMA Based Radio Access Chichester/Wiley Holma, H., & Toskala, A. (2010) 5th ed. WCDMA for UMTS - HSPA Evolution and LTE Chichester/Wiley Molisch, Andreas F. (2010) 2nd ed. Wireless Communications Chichester/Wiley
Assessment: Test, In-Class Test (2 hours), 20%. Laboratory Work, Laboratory Reports (2000 words each; Team of Two), 30%. Examination, Examination (3 hours), 50%.

NEE4212 Electric Energy Systems Protection and 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 electric energy systems protection and communication. The unit is delivered in two parts: Part A - Protection: Part A 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. Part B - Communication: Part B deconstructs the relationships between power system automation, control, and communication concepts and technologies, as 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. Evaluate the implementation of different protection schemes applicable to generation, transmission and distribution systems; 2. Design protection systems including relay settings and protection coordination; 3. Design for the use of communication media and architectures in power systems; 4. Evaluate and assess recent innovations on power system communications; such as the IEC 61850 protocol; 5. Critically review the communication standards, protocols and architectures most commonly employed in power system protection and distribution networks; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Laboratory groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.
Required Reading: Lecture notes and hand outs. Kalam, A. and Kothari, D.P. (2010), 1st ed. System Protection and Communications, New Age International (P) Ltd, Ozansoy, C. (2010), 1st ed. Modelling and Object Oriented Implementation of IEC 61850, Lambert Academic Publishing, Saarbrucken, Germany.
Assessment: Test, 1 Mid-Semester Test (1 hour duration), 15%. Laboratory Work, Two Laboratory Group Reports (Team of two, 1500 words), 15%. Examination, Final Examination (3 hours closed book), 50%. Project, Team Project Report (Team of two, 2500 words), 20%.

NEF2101 Fluid Mechanics 1

Locations: Footscray Park.

Prerequisites: NEM1001 - Algebra and Calculus

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: Class3.0 hrsSeminar1.0 hrWorkshop1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr workshop and 1x1hr seminar Week 4: 2x3hr class and 2x1hr workshop and 1x1hr seminar

Required Reading: Class Notes and additional resources on WebCT.Hamill, Les. (2011) 3rd ed. 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%.

NEF2201 Building HVAC Systems

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to provide students with required skills and knowledge to design Heating, Ventilation, and Air Conditioning (HVAC) 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. In addition students learn about complex HVAC systems and develop skills needed in selection of components to make the systems energy efficient in full load and part load operation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain and critically evaluate basic psychrometric processes and demonstrate how they apply in various types of air conditioning systems; 2. Assess options available to HVAC designers in selecting main types of plant and formulate a suitable proposal for equipment selection; 3. Explain an impact of design decisions on equipment performance under full-load and part-load operation, and on system energy efficiency; 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; and 5. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Class3.0 hrsSeminar1.0 hrWorkshop1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr workshop and 1x1hr seminar Week 4: 2x3hr class and 2x1hr workshop and 1x1hr seminar

Required Reading: ASHRAE (2013) Handbook - Fundamentals ASHRAE Suggested texts: 1. Jones, W.P. (2012), Air Conditioning Application and Design, 2nd ed., Taylor and Francis 2. AIRAH (1997), Air Conditioning: Lead Estimation, Taylor and Francis, AIRAH 3. Murray, M., Hamilton, T. and Kingstone, T. (2002), User Guide for the Computer Program, ACADS-BSG

Assessment: Assignment, Team Project(3 students per project); equivalent to 3000 words per team., 30%. Presentation, Oral presentation; 5 minutes per students, 30%. Portfolio, Individual portfolio and reflective journal based on tutorial classe; equivalent to 1500 words., 40%. Teams will consist of 3-4 students.

NEF2251 Fundamentals of Electrical and Electronic Engineering

Locations: Footscray Park.

Prerequisites: NEF1205 - Engineering FundamentalsNEF1205 - 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 arithmetic operations, Boolean expressions and their reduction techniques. 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 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: Class2.0 hrsLab2.0 hrsSeminar1.0 hrTutorial1.0 hrContact time 48 hours: Week 1: 3x2hr class and 3x1hr tutorial and 1x2hr lab and 1x1hr seminar Week 2: 3x2hr class and 3x1hr tutorial and 2x2hr lab and 1x1hr seminar Week 3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 1x2hr lab and 2x1hr tutorial and 1x1hr seminar

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.

Assessment: Test, Two Class Tests (One hour each), 50%. Laboratory Work, Two Laboratory Group Reports (1000 words each), 50%.

NEF3001 Applied Project 1

Locations: Footscray Park.

Prerequisites: Completion of at least 144 credit points.

Description: Applied Project 1 is the culmination of student experience in their 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 applied 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. Applied 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 oral presentation. Upon successful completion of this unit, students will continue with Applied 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 the project including key discipline requirements; 3. Evaluate the feasibility of a range of solutions to anticipated problems taking into account relevant factors including sustainability; 4. Synthesise, critically analyse and/or test project designs ensuring that design outcomes meet specifications; 5. Produce a range of high quality professional and technical documents including a project proposal; and presentation; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to relevant audiences.

Class Contact: One hour per week and an hour meeting with an academic mentor. Students are expected to spend a substantial portion of their time working independently and are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per session of private study.

Required Reading: None required. Notes from lecturers will be provided to students.

Assessment: Project, Project Plan (1500 words or equivalent), 30%. Project, Project Proposal/Portfolio (2500 words or equivalent), 50%. Presentation, Oral Presentation (10 minutes), 20%. The above assessment word equivalents are for individual contributions to a group, or the expectation for students undertaking an individual project. Portfolios for students in the Building disciplines will include a creative piece.

NEF3002 Applied Project 2

Locations: Footscray Park.

Prerequisites: NEF3001 - Applied Project 1

Description: Applied Project 2 is the implementation of the negotiated project (Applied Project 1) and represents the culmination of student experience in their course. 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-unit, substantial applied 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. Applied Project 2 focuses on the implementation, delivery and evaluation of project outcomes to the satisfaction of the client (when relevant) 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 oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and deliver evidenced based recommendations relevant to an applied project; 2. Propose and present a range of solutions to real and anticipated problems relevant to the project; 3. Produce a range of documents and/or artifacts appropriate to the profession; 4. Communicate effectively with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to relevant audiences.

Class Contact: One hour per week and an hour meeting with an academic mentor. Students are expected to spend a substantial portion of their time working independently and are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per session of private study.

Required Reading: None required. Notes from lecturers will be provided to students.

Assessment: Report, Interim Report/Plan (1000 words or equivalent), 20%. Report, Project Report/Portfolio (4000 words or equivalent), 60%. Presentation, Oral Presentation (10 minutes), 20%. The above assessment word equivalents are for individual contributions to a group, or the expectation for students undertaking an individual project. Interim Report focuses on the problem addressed and the key results, whereas the Final Report will include the analysis, methodology and the justification of recommendations. Portfolios for students in the Building disciplines will include a creative piece.

NEF3101 Project Management

Locations: Footscray Park.

Prerequisites: Completion of at least 96 Credit Points

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: Class1.0 hrLecture2.0 hrsTutorial1.0 hr
Required Reading: Lecture Materials and associated Notes will be distributed to students as required.Meredith, J.R., Mantel, S.J., Hoboken, H. and Jr. Meredith, J.R. (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, Harold Kerzner, Harold Hoboken Project management [electronic resource]: a systems approach to planning, scheduling, and controlling (2013) 11th ed. N.J. Wiley.
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%. The examination focuses upon the individual student's ability to demonstrate his or her ability to fluently apply engineering techniques, tools and resources, as defined in Engineers Australia competency 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within both reports or the presentation. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEF3202 Research Methods

Locations: Footscray Park.
Prerequisites: Nil.
Description: Effective management of successful building design and construction process requires extensive evidence-based research. 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 building design and construction; 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.
Class Contact: Lecture1.0 hrTutorial2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.
Assessment: Report, Research Proposal: submission in report format (1500 words equivalent), 20%. Presentation, Research Proposal individual project presentations and discussions (10 minutes), 20%. Presentation, Final Formal Research Presentation (15 minutes), 20%. Report, Final individual research report (2500 words equivalent), 40%.

NEF4101 Research Project 1

Locations: Footscray Park.
Prerequisites: NEF3101 - Project ManagementNHCM: NEF3202 Research Methods NHEA, NHEC, NHEE, NHEM: NEF3101 Project Management and NEF3202 Research Methods.
Description: The research project is the culminating experience of the student's course and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This substantial discipline related project is achieved across two units where students demonstrate their research capability to collect data and analyse it in relation to the project problem. 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 will be undertaken individually by each student although a number of projects can be closely related to address large challenges or problems. This unit focuses on the research, scoping, designing and planning of the project. Upon successful completion of this unit, students will continue with Research Project 2 where the project outcomes will be finalised and delivered.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse a multi-faceted problem of significance to your discipline; 2. Use discipline-relevant research methods to evaluate the feasibility of a range of solutions; 3. Synthesise, critically analyse and/or test project designs or research hypotheses ensuring that outcomes meet negotiated requirements or client specifications; 4. Effectively plan a research based project within the constraints of the project brief; 5. Produce a range of research based documents and/or artifacts consistent with the expectations of the discipline; 6. Effectively communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the relevant audiences.
Class Contact: One hour per week and one hour of meeting with an academic mentor. Students are expected to spend a substantial portion of their time working independently and are expected to attend weekly meetings with their mentors.
Required Reading: None required.
Assessment: Report, Project Plan (1500 words or equivalent), 25%. Report, Project Proposal (3000 words or equivalent), 50%. Presentation, Oral Presentation (15 minutes), 25%. In the project proposal, students will apply their skills and knowledge to critically analyse a complex problem or research question, conduct a

detailed literature review and investigation and propose a detailed solution or hypothesis to be tested. In the Project Plan students will document the complete design of their solution or research investigation as well as a detailed plan on how the 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.

NEF4102 Capstone Project 1

Locations: Footscray Park.

Prerequisites: NEF3101 - Project Management

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 will be undertaken individually by each student although a number of projects can be closely related to address large challenges or problems. This unit focuses on the research, scoping, designing and planning of the project. Upon successful completion of this unit, students will continue with Capstone Projects 2 where the project outcomes will be finalised 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: Report, Project Management Plan/Progress Report, 30%. Report, Project Proposal, 60%. Presentation, Oral Presentation, 10%. 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: Nil.

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. Demonstrate comprehensive understanding of professional opportunities and recruitment practices in a range of employment documents and mock interview; 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: Lab 2.0 hrs Workshop 2.0 hrs Total of 48 hours, comprising of 12 x 2 hour workshops, 12 x 2 hours of labs.

Required Reading: Nil required texts for this unit. Lecturer will provide references and reading materials when required.

Assessment: Assignment, Individual Employment Documents and Mock Interview (1000 words), 30%. Case Study, Individual Report on Professional Conduct & Development, and Ethics (1000 words), 20%. Presentation, Presentation on Inquiry into Workplace Safety, Intellectual Property, and/or Union Activities (Team of two; 15 minutes), 15%. Assignment, Business Plan Report (Team of two; 2500 words), 35%.

NEF4107 Smart Architectural Systems Design

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 environmental residential 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 and active

measures of renewable energy usage.

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 design approaches to the design of green residential buildings in response to climate change issues in 21st century; 2. Develop and critically assess alternative approaches for designing environmentally sustainable residential buildings based on environmental, structural, cultural and legal constraints 3. Appraise international and Australian federal, state and local building regulations and integrate governments and accredited Non-Profit Organizations (NGOs) policies in building environmentally sustainable design process; 4. Work collaboratively and effectively as a member and/or leader of a team; and 5. Effective collaborative and individual communication using range of oral ad paper-based methods.

Class Contact: Lecture 1.0 hr Tutorial 3.0 hrs Forty-eight hours per semester, consisting of 1 hour Lecture and 3 hours of PC Labs per week.

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: Presentation, Team Presentation (5 minutes per team member), 10%. Project, Team Poster (2 A0 size pages), 35%. Portfolio, Individual Portfolio, 35%. Creative Works, Physical Model, 20%.

NEF4108 Architectural Lighting and Acoustics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This subject consists of two distinct themes, the first is Architectural Lighting of buildings and the second is Building Acoustics. They are taught in parallel by different academic (and sessional academic) staff. Part A Light and the visible portion of the electro-magnetic spectrum. Visual performance characteristics of the human eye. Photometric concepts and units of measurement. Direct and indirect surface illuminance calculations. Electric lamp technology, including incandescence, gaseous/vapour discharges. Principles of Colourimetry. The CIE classification system/colour rendering indices. User 'quality' assessment of illuminated spaces including control of glare. Daylight as an alternative to electric light. CIE and other models of sky luminance as a means to simple daylight estimation. Surveys of existing building illumination systems and practical (actual) illumination of buildings using a range commercial luminaires and lamps. Part BAcoustic principles applicable to Building Acoustics such as the decibel scale, sound power vs sound pressure, and wave propagation. Description of laboratory and field testing sound insulation values, identifying sound transmission paths in buildings, and subjective descriptors of sound insulation. Down-duct noise calculations, sizing of duct attenuators, and regenerated noise from duct elements. Sabine absorption calculations, description of early and late reflections, and room design for speech intelligibility. These topics will be discussed in context with National Construction Code, Australian Standard, Environmental Protection Agency, and Green Star acoustic criteria.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate the artificial lighting needs of residential, commercial and industrial buildings in accordance with Australian standards, current 'best practice'' and the minimisation of electrical energy usage; 2. Select and determine the size of luminaries, lamps, their control devices for a range of residential, commercial and industrial buildings. Predict illumination levels at relevant positions from installed lighting systems, using manual and computer calculation methods; 3. Recommend suitable maintenance programs for artificial lighting systems to achieve required illumination levels throughout the life of the lamps employed in the system; 4. Estimate the contribution that natural daylight can provide to the interior illumination of buildings, through the architecture of the building fabric and façade; 5. Evaluate the range of solutions and equipment for designing building acoustic systems, and be able to distinguish the applicability of alternate systems for a given building; 6. Select appropriate forms of specification (for tendering) for the installation of building acoustic systems.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs Students complete six (6) hours of site visits relative to their assignment and portfolio completion. Lectures and Tutorials are conducted for 2 hours each week from week 1 - 4 of the semester, then recommence at weeks 11 and 12.

Required Reading: Australian Standards (current version) AS 3080; AS 4428; AS60849; AS2201 Australian Standards Australian Standards Australian Standards 1680 (current version) Code for Interior Lighting Australian Standards Australian Standards Australian Standards (current version) Acoustics - Recommended design sound levels and reverberation times for building interiors Australian Standards Australian Standards The following texts are recommended only: Marshall Long (2014) Architectural Acoustics 2nd ed. Elsevier Science Publishing Co Inc Helms, R. and Belcher, M. Clay. (2005) Lighting for Energy Efficient Luminous Environments Prentice-Hall

Assessment: Assignment, Assignment 1 - Domestic lighting project (1000 words per person equivalent), 30%. Portfolio, Portfolio 1 - Practical lighting (Industry), 20%. Assignment, Assignment 2 - Acoustic report (1000 words per person equivalent), 30%. Portfolio, Portfolio 2 - Acoustic, 20%.

NEF4201 Research Project 2

Locations: Footscray Park.

Prerequisites: NEF4101 - Research Project 1

Description: The research project is the culminating experience of the student's course and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This substantial discipline related project is achieved across two units where students demonstrate their research capability to collect data and analyse it in relation to the project problem. 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 will be undertaken individually by each student although a number of projects can be closely related to address large challenges or problems. This unit continues from Research Project 1. The focus of this unit is the collection and the analysis of data and formally reporting the conclusions and recommendations. Students will report on their key findings through the oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Implement research methodologies appropriate to the problem and the relevant discipline; 2. Analyse data to demonstrate the feasibility of alternative solutions to the problem under investigation; 3. Produce a range of research based documents consistent with the expectations of the discipline; 4. Effectively communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the relevant audiences.

Class Contact: One hour per week and one hour of meeting with an academic mentor. Students are expected to spend a substantial portion of their time working independently and are expected to attend weekly meetings with their mentors.

Required Reading: None required. Notes from lectures will be provided to students.

Assessment: Report, Interim Report (1500 words or equivalent), 15%. Report, Final Report (4000 words or equivalent), 60%. Presentation, Oral Presentation (15 minutes), 25%.

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; 4. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences. 5. Give high quality oral presentation and defend you approach in solving problem(s)
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: Report, Project Report (20,000 word equivalent))., 80%. Presentation, Oral presentation (10 mins). The presentation is also to be accompanied by a 1-page project abstract., 20%. The project report is effectively a thesis as it is the main outcome of the unit and the honours-level course The outcomes of the project are also presented orally in the final oral presentation during which student will be required to defend their work. As this is the only assessment task that aligns with LO 5, it is a hurdle task.

NEF4205 Sustainable Energy Systems

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit of study aims to provide applied and creative knowledge and skills in the area of sustainable energy systems. The unit reflects on the concept of sustainability in the energy generation sector in order to provide a broad and coherent body of knowledge for the consideration of future energy sustainability. The unit will first analyse conventional energy systems and the effect of emissions from these conventional energy systems. Then, renewable energy systems such as solar, wind, hydro, and biofuels will be introduced and the significance of energy storage technologies will be diagnosed. Technical properties, environmental and economic advantages of these technologies will be discussed and learning activities will focus on mathematical modelling, design, and analysis of exemplar systems. Special emphasis will be given to the critical review of energy conversion principles in turbine based systems including wind and hydro turbines. Energy conversion efficiency and losses occurring during the transformation of mechanical energy to usable electric energy will be specifically diagnosed for a wind turbine case study.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse 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; 3. Research and review the potential alternative energy systems critically reflecting on their local viability; 4. Critically review the theoretical and mechanical aspects of energy conversion in generation systems; 5. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice; 6. Critique efficiencies and losses in the energy conversion process;
Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 2.0 hrs Total of 48 hours, comprising of 12 x 1 hour lectures , 12 x 2 hour Tutorials, 6 x 2 hours of Laboratory work. Lab groups will be running on alternating weeks.
Required Reading: Lecture and tutorial handouts will be distributed as required. Masters, G. (2013) 2nd ed. Renewable and Efficient Electric Power Systems. John Wiley & Sons, Hoboken, NJ.
Assessment: Project, Two Group Reports (Teams of two, 2000 words each), 50%. Test, Two Tests (1 hour each), 50%.

NEF4206 Advanced Engineering Design

Locations: Footscray Park.
Prerequisites: NEF3101 - Project Management Completion of 288 credit points.
Description: Industry demands graduate engineers to undertake all-encompassing design tasks that require a comprehensive range of skills often with minimal training and assistance. In preparation for this challenge, this unit requires students to undertake a range of advanced design tasks based on real life engineering projects. Students will work individually and in a team to resolve a complex engineering problem. Students will implement systems design and project management process, drawing on principles and theoretical knowledge developed in the prerequisite units. 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. To ensure that teams are working towards a realistic project outcome, regular assessments will include written portfolios and oral presentations on progress. Other assessments will comprise of one interim and a final design report that will be supported by a final oral presentation. The reports 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. Demonstrate the capacity to conduct advanced engineering design problems or projects; 2. Identify design problems, propose solutions and complete associated design work in a number of 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: Lecture 1.0 hr Tutorial 3.0 hrs Forty-eight hours per semester, comprised of 1 hour Lectures and 3 hour Tutorials.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Design brief and specification documents will be provided.
Assessment: Portfolio, Individual weekly entries (written) demonstrating design progress and skills development., 20%. Presentation, Intermittent oral presentations providing updates on the design process and demonstration of skills developed., 20%. Presentation, Final Design Presentation, 10%. Report, Interim design report (including design calculations, drawings, and peer assessment) (2500 words), 25%. Report, Final design report (includes peer assessment) (2500 words), 25%. Reports 1 and 2 focuses upon the students' ability to demonstrate his or her fluent application of engineering techniques, tools and resources. The portfolio and presentations assess the individuals' capability against the learning outcomes for that assessment. It also evaluates effective team membership and team leadership. This has been defined in Engineers Australia competencies 2.2 and 3.6. As these reports are one way by which these competencies can be assessed in a team environment, students must achieve a minimum mark of 50% in Reports 1 and 2 in order to pass the unit. .

NEF4207 Engineering Applications

Locations: Footscray Park.
Prerequisites: NEF3101 - Project Management NEC3203 - Structural Engineering Design 1 Completion of 288 credit points.
Description: Practising as an engineer involves the creative application of knowledge in mathematics, science, engineering fundamentals and an engineering specialisation. This unit therefore requires students to gain advanced skills in the process of applying the knowledge obtained in prerequisite units to solve complex engineering problems. More specifically, the fluent and systematic application of these are learnt as applicable to the disciplines of Architectural and Civil Engineering.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate the capacity to apply established engineering methods to solve real-world engineering problems or projects; 2. Research and locate relevant information about the application processes involved in resolving complex problems; 3. Conceptually mapping followed by the implementation of a systems approach to apply an engineering method taking into account technical, environmental, economic and social criteria; 4. Work effectively as a member and/or leader of a team; 5. Demonstrate sound communication skills in preparing requisite technical reports, contributing to team discussions and making oral presentation.
Class Contact: Lecture 1.0 hr Tutorial 3.0 hrs Forty-eight hours per semester, comprising of 1 hour Lectures and 3 hour Tutorials.
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: Presentation, Debate (individual assessment), 30%. Report, Part 1: Portfolio, demonstrate progress towards Part 2., 20%. Report, Part 2: Application report (including calculations, drawings, and peer assessment). Students to work in teams of 3 - 4., 20%. Examination, End of Semester Exam (2 hours), 30%. Assessments are on debates, a project report submission (including a presentation), and a final examination. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.1, 1.2, 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 and 3) which are not assessed within the debate and report. As the final examination is one way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in each of the assessments in order to pass the unit.

NEF6001 Research Project Part A

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT6130 - Introduction to Research EPM5640 - Research Methods Either NIT6130 or EPM5640, plus completion of 48 credit points.
Description: An applied project enables students to investigate an applied contemporary research problem by synthesising and situating complex specialist knowledge, through critical thinking and the purposeful application of analytical and technical skills. Through systematic application and conceptual approaches, students have the potential to make a contribution to the disciplinary evidence-base. The applied project will normally be completed over two study periods. In Applied Project 1, students clearly define a problem from contemporary and emergent settings, create an evidence-based research proposal, and complete a structured, critical review of theoretical and experimental literature on the topic area. The student introduces and formulates the problem and describes the proposed investigation. Applied Project 2 is the continuation of Applied Project 1 work and is usually undertaken in the following study period, when the student must submit a final, formal written report/thesis covering two semesters' work.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse a contemporary research problem related to their discipline, and propose strategies to systematically investigate this specialised topic; 2. Critique and synthesise relevant literature including critically reviewing relevant concepts, theories and technologies to demonstrate multi-faceted insights into the research problem; 3. Formulate and justify an effective evidence-based project plan including appropriate research methodology and methods to collect and analyse data; 4. Effectively communicate with a variety of specialist and non-specialist audiences/stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the relevant audiences.
Class Contact: Tutorial 3.0 hrs Thirty-six hours comprising face-to-face supervision and online activities.
Required Reading: Joyner, R.L., Rouse, W. and Glatthorn, A.A., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press Collins, J. & Hussey, R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London
Assessment: Literature Review, Literature Review (2000 words), 30%. Assignment, Project Proposal (3000 words), 50%. Presentation, Oral Presentation (20 minutes), 20%.

NEF6002 Research Project Part B

Locations: Footscray Park, VU Sydney.
Prerequisites: NEF6001 - Research Project Part A
Description: Applied Project 2 is a continuation of Applied Project 1, usually undertaken in the following study period as an integrated project. This project enables students to independently investigate an applied contemporary discipline-relevant research problem by synthesising and situating complex specialist knowledge, through critical thinking, and the purposeful application of analytical and technical skills. Through systematic application and conceptual approaches, students have the potential to make a contribution to the disciplinary evidence-base. Applied

Project 2 comprises a formal written report / thesis covering two study periods. This document demonstrates the student's ability to clearly define a problem, develop and implement an evidence-based plan, and justify recommendations. Students consolidate skills and confidence in effective, professionally appropriate communication through a formal written report and defence of their conclusions and recommendations through an oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Implement and critically analyse a systematic data collection and analysis plan; 2. Methodically and systematically record experimental data according to professional protocols; 3. Contextual results within a critical literature review to demonstrate multi-faceted insights into the research problem; 4. Effectively communicate with a variety of specialist and non-specialist audiences/stakeholders in an ethical and professional manner and confidently justify findings, and defend conclusions and recommendations.

Class Contact: Lab 1.5 hrs Tutorial 1.5 hrs Thirty-six hours comprising of face-to-face supervision and online activities.

Required Reading: Joyner, R.L., Rouse, W. and Glatthorn, A.A., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London

Assessment: Presentation, Mid Semester Oral Presentation (10 minutes), 10%. Thesis, Final Report (14,000 - 16,000 words), 70%. Presentation, Final Oral Presentation addressing and incorporating feedback (20 minutes), 20%.

NEF6101 Research Thesis 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: A major thesis enables students to investigate a contemporary research problem by critiquing and situating advanced theoretical knowledge, through critical thinking and the purposeful application of analytical and specialist technical skills. Through systematic investigations based on conceptual approaches, students may make a contribution to the disciplinary evidence-base. The 48-credit point thesis is normally completed over two study periods. In Thesis 1, the student clearly defines a problem, develops an evidence-based research plan, and prepares an in-depth, structured critical review of relevant theoretical and experimental literature. 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 submits a final, formal written thesis covering two semesters' work.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse a contemporary research problem related to their discipline, and propose strategies to systematically investigate this specialised topic; 2. Critique and synthesise relevant literature including critically reviewing relevant concepts, theories and technologies to demonstrate multi-faceted insights into the research problem; 3. Formulate and justify an effective, evidence-based research plan including appropriate research methodology and methods to collect and analyse data; 4. Effectively communicate with a variety of specialist and non-specialist audiences in an ethical and professional manner and confidently defend a research plan.

Class Contact: Seminar 3.0 hrs Seventy-two hours for one semester, comprising face-to-face supervision, group seminars and online activities

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Joyner, R.L., Rouse, W. and Glatthorn, A.A., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press

Assessment: Literature Review, Literature Review (4000 words), 30%. Assignment, Research Proposal (5000 words), 50%. Presentation, Oral Presentation (20 minutes), 20%.

NEF6102 Research Thesis 2

Locations: Footscray Park.

Prerequisites: NEF6101 - Research Thesis 1

Description: A major thesis enables students to investigate a contemporary research problem by critiquing and situating advanced theoretical knowledge, through critical thinking and the purposeful application of analytical and specialist technical skills. Through systematic investigations based on conceptual approaches, students may make a contribution to the disciplinary evidence-base. The 48-credit point thesis is normally completed over two study periods. Thesis 2 is a continuation of Thesis 1 and culminates in a comprehensive written report of independently conducted academic research which demonstrates the student's ability to clearly define a problem, implement a research plan, and justify recommendations with reference to their data and a critical review of theoretical and experimental literature. Students consolidate skills in effective, professionally appropriate communication through a formal written report and defence of their conclusions and recommendations through an oral presentation.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Implement and critically analyse a systematic data collection and analysis plan; 2. Methodically and systematically record experimental data according to professional protocols; 3. Contextualise results within a critical literature review to demonstrate multi-faceted insights into the research problem; 4. Effectively communicate with a variety of specialist and non-specialist audiences/stakeholders in an ethical and professional manner and confidently justify findings and defend conclusions and recommendations.

Class Contact: Tutorial 3.0 hrs Seventy-two (72) hours for one semester comprising face-to-face supervision, seminars and online activities.

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Joyner, R.L., Rouse, W. and Glatthorn, A.A., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press

Assessment: Presentation, Oral Presentation (20 minutes), 15%. Thesis, Thesis (final report) (20,000-24,000 words), 85%.

NEM2101 Mechanical Engineering Design

Locations: Footscray Park.

Prerequisites: NEF1204 - Introduction to Engineering Design NEF1205 - 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. 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 techniques. 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 the unit 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. Adapt mechanical engineering design skills to solve authentic, 'real-world' problems taking into consideration relevant variables

Class Contact: Class2.0 hrsLab2.0 hrsContact time 48 hours: Weeks 1-3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 2x2hr lab and 1x1hr seminar

Required Reading: K. Nisbett & R. Budynas (2014) 10th ed. Shigley's Mechanical Engineering Design McGraw Hill

Assessment: Portfolio, Mechanical Design Skills Portfolio: Includes regular homework submissions (mathematical short answer) and a minor assignment on technical drawing, 10%. Portfolio, Design Optimisation Portfolio: Includes 2 minor homework submissions (mathematical short answer) and one minor written report (1000 words approx.), 10%. Test, Mid semester skills test (1 hour), 10%. Examination, Final Examination (3 hours), 70%.

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. Explain micro-structure property relationship of solid materials; 2. Review and advise of limitations of basic materials in engineering design; 3. Apply systematice decision-making process for areas of optimum engineering design and adapt as necessary for a range of contexts; 4. Cognisance of the role materials play in maintaining a sustainable environment; 5. Communicate and justify recommendations effectively through written technical reports individually and as a part of a team.

Class Contact: Class2.0 hrsLab2.0 hrsContact time 48 hours: Weeks 1-3: 3x2hr class and 3x2hr lab and 1x1hr seminar Week 4: 2x2hr class and 2x2hr lab and 1x1hr seminar

Required Reading: Budinski, G.K. & Budinski, K.M. (2009) 9th Engineering Materials - Properties and Selection Prentice-Hall Askeland, D.R., & Wright, J.W. (2018) 4th Essentials of Materials Science and Engineering, Cengage Learning Cengage Learning

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%. Additional conditions: Attendance in all laboratory sessions is compulsory.

NEM2104 Numerical Modelling of Mechanical Systems

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2NEF1104 - Problem Solving for EngineersNEF1205 - Engineering Fundamentals

Description: This Unit of Study introduces students to the application of numerical techniques to model, simulate and predict the behaviour of fundamental mechanical systems and processes. Numerical modelling is becoming increasing employed in designing engineering systems and solutions. The unit exposes student to modern computing tools that are widely used in industry. Students will study various relevant topics including: Generating numerical solutions to Ordinary Differential Equations; the application of statistical techniques to real data such as seismic events, wind energy, ocean wave data and environmental shocks and vibrations; Undertaking basic frequency analysis using the Fourier Transform; Modelling events such as collisions and particle trajectories using numerical differentiation and integration; how to capture and generate signals using modern analogue/digital conversion devices; Produce graphical visualisation of multi-dimensional data. All the topics in the unit will be studied using real-life applications of engineering and physical phenomena.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Use numerical techniques to solve simple ordinary differential equations 2. Calculate moving statistics as well as graphically generate best-fitting probability functions 3. Compute and generate graphical representations of frequency spectra 4. Carry-out numerical differentiation and integration for simple dynamic events 5. Capture and generate signals using analogue/digital conversion devices

Class Contact: Class2.0 hrsWorkshop2.0 hrsContact time 48 hours: Weeks 1-3: 3x2hr class and 3x2hr workshop and 1x1hr seminar Week 4: 2x2hr class and 2x2hr workshop and 1x1hr seminar

Required Reading: All necessary information will be made available on VUC

Assessment: Examination, Mid-semester examination, 30%. Examination, Final examination, 40%. Journal, Journal to show record of work done and learning for each week. Will be inspected regularly and used to provide students feedback on their progress., 30%.

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: Class3.0 hrsSeminar1.0 hrWorkshop1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr workshop and 1x1hr seminar Week 4: 2x3hr class and 2x1hr workshop and 1x1hr seminar
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 2NEM1001 - Algebra and CalculusNEF1101 is equivalent to NEM1001.
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 and fundamental experimental skills. 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: Class3.0 hrsWorkshop1.0 hrContact time 48 hours: Weeks 1-3: 3x3hr class and 3x1hr workshop and 1x1hr seminar Week 4: 2x3hr class and 2x1hr workshop and 1x1hr seminar
Required Reading: Meriam J.L., & Kraige L.G. (2012) 7th ed. Engineering mechanics: Dynamics John Wiley and Sons
Assessment: Portfolio, Short answer mathematical problems (weekly), includes oral presentation of a solution (Individual), 10%. Assignment, Minor laboratory report (max. 3 pages) - Group, 5%. Assignment, Laboratory report (approx. 2000 words) - Group, 20%. Examination, End-of-semester examination (3 hours), 65%.

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

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 prepare individual portfolios. Test, Week 5 test (1 Hour), 10%. Portfolio, Weekly entry that will be evaluated regularly and feedback provided. (Hurdle), 30%. Examination, Final Exam (3 hours), 60%. The portfolio needs to be a hurdle assessment as it is the only task that assesses LO 3 and 6. .

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%. The assignments will be undertaken in pairs or groups of three and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.1, 1.2, 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment). In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

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. Particular attention will be focused on conservation of momentum. The unit will explore dimensional analysis, similarity and modelling with applications extrapolating experimental data based on prototype to full scale engineering devices. Various flows are investigated in more detail including external boundary layers. Students will also study the drag and lift forces, as a result of flow around bluff bodies. Losses in pipe networks will also be investigated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the conservation laws in integral and differential forms to wide ranging contexts to determine the forces on engineering devices from fluid flows; 2. Conduct dimensional and similarity analysis of prototypes or models to extrapolate data to full scale applications; 3. Apply knowledge of turbulent boundary layers and flow around bluff bodies to determine drag and lift; 4. Detailed study of the energy losses in pipe networks; 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, adapted by Prof. Rhim, Yoon Chul., (2016) 8th ed. Fluid mechanics New York, NY McGraw-Hill Education

Assessment: Test, Class test; calculations, sketches (1000 words), 10%. Project, Group project: application of fluid mechanics knowledge to solve a real world problem. (1000 words), 10%. Report, Based on laboratory work. Includes calculations, sketches (1000 words), 10%. Examination, Final Semester Examination (3 hours), 70%. Test: Dimensional analysis, similarity and modelling. Project: Working in groups students will apply their knowledge of fluid mechanics to solve a real world problem then report their findings to their peers. Laboratory Work: Students will conduct experiments in groups. Reports must be presented to a professional standard, with analysis and interpretation of findings/results, consistent with the level of study. .

NEM3203 Stress Analysis

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics

Description: Any object subjected to a load, whether it is a force or a thermal load, will experience a stress and a strain. Understanding how a load causes stress and strain is essential for solving engineering problems. Being able to determine the maximum stress and strain and their locations, is imperative for evaluating and optimising designs. Building on knowledge of structures and equilibrium of forces gained in Solid Mechanics, this unit will allow students to analyse the effects of axial, bending, shear, torsional and thermal loading on mechanical structures and elements using mathematical techniques and computer simulations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and evaluate solutions to engineering problems of 3-dimensional stress and strain, especially fundamental problems of elasticity in mechanical engineering. 2. Collaborate and investigate real-world engineering problems of stress and strain. 3. Present clear and coherent exposition of mechanical engineering knowledge. 4. Analyse and interpret problems, results and their significance.

Class Contact: Class 2.0 hrs Lecture 2.0 hrs Tutorial 2.0 hrs Tutorials and Computer Labs will be conducted on alternating weeks. Odd numbered weeks are in the Tutorial room (2 hours x 6 weeks). Even numbered weeks in the PC Lab (2 hours x 6 weeks).

Required Reading: Nil required texts. Reading material and lecture notes will be provided by the lecturer(s). Recommended text: Mechanics of Materials, R.C. Hibbeler, Edition 9 (SI)

Assessment: Portfolio, Computer modeling of stress and strain - Group (approx. 2,000 words), 15%. Case Study, Case study and portfolio of evidence. Mechanical engineering application - Group (approx. 2,000 words), 25%. Examination, Restricted Open Book Examination (3 hours), 60%. The reports and case study are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment) in order to pass the unit.

NEM4101 Mechanical Vibrations

Locations: Footscray Park.

Prerequisites: NEM3101 - Engineering Analysis and Modelling Either NEM3101 Engineering Analysis and Modelling

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.

NEM4102 Finite Element Analysis

Locations: Footscray Park.

Prerequisites: NEF1204 - Introduction to Engineering DesignCompletion of 192 credit points

Description: This unit will focus on the application of the commercial simulation software ANSYS for the computer simulation of problems related to Mechanical Engineering and Electrical and Electronics Engineering. The unit will introduce students to computational fluid dynamics (CFD) allowing them to solve problems related to flow paths in complex systems. This will include the modelling of natural convective and radiative heat transfer, heat removal from critical electronics, thermal management to improve reliability and prevent premature failure of circuitry and electronic devices used in data centres, large computing facilities and telecommunication environments. The unit will also introduce the modelling of electro-mechanical devices such as electric motors.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Generate CFD models of simple, verifiable geometries with predictable results and of complex geometries with unknown flow fields; 2. Critically evaluate the validity of CFD results and interpret their meaning; 3. Model heat removal systems using CFD and interpret results indicating necessary adjustments; 4. Generate models of simple electro-mechanical devices.

Class Contact: Lecture2.0 hrsTutorial2.0 hrsAll class rooms require ANSYS FEA software loaded.

Required Reading: Notes will be provided by the Lecturer via VU Collaborate.

Assessment: Test, Test of the theory and application of CFD (one hour), 15%. Test, Test - theory and application of CFD and electro-mechanical simulation tools (one hour), 15%. Portfolio, Face to Face and written evidence demonstrating consistent progress related to the learning activities and outcomes. (hurdle task), 70%. The portfolio focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, fluent application of engineering techniques, tools and resources and effective communication in professional and lay domains as defined in Engineers Australia competencies 2.1, 2.2 and 3.2. As the portfolio is the one way by which these competencies can be assessed on an individual basis, this is a hurdle assessment task.

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: Test, Test (week 5, 1 hour), 10%. Portfolio, Comprised of regular minor reports and reflections (written) of the design process and demonstration of the skills developed. (Hurdle), 30%. Examination, Final Examination, 60%. Students will

work in groups of two but prepare individual portfolios. Final Examination is weighted by the average score for group reports. The portfolio is a hurdle assessment as it is the only task that assesses LO 4 and 5.

NIT2102 Cyber Security Essentials

Locations: Footscray Park.
Prerequisites: Nil.
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).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Audit a system for security vulnerabilities by managing and using system security and logging tool; 2. Identify strengths and weaknesses in security products and apply security tools to strengthen a networked system; 3. Analyse a system for deploying appropriate security solutions including security policies and practices; 4. Design and implement a security solution given a set of constraints.
Class Contact: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: Lecturer may supply additional/alternative material. Jie Wang, Zachary A. Kissel (2015) 2nd ed. Introduction to Network Security: Theory and Practice John Wiley & Sons (Asia) REFERENCE TEXTS: Mark Ciampa (2017) CompTIA Security + Guide to Network Security Fundamentals, 6th ed. Cengage Learning UK CCNA Security 2.0
Assessment: Laboratory Work, Practical Lab Work (2 Hours), 25%. Assignment, Individual Assignment (solving practical problems), 35%. Examination, Final Written Examination (3 hours), 40%.

NIT2112 Object Oriented Programming

Locations: Footscray Park, VU Sydney.
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: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
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, VU Sydney.
Prerequisites: NIT1102 - Introduction to Programming BCO1102 - Information Systems for Business NIT1102 OR BCO1102.
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: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: There are no Required Texts for this unit and the below is a Recommended Text only: Choi, P., McGuire, C., Roth, C., Carroll, D., Tran, N., Leszek, A. & Donnelly, B. (2016) Version 9.2 SalesForce.com Fundamentals: An Introduction to Custom Application Development in the Cloud SalesForce.com
Assessment: Assignment, Cloud application design (1000 words), 25%. Project, Cloud application development (1000 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2122 Server Administration and Management

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
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: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: Ross Mistry, Shirmattie Seenarine (2012) 2nd Microsoft SQL Server 2012 Management and Administration Sams Publishing
Assessment: Laboratory Work, Practical Knowledge Test (one hour), 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2124 Network Management

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT1104 - Computer Networks
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. Master the applicability of the available tools; 4. Perform network management tasks.
Class Contact: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: CISCO (2018) SNMP Configuration Guide (online) CISCO Recommended reading: Alexander Clemm (2006), Network Management Fundamentals 1st ed. Cisco Press Douglas Mauro, Kevin Schmidt (2009), Essential SNMP, 2nd ed. O'Reilly Media
Assessment: Assignment, Technical Report, 25%. Test, Practical Knowledge Test, 25%. Examination, Final Written Examination (2 hours), 50%.

NIT2171 Introduction to ICT Management

Locations: Footscray Park, VU Sydney.
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: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: Schilling, M (2012) 4th ed. Strategic Management of Technological Innovation McGraw-Hill, USA Recommended Reading: Fitzsimmons, J.A & M.J Fitzsimmons (2010) Service Management: Operations, Strategy, Information Technology, McGraw-Hill, USA. Adomi, Esharenana E. (2010) Frameworks for ICT Policy: Government, Social and Legal Issues: Government, Social and Legal Issues, IGI Global
Assessment: Test, two tests (10% each), 20%. Assignment, Group assignment (2000-2500 words), 30%. Examination, (3 hours), 50%.

NIT2201 IT Profession and Ethics

Locations: Footscray Park, VU Sydney.
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: Class2.0 hrsWorkshop2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr workshop Week 4: 2x2hr class and 2x2hr workshop
Required Reading: Reading material will be provided by the unit coordinator and will be appropriate to the topic under investigation.
Assessment: Assignment, Assignment 1 (1000-1500 words), 25%. Assignment, Assignment 2 (1000-1500 words), 25%. Examination, Final Written Examination (2 hours), 50%.

NIT2202 Big Data

Locations: Footscray Park.
Prerequisites: Nil.
Description: 'Big Data' phenomenon is an emerging force in the global business world. It is characterised by five Vs: Volume, Velocity, Variety, Veracity and Value. It increasingly makes data sets too large to store and analyse beyond the ability of traditional relational database technology. This unit provides fundamentals related to the technology and the core concepts behind big data problems, applications, and systems. It provides an introduction to the most common open-source software framework to increase the potential for data to transform our world. Students will develop comprehensive understanding of the challenges that organisations are facing for managing 'Big Data' and the technological solutions for efficient and strategic decision making.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and illustrate Big Data challenges to the business world; 2. Explain the impact of Big Data's five V's (volume, velocity, variety veracity and value) using real world examples; 3. Implement architectural components and programming models of commonly used Big Data; 4. Install and execute a technological solution using open-source software framework.
Class Contact: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: Lecturer may supply additional reading material. Sridhar Alla (2018) 1st ed. Big Data Analytics with Hadoop 3 Packt Publishing Ltd REFERENCE TEXTS: Dirk deRoos et al (2014) Hadoop for Dummies, 1st ed, Wiley; Tom White

(2015) Hadoop: The Definitive Guide , 4th ed, O'Reilly Media.
Assessment: Test, Knowledge Test (1 hour), 25%. Laboratory Work, Weekly Practical Lab Work, 25%. Case Study, Individual assignment on big data management (2000-2500 words), 50%.

NIT2213 Software Engineering

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
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: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
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 (45 minutes), 25%. Assignment, PC Lab Assignment (students in pairs, 500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2222 Networking Technologies

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
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: Class2.0 hrsLab1.5 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab
Required Reading: Kurose, J.F. & Ross, K.W., (2012) 6th 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.

NIT2271 ICT Change Management

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
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: Class2.0 hrsLab2.0 hrs"Contact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab"
Required Reading: Text will be provided by the lecturer.Esther Cameron and Mike Green, (2015) 4th ed. Making Sense of Change Management : A Complete Guide to the Models, Tools and Techniques of Organizational Change Kogan Page Ltd Recommended Reading: Melanie Franklin (2014), Agile Change Management : A Practical Framework for Successful Change Planning and Implementation, Publisher Kogan Page Ltd
Assessment: Test, two tests (10% each), 25%. Assignment, Assignment (equivalent to 1,000 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3001 IT Professional 1

Locations: Footscray Park.
Prerequisites: Students have to complete the common first year and six units of a major plus two units of the graduating core in the second year.
Description: In this unit, the first of two IT Professional units, students will undertake an IT industry placement of at least 192 hours during the semester. Students will put into practice the knowledge and skills developed in their course. The placement needs to be approved by the Course Coordinator. Students will get an opportunity to gain valuable real-world IT professional experience, and know the relevant industry practices such as the respective skill of particular major 'Web and Mobile Application Development', 'Network and System Computing', time management, project management, client liaison, and budgets.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Gain relevant industry experience; 2. Demonstrate critical reflective practice in the assessment of their personal strengths and development needs in the context of their work-readiness and career planning; 3. Identify and convey the knowledge, skills and attributes required for the professional workplace in a relevant IT major setting; 4. Develop leadership skills by working on a project within an industry; 5. Apply degree-related knowledge and skills to real-life situations.
Class Contact: Placement consists of 16 hours per week * 12 weeks = 192 hours.
Required Reading: Nil.
Assessment: Journal, Reflective Journal, 20%. Presentation, Presentation of Project, 30%. Report, Industry Experience and Mentor Report on the project, 50%. Reflective Journal: completed at the end of each week of placement, not required for week 1 and 12. Presentation of Project: completed within the 12 weeks of industry placement. Industry Experience and Mentor Report on the project: completed within the 12 weeks of industry placement.

NIT3002 IT Professional 2

Locations: Footscray Park.
Prerequisites: NIT3001 - IT Professional 1
Description: In this unit, students will continue undertaking IT industry placement of at least 192 hours during the semester after completing the first unit, Industry

Placement 1. Students will put into practice the knowledge and skills developed in their course. The placement needs to be approved by the Course Coordinator. The students will get an opportunity to gain valuable real-world IT professional experience, and know the relevant industry practices such as the respective skill of particular major 'Web and Mobile Application Development', 'Network and System Computing', time management, project management, client liaison, and budgets.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Gain relevant industry experience; 2. Apply degree-related knowledge and skills to real-life situations; 3. Develop leadership skills by working on a project within an industry; 4. Review and reflect on the insights gained from the immersion in a professional setting, and the impact of this experience in their career development; 5. Get ready for future professional pathways.

Class Contact: Placement consists of 16 hours per week * 12 weeks = 192 hours.

Required Reading: Nil.

Assessment: Journal, Reflective Journal, 20%. Presentation, Presentation of Project, 30%. Report, Industry Experience and Mentor Report on the project, 50%. Reflective Journal: completed at the end of each week of placement, not required for week 1 and 12. Presentation of Project: completed within the 12 weeks of industry placement. Industry Experience and Mentor Report on the project: completed within the 12 weeks of industry placement.

NIT3101 IT Project 1

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2201 - IT Profession and EthicsNIT2202 - Big DataNIT2213 - Software EngineeringNIT2122 - Server Administration and ManagementNIT2222 - Networking Technologies(NIT2201 and NIT2202 and NIT2213) OR (NIT2201 and NIT2122 and NIT2222)

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. 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. Work collaboratively to demonstrate initiative, responsibility and accountability for own learning and professional practice within IT project management in authentic, contemporary settings 4. Effectively communicate complex ideas and judgements in planning, problem solving and decision-making in professional settings to a range of audiences

Class Contact: Tutorial4.0 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 (4,000-5,000 words), 50%.

NIT3112 Advance Web Application Development

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT1101 - Web Development and CMSNIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringNIT1101 OR NIT2112 OR NIT2213

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 hrsTutorial2.0 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 and development, 25%. Project, Large web system prototyping and development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3114 Online Business System Development

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringNIT2112 OR NIT2213

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: Lab1.0 hrTutorial1.0 hrWorkshop2.0 hrsTotal of 44 hours comprising of workshops, tutorials and laboratory work.

Required Reading: J. Valacich & C. Schneider (2018) 8th ed. (Global Edition) Information Systems Today Pearson Education

Assessment: Assignment, Online business system design and analysis (1000 words equivalent), 25%. Project, Online business system prototype development (1000 words equivalent), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3122 Enterprise Network Management

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2122 - Server Administration and ManagementNIT2222 - Networking TechnologiesNIT2122 or NIT2222

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 Tutorial 2.0 hrs

Required Reading: Shannon McFarland (2011) 1st ed. IPv6 for Enterprise Networks (Networking Technology) Cisco Press

Assessment: Examination, Final Written Examination (3 hours), 50%. Laboratory Work, Practical Tasks (4 to 6 labs), 20%. Assignment, Enterprise network Design and Implementation, 30%.

NIT3171 ICT Business Analytics and Data Visualisation

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2171 - Introduction to ICT Management NIT2202 - Big Data NIT2271 - ICT Change Management NIT2171 OR NIT2202 OR NIT2271.

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 Tutorial 2.0 hrs

Required Reading: Lecturer may supply additional/alternative material. Brendan Tierney (2014) 1st ed. Predictive Analytics Using Oracle Data Miner McGraw-Hill

Assessment: Test, Knowledge Test (1hour), 25%. Project, Group project on BA solution development, 25%. Assignment, Individual assignment reviewing business analytics, 50%.

NIT3201 IT Project 2

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2201 - IT Profession and Ethics NIT2202 - Big Data NIT2213 - Software Engineering NIT2122 - Server Administration and Management NIT2222 - Networking Technologies (NIT2201 and NIT2202 and NIT2213) OR (NIT2201 and NIT2122 and NIT2222)

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. Work collaboratively to demonstrate initiative, responsibility and accountability for own learning and professional practice within IT project management in authentic, contemporary settings 4. Effectively communicate complex ideas and judgements in planning, problem solving and decision-making in professional settings to a range of audiences

Class Contact: Tutorial 4.0 hrs Forty-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 (1,000-2,000 words per student), 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).

NIT3202 Data Analytics for Cyber Security

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit explores the essential knowledge and skills of data science and big data analytics, in particular, their applications into cyber security. Content includes: in-depth study of large-scale data management, processing, mining, curation, and analysis; big data technologies, e.g., batch processing and stream processing, as well as tools, e.g., Hadoop and MapReduce; challenges of data security, e.g., data provenance, privacy, and secure storage; topics on security analytics, e.g., analytics model, threat detection analytics, botnet identification, and events analytics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply appropriate data analytics methodologies and tools to improve the business intelligence; 2. Program and develop applications to implement data analytics techniques; 3. Implement a framework to achieve data security in Internet; 4. Design analytics solutions for a variety of cyber attacks.

Class Contact: Lab 1.0 hr Tutorial 1.0 hr Workshop 2.0 hrs Total of 44 hours comprising of workshops, tutorials and laboratory work.

Required Reading: Lecturer may supply additional reading material. William Easttom (2016) 3rd ed. Computer Security Fundamentals Pearson IT Certification REFERENCE TEXTS: Thomas Erl, Wajid Khattak, and Paul Buhler (2016) Big Data Fundamentals: Concepts, Drivers & Techniques 1st ed., Prentice Hall

Assessment: Laboratory Work, Practical Lab Work (2 hours), 25%. Assignment, Individual Assignment (solving practical problems), 35%. Examination, Final Written Examination (3 hours), 40%.

NIT3213 Mobile Application Development

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2112 Object Oriented Programming OR NIT2213 Software Engineering

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 hrsTutorial2.0 hrs
Required Reading: Steve Derico (2015) 1st ed. Introducing iOS 8 O'Reilly Media Neil Smyth (2015) 6th ed. Android Studio Development Essentials eBookFrenzy
Assessment: Test, Practical Knowledge Test (one hour), 25%. Project, Mobile application development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3222 Virtualisation in Computing

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT2122 - Server Administration and ManagementNIT2222 - Networking TechnologiesNIT2122 or NIT2222
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 hrsTutorial2.0 hrs
Required Reading: John Savill (2016) 1 Mastering Windows Server 2016 Hyper-V SYBEX Recommended reading: Jason Kappel, Anthony Velte, and Toby Velte (2009), Microsoft Virtualization with Hyper-V, McGraw Hill
Assessment: Test, Practical Knowledge Test (one hour), 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, VU Sydney.
Prerequisites: NIT2171 - Introduction to ICT ManagementNIT2271 - ICT Change ManagementNIT2171 OR NIT2271
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 hrsTutorial2.0 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 (one hour), 10%. Project, Team Project: Business Website Development, 40%. Examination, Final Examination (3 hours), 50%.

NIT5081 Fundamentals of Cyber Security

Locations: Footscray Park, VU Sydney.
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: Lab2.0 hrsLecture1.0 hrThirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.
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, VU Sydney.
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 Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

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, VU Sydney.

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 Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

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, VU Sydney.

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 Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

Required Reading: Clark, D., Berson, T. and Lin, H.S., (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: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Kurose, J.F. and Ross. K.W., (2012) 6th ed. 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%.

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. Compare and critically evaluate alternative life cycle models for a given project, and formulate recommendations for an appropriate model. 2. Evaluate requirements for a complex software system. 3. Quantify and prioritise project tasks and assign resources. 4. Construct and explicate software development techniques for both classical and objected oriented systems. 5. 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 Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Schach, S.R., (2010) 8th ed. Object Oriented and Classical Software Engineering McGraw Hill
Assessment: Test, Three (3) Lab Tests (1 hour per test, 3 hours in total), 30%. Assignment, Team Assignment (3-4 students), 20%. Examination, Final Examination (3 hours), 50%.

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 Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Elmasri, R. and Navathe, S.B., (2015) 7th ed. Fundamentals of Database Systems Pearson
Assessment: Test, Lab Test (2 hours), 20%. Assignment, Term assignment (3000 words), 20%. Examination, Final Examination (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: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: 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 (2000 words), 20%. Assignment, Practical programming project 2 (3000 words), 30%. Examination, Summative assessment (2 hours), 50%.

NIT6110 Advanced Wireless Networking

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
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 Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Burbank, J.L., Andrusenko, J., Everett, J.S., Kasch, W.T.M., (2013) 1st ed. Wireless Networking: Understanding Internetworking Challenges Wiley-IEEE Press
Assessment: Report, Weekly Labs (100 word report for each Lab), 20%. Project, Design Project Report (2000 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. Design and implement 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 Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Thomas J. Duffy, (2013) 1st ed. 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 presentation and research assignments.

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 Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Research material including recent research publications will be provided by the lecturer.

Assessment: Assignment, Ethics Issues (2,000 words), 25%. Assignment, Literature review (2,000 words), 30%. Assignment, Research Proposal, Methodology, Experiment Design (4,000 words), 45%.

NIT6150 Advanced Project

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5110 - Networking Systems NIT5130 - Database Analysis and Design NIT5150 - Advanced Object Oriented Programming EPM5600 - Principles of Project Management EPM5700 - Project Management and Information Technology (NIT5110 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. 7. Critically Reflect understanding on computer ethics in practical project development.

Class Contact: Tutorial 3.0 hrs Thirty-six (36) hours for one semester comprising face-to-face tutorials and via virtual classroom supervision and online activities.

Required Reading: Schach, S.R., (2010) 8th ed. Object Oriented and Classical Software Engineering McGraw Hill

Assessment: Report, Project Proposal (1000 words), 10%. Project, System Analysis and Design Report (2000 words), 40%. Project, Final System Delivery and Evaluation (3000 words), 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. Extrapolate 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: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Han, J., and Kamber, M. (2011) 3rd ed. Data Mining: Concepts and Techniques Morgan Kaufmann

Assessment: Assignment, Assignment 1 - Development of data warehouse (1000 word report and 200 line codes), 20%. Assignment, Assignment 2 - Data mining project, soft code and analysis report (1000 word report and 200 line codes), 20%. Examination, Final Exam (3 hours), 60%.

NNM6001 Electrical Power Systems, Analysis and Operation

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit critically examines the planning, design and operation of electrical transmission and distribution networks in the deregulated Australian power industry. Load flow analysis methods are experimented with in their use as network planning and analysis tools. Contemporary approaches including Gauss-Seidel, Newton-Raphson, and Fast Decoupled load flow analysis methods are cross examined as alternative and complementary strategies in the operation, design and planning of electrical distribution and transmission networks. The unit diagnoses electrical insulation properties and characteristics, insulator selection and 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 are decoded as enduring challenges to be addressed through networks. The impact of breakdown in gases, liquids and solids on the provision of reliable electrical insulation in electrical networks will be evaluated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate and critique different load flow techniques including analysis of a multi-bus system; 2. Devise solutions to complex power system problems using contemporary engineering methods; 3. Investigate electrical insulation properties and characteristics including: insulator selection, insulation co-ordination in electric energy networks to optimise operational reliability; 4. Inquire into and hypothesise about impacts of overvoltages, and lightning on transmission and distribution networks, 5. Diagnose surge propagation and circuit interruption theories and circuit breaker operation on reliable insulation and protection of electrical networks; 6. Analyse transient and dynamic stability in power system networks;

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Lab groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.

Required Reading: Lecture and tutorial handouts will be distributed as required. Saadat, H. (2011) 3rd ed. Power System Analysis. PSA Publishing LLC. Recommended Texts: Glover, J. D., Sarma, M. S. & Overbye, T. J. (2016) Power System Analysis and Design. 6th ed. Cengage Learning. Arora, R. and Mosch, W. (2011) High Voltage and Electrical Insulation Engineering. 1st ed. Wiley.

Assessment: Laboratory Work, Four (4) Laboratory Reports (Team of two; 1500 words per lab report), 20%. Project, Project Report (Team of two; 2500 words), 20%. Examination, Final Examination - Closed Book (3 hours), 60%.

NNM6002 Electric Energy Systems Protection and Communication

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study covers applied and creative knowledge and skills in the areas of electric energy systems protection and communication. The unit is delivered in two parts: Part A - Protection: Part A investigates the planning, design and operation of protection systems in electrical generation, transmission and distribution systems. Design standards and performance requirements are critically reviewed and different principles and types of protection systems (over-current, impedance, differential, backup, fuses) are hypothesised. Application of protection systems to generators, motors, transmission lines, transformers, busbars, and distribution networks will be diagnosed. Sources of overvoltages and lightning impact on transmission and distribution networks will be debated. Surge propagation theory, circuit interruption theory and operation of instrument transformers will be assessed.

Part B - Communication: Part B deconstructs the relationships between power system automation, control, and communication concepts and technologies, as integral elements of a state of the art power system network, i.e. a smart grid informed by the IEC 61850 protocol. Power system automation, protection and control concepts will be explored with examples from real world applications such as SCADA technologies. Part B will also revise the communication technologies, network topologies, and standardization efforts in the power systems communication arena, and analyse the effectiveness of 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 substantiated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Hypothesise and adapt different protection schemes applicable to generation, transmission and distribution systems and evaluate the effectiveness of the adaptation; 2. Design contemporary protection systems including relay settings and protection coordination to meet emerging challenges; 3. Design communication media and architectures for protection applications in power systems; 4. Deliberate upon recent innovations in power system communications to generate insights into the operation of modern protection schemes; 5. Investigate communication standards, protocols and architectures most commonly employed in power system protection and distribution networks for a reliable and secure network; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Laboratory groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.

Required Reading: Lecture and tutorial handouts will be distributed as required. Kalam, A. and Kothari, D.P. (2010) 1st ed. System Protection and Communications. New Age International (P) Ltd. Hewitson, L. G. (2005) 1st ed. Practical Power

System Protection. Elsevier.

Assessment: Test, One Mid-Semester Test (1 hour duration), 15%. Laboratory Work, Two Laboratory Group Reports (Team of two, 1500 words), 15%. Project, Team Project Report (Team of two, 2500 words), 20%. Examination, Final Examination (3 hours closed book), 50%.

NNM6003 Overhead and Underground Power Line Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit advances students' skills, capabilities and specialist knowledge in cable systems, types of system topologies, manufacturing practices and relevant standards. Students will investigate and resolve complex problems in overhead and underground design and construction of power distribution networks through the application of advanced theoretical knowledge, critical analysis and professionally-relevant practical skills. The uses and design parameters of equipment necessary for underground system design will be investigated. Subsequently, basic underground cable design practices are reviewed and installation practices for both transmission and distribution projects are justified. Relevant application concepts such as hydraulic pressures, commissioning and industry standards will be articulated. Students will also critically review and reflect on power delivery requirements (in voltage and megawatts) and the maximum outage limitations in order to survey the electrical, mechanical and environmental requirements for an Australian overhead line.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adapt specialist technical knowledge of cable systems, manufacturing practices and standards to a variety of current professional contexts; 2. Design and implement specifications for equipment needed for an underground system design; 3. Investigate underground cable design and installation practices for both transmission and distribution projects to optimise operational reliability and safety; 4. Critically reflect on specialised technical knowledge and skills to design for the electrical, mechanical and environmental requirements for Australian overhead lines; 5. Design and simulate an overhead line for a given Basic Insulation Line (BIL) and conduct transient analysis from a lightning and switching perspective; 6. Conceptually map and evaluate the key design aspects of overhead line construction and maintenance including OHS requirements and long-term operational regimes; and 7. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial1.0 hrForty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Laboratory groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.

Required Reading: Lecture and tutorial handouts will be distributed as required.

Assessment: On successful completion of this unit, students will be able to: Test, Mid-Semester Test (1 hour), 30%. Project, Team Project Report (Team of two, 4000 words), 30%. Examination, Final Examination (3 hours), 40%.

NNM6004 Alternative Energy Systems and Power Electronics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study covers knowledge and skills in the two broad areas of alternative energy systems and power electronics. 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 critique and recommend alternative energy systems for a range of contexts. Part A will diagnose conventional energy systems and the emissions associated with these systems. Then, students will investigate 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 assessed with learning activities focusing on mathematical modelling, and analysis of these alternative generation technologies. Design of hybrid systems and their integration to existing distribution and transmission systems will be diagnosed. Part B - Power Electronics: Part B critically examines 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, to critique and recommend power conversion systems for a range of applications. The use of electronic speed control techniques for DC motor drives will be explored for different applications. AC-DC single-phase and three-phase power converters: Diode and SCR bridge rectifiers will be investigated. DC-DC Switching Mode Power Converters, buck converters and boost converters, and Buck-boost converters will be analysed. Other topics to be covered include: unipolar and bipolar voltage switching method, push pull converters, and 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. 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. Research and review potential of alternative energy systems critically reflecting on their local viability; 4. Evaluate the operation of power semiconductor switches in a range of operational settings; 5. Verify theoretical concepts informing building blocks of power electronics conversion as implemented in different operational environments; 6. Critique AC/DC and DC/DC power converters; and design different types of switching power supplies to increase efficiency; 7. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial1.0 hrForty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Laboratory groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.

Required Reading: Lecture and tutorial handouts will be distributed as required. Masters, G. (2013) 2nd ed. Renewable and Efficient Electric Power Systems John Wiley & Sons, Hoboken, NJ. Trzynadlowski, A. M. (2015) 3rd ed. Introduction to Modern Power Electronics John Wiley & Sons. Recommended Reading: Simoes, M. G. and Farret, F. A. (2016) Modeling Power Electronics and Interfacing Energy Conversion Systems. 1st ed. John Wiley & Sons.

Assessment: Laboratory Work, Two Laboratory Group Reports (Team of two, 1500 words), 20%. Test, Mid-Semester Test (1 hour), 10%. Project, Team Project Report (Team of two, 3000 words), 20%. Examination, Final Examination (3 hours), 50%.

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: Class2.0 hrsLecture1.0 hrTutorial2.0 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.

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: Class2.0 hrsLecture1.0 hrTutorial2.0 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: Class2.0 hrsLecture1.0 hrTutorial2.0 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: Lecture1.0 hrSeminar2.0 hrsTutorial1.0 hrWorkshop1.0 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.

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%.

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: The texts below are recommended only.Wong, D. K. (2012) 5th ed. Fundamentals of wireless Communications Hoboken: Wiley Rappaport T. S. (2007) 2nd ed. Wireless Communications. New Jersey: Prentice-Hall. Molisch, A. F. (2005) 2nd ed. Wireless Communications. Chichester: Wiley

Assessment: A pass must be achieved in each assessment item to complete the unit. Test, Written Tests x 2 (1 hour each - equivalent to 1000 words), 30%. Laboratory Work, Laboratory Reports x 2 (1000 words each report), 30%. Examination, Final Examination (3 hours), 40%.

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: Seminar 3.0 hrs Forty-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: Seminar 3.0 hrs Forty-eight (48) hours for one semester comprising lectures, tutorials. Additional self-directed learning comprising assignments, projects and laboratory work.

Required Reading: The texts below are recommended only. 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. Test, Two (2) Class Tests (1 hour each), 30%. Laboratory Work, Two (2) Laboratory Practicals (equivalent to 2000 words), 30%. Examination, Final Examination (3 hours), 40%.

NPU2101 Analytical Methods 1

Locations: Footscray Park.

Prerequisites: RCS1110 or RCS1601 and RCS1120 or RCS1602

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: Class3.0 hrsLab4.0 hrsWorkshop4.0 hrsContact time 40 hours: Weeks 1-3: 1x3hr class and 2x4hr lab Week 4: 1x3hr class and 1x4hr workshop

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 skills are a critical part of the Learning Outcomes of this Unit and therefore students MUST pass the laboratory component in order to pass the Unit. The laboratory component of this Unit has a minimum attendance requirement of 80% (which equates to missing no more than 2 lab sessions out of 11 sessions) and students who fail to meet the minimum attendance requirements may wish to submit a Special Consideration application to the Unit Convenor.

NPU2102 Analytical Methods 2

Locations: Footscray Park.

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: Class3.0 hrsLab4.0 hrsWorkshop4.0 hrsContact time 40 hours: Weeks 1-3: 1x3hr class and 2x4hr lab Week 4: 1x3hr class and 1x4hr workshop

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: Footscray Park.

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: Class3.0 hrsLab3.0 hrsWorkshop5.0 hrsContact time 44 hours: Weeks 1-3: 1x3hr class and 3x3hr lab Week 4: 1x3hr class and 1x5hr workshop

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: Footscray Park.

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: Class5.0 hrsWorkshop3.0 hrsContact time 35 hours: Weeks 1-3: 3x3hr workshop Week 4: 1x5hr class and 1x3hr workshop
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: Footscray Park.
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: Class2.0 hrsField TripContact time 43 hours: Weeks 1-3: 3x2 hr class Week 4: 2x2 hr class Also 3x7 hr field trips
Required Reading: Attiwill, P., (2007) Ecology: An Australian Perspective Oxford
Assessment: Assignment, Assignments (2,000 words), 20%. Report, Field Work Report #1 (1,300 words), 20%. Report, Field Work Report #2 (1,300 words), 20%. Presentation, Oral (20 minutes) and written presentation (3,000 words), 40%.

NPU3101 Pharmaceutical Regulatory Processes

Locations: Werribee, Footscray Park.
Prerequisites: NPU2102 - Analytical Methods 2
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: Lab3.0 hrsLecture2.0 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.
Prerequisites: NPU2103 - Organic SynthesisNPU2104 - 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: Lab1.5 hrsLecture1.5 hrsTotal face-to-face delivery 36 hrs comprising: 18 hours of lectures and 18 hours of computer labs.
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.

Prerequisites: NPU2103 - Organic Synthesis
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 2.0 hrs Lecture 2.0 hrs Total face-to-face delivery 44 hrs comprising: 24 hours of lectures and 20 hours of lab work.
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: Footscray Park.
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: Class 4.0 hrs Lab 3.0 hrs Workshop 2.0 hrs Total face-to-face delivery 44 hrs comprising: 8 hours of classes, 6 hours of workshops and 30 hours of lab work.
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: Footscray Park.
Prerequisites: RBF1310 - Biology 1R BF1320 - Biology 2R BF2610 - 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 reproductive interventions such as manual pollination or selective breeding.

Class Contact: Field TripLab3.0 hrsLecture2.0 hrsWorkshop2.0 hrsTotal face-to-face delivery 44 hrs comprising: weeks 1-12: 12 x 2 hr lectures, weeks 2, 3, 5 and 7: 4 x 3 hr labs (biology), weeks 4 and 8: 2 x 2 hr computer workshops and week 10: 1 x 4 hr field trip

Required Reading: Frankham. R., Ballou, J.D., Briscoe, D.A., (2010) Introduction to Conservation Genetics Cambridge University Press, Cambridge

Assessment: Report, Practical reports and simulations, 20%. Assignment, Written Assignment (2,000 words), 30%. Presentation, Class Presentation of the assignment (30 min), 30%. Report, Lab Report (2,000 words), 20%.

RBF2610 Fundamentals of Ecology

Locations: Footscray Park.

Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2Or 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: Class2.0 hrsField TripContact time 43 hours: Weeks 1-3: 3x2hr class Week 4: 2x2hr class Also 3x7hr field trips

Required Reading: Attiwill, P. & Wilson, B., (2006) Ecology: An Australian perspective Oxford University Press

Assessment: Assignment, Field Studies #1 (1000 words), 20%. Assignment, Field Studies #2 (1000 words), 20%. Assignment, Field Studies #3 (1000 words), 20%. Examination, Final Exam (2 hours), 40%.

RBF2620 Australian Plants

Locations: Footscray Park.

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, 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: Class3.0 hrsField TripLab4.0 hrsContact time 44 hours: Week 1: 1 x 3hr class, 1 x 4hr lab, 1 x 8hr field trip Weeks 2-3: 1 x 3hr class, 2 x 4hr lab Week 4: 1 x 4hr lab, 1 x 3hr class

Required Reading: Knox, B., Ladiges, P., Evans, B., & Saint, R. (2010) 4th ed. Biology McGraw-Hill

Assessment: Laboratory Work, Practicals (6 x labelled illustrations, 100-150 words each), 20%. Assignment, Written Report (1000 words), 15%. Portfolio, Approximately 30 page Herbarium, 25%. Examination, Examination (2 hours), 40%.

RBF2640 Australian Animals

Locations: Footscray Park.

Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2

Description: This unit builds on Biology 1 and 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; 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: Class2.0 hrsField TripContact time 43 hours: Weeks 1-3: 3x2hr class Week 4: 2x2hr class Also 3x7hr field trips

Required Reading: Hickman, C. (Jr); Keen, S.; Larson, A.; Eisenhour, D.; l'Anson, H. and Roberts, L. (2016) 17th ed. Integrated Principles of Zoology McGraw-Hill

Assessment: Assignment, Essay, 20%. Other, Practical Assessment, 40%. Examination, Final Examination (3 hours), 40%.

RBF3110 Marine & Freshwater Ecology

Locations: Footscray Park.

Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2RBF2640 - Australian

Animals

Description: This unit builds on units Biology 1 and 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, diagrammatically and in writing, complex information on a range of ecologically important concepts in relation to marine and freshwater ecosystems.

Class Contact: Field TripLecture2.0 hrsContact time 44 hrs comprising: weeks 1-12: 12 x 2 hr lectures, 2 x 6.5 hr field trips in week 2 & 4 and a 7 hr field trip in week 7.

Required Reading: Boulton, A.; Brock, M.; Robson, B.; Ryder, D.; Chambers, J. and Davis, J. (2014) 2nd ed. Australian freshwater ecology: processes and management John Wiley & Sons Mapstone, B.D. ed. (2017) 1st ed. Oceans: Science and Solutions for Australia CSIRO Publishing

Assessment: Essay, Essay (2000 words), 25%. Report, Two (2) field reports (1500 words each, 25% each), 50%. Presentation, Oral Presentation (15 minutes), 25%.

RBF3210 Environmental Rehabilitation

Locations: Footscray Park.

Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2

Description: This unit Environmental Rehabilitation builds on Biology 1 and 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: Field TripLecture2.0 hrsContact time 44 hrs comprising: weeks 1-12: 12 x 2 hr lectures, 2 x 6.5 hr field trips in weeks 5 & 7 and a 7 hr field trip in week 9.

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, Herbarium submission of 20 specimens, 25%. Report, Written Field Report (1500 words), 25%. Presentation, Management Plan: Individual/Group written/Oral report (2000 words/7 minutes), 25%. Report, Vegetation Report (2000 words), 25%.

RBF3620 Conservation and Sustainability

Locations: Footscray Park.

Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2RBF2610 - 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: Field TripLecture2.0 hrsContact time 44 hours: Weeks 1-12: 12 x 2 hrs lectures Week 5 and 7: 2 x 6.5 hrs field work Week 9: 1 x 7 hrs field work

Required Reading: Lindenmayer, D. and Burgman, M., (2016) Practical Conservation Biology CSIRO Publishing, Collingwood.

Assessment: Assignment, Field Report #1 (1500 words), 20%. Assignment, Field Report #2 (1500 words), 20%. Essay, Major assignment (2500 words), 40%. Presentation, Community participation and Oral Presentation (10 min), 20%.

RCM2611 Linear Statistical Models

Locations: Footscray Park.

Prerequisites: NEM1002 - Statistics for Decision Making

Description: In this unit, Linear Statistical Models, students are introduced 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 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.

Class Contact: Class3.0 hrsLab3.0 hrsWorkshop2.0 hrsContact time 44 hours: Weeks 1-3: 3x3hr class, 1x3hr computer lab Week 4: 2x3hr class, 1x2hr computer workshop

Required Reading: Reading materials for this unit will be made available via VU Collaborate.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 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.

RCM2713 Modelling for Decision Making

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit builds on first year mathematical units 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: Class2.0 hrsTutorial2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr tutorial Week 4: 2x2hr class and 2x2hr tutorial

Required Reading: Bender, E. A. (2003), Introduction to Mathematical Modelling, Dover Publications Inc., New York

Assessment: Assignment, Assignment #1 consisting of Mathematical problems (approx.1,000 words), 15%. Assignment, Assignment #2 consisting of Mathematical problems (approx.1,000 words), 25%. Examination, Final Exam (3 hours), 60%.

RCM2911 Linear Optimisation Modelling

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces the topic of linear modelling, which is modelling by means of linear inequalities. Such problems arise in every aspect of industry, economics, planning, and management, and the modelling and solution of such problems has become a vital and central part of modern applied mathematics. The emphasis in the unit is on modelling: the creation of a mathematical model to describe a problem. Students are introduced to basic concepts through two and three dimensional graphs, as well as to some standard solution methods, such as the well-known Simplex Algorithm. The unit also investigates particular problems which have their own specific methods of modelling and solution, such as the transport and assignment problems. There is also discussion of integer programming - modelling where all the solutions must be integers (whole numbers) - and some of the heuristic means of solution. (Integer programming is, in general, much more difficult than standard linear programming).

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 models for them; 2. Implement graphical and other mathematical techniques, such as the Simplex Algorithm, to evaluate alternatives and determine the best alternative in a given situation; 3. Reflect on the underlying assumptions, and on the sensitivity of the linear programming models developed; 4. Formulate special linear programming 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 heuristic techniques like greedy algorithms, and branch and bound; and 6. Construct computer models for the linear programming models mentioned above and interpret the solutions obtained by the computer system.

Class Contact: Class2.0 hrsLab2.0 hrsContact time 44 hours: Weeks 1-3: 3x2hr class and 3x2hr lab Week 4: 2x2hr class and 2x2hr lab

Required Reading: Lecture notes and other material will be made available to students on the learning management system.

Assessment: Assignment, Written Assignment 1 (approximately 3 pages of mathematics), 20%. Assignment, Written Assignment 2 (approximately 6 pages of mathematics), 40%. Assignment, Written Assignment 3 (approximately 6 pages of mathematics), 40%. All assessment tasks are individual tasks. Although the first two assignments cover similar learning outcomes, the first assignment is more introductory, and the second will cover the material in more depth. Each of the Assignments aligns the approximate amount of pages to the weighting of the assessment item. This does not include screenshots and computer code.

RCM3711 Computational Methods

Locations: Footscray Park.

Prerequisites:RCM2713 - Modelling for Decision MakingRCM2611 - Linear Statistical ModelsRCM2911 - Linear Optimisation ModellingAny one of the above pre-requsite units.

Description: This unit introduces students to numerical and approximate techniques to solving applied mathematical problems and the application of current problem-solving tools such as CAS calculators. Computational methods are a core technique for analysing and explaining patterns: both naturally-occurring and arising in industrial and scientific applications. While applied mathematics can provide many "aha!" moments with recognising connections between two seemingly different topics, computational methods are also highly satisfying to teach. As with all mathematics, this unit requires demonstration of logical rigour and application to problem solving. Pre-service teachers will see how to introduce students to its relevance, applications, and intrinsic simplicity. In order to illustrate conventional teaching methods for solving such applied mathematical problems, this unit is divided into five discrete modules: - non-linear equations; - solving systems of linear equations; - interpolation and extrapolation; - numerical calculus, including integration (quatrature) and differentiation; - numerical solution of ordinary differential equations. Although the modules are discrete, they are scaffolded to the extent that later modules assume material and techniques from previous modules.

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. Select and evaluate computational techniques appropriate to solving a wide range of problems chosen from the field of numerical analysis. 3. Implement appropriate numerical techniques using a computer algebra system. 4. Critically review the use of technology in the secondary mathematics classroom.

Class Contact: Lecture2.0 hrsTutorial2.0 hrsEquivalent to forty-eight (48) hours of directed study for one semester.

Required Reading: No text is required; materials for the unit will be made available through the learning management system.

Assessment: Assignment, Assignment 1 - covering topics 1 and 2 (approximately 6 pages of mathematics), 30%. Assignment, Assignment 2 - covering topics 3, 4 and 5 (approximately 9 pages of mathematics), 50%. Essay, Short essay on a topic based on school mathematics and technology (500 words), 20%. Each of the Assignments aligns the approximate amount of pages to the weighting of the assessment item. This does not include screenshots and computer code.

RCS2503 Forensic Chemistry 2

Locations: Footscray Park.

Prerequisites:RCS1601 - Chemistry 1A

Description: 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: Lab3.0 hrsLecture2.0 hrs

Required Reading: The below texts are Recommended Texts only.R. Saferstein, (2014) 11th ed. Criminalistics: An Introduction to Forensic Science Pearson Higher Ed USA P. White, J. Millington, B. Rankin, P Wiltshire and D. Gennard (2016) 4th 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, (2010) 2nd ed. Practical Skills in Forensic Science Pearson Education, USA

Assessment: Assignment, Written Assignment (1000 words), 20%. Laboratory Work, Portfolio of laboratory work with summary addressing criteria (2000 words), 40%. Examination, Final Exam (2 hours), 40%. Laboratory skills are a critical part of the Learning Outcomes of this Unit and therefore students MUST pass the laboratory component in order to pass the Unit. The laboratory component of this Unit has a minimum attendance requirement of 80% (which equates to missing no more than 2 lab sessions out of 11 sessions) and students who fail to meet the minimum attendance requirements may wish to submit a Special Consideration application to the Unit Convenor.

VES3212 Sports Engineering Project

Locations: Footscray Park.

Prerequisites: Nil.

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%.

VQB5611 Risk Assessment and Human Behaviour

Locations: City Flinders.

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. Contextualise 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 fault tree and event tree; 4. Interpret and analyse fire statistical data; 5. Manage building evacuations in case of fire; 6. Analyse toxicity and toxicological effects of fire and its effluents

Class Contact: Lecture 6.0 hrs Over a one week period, there will be 30 hours of face-to-face learning. Students are also expected to complete an equivalent amount of structured self-directed studies. In addition, there will be a practical exercise relating to 'pathway finding' under low visibility conditions over a 2 hour period (a simulated scenario conducted at the Werribee Campus).

Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material. Australian Building Codes Board, (2011) Building code of Australia, Australian Building Codes Board. Australian Building Codes Board, (2005) International fire engineering guidelines, Australian Building Codes Board. International fire engineering guidelines (2005) is the most recent edition.

Assessment: Assignment, Assignment 1 (1300 words), 25%. Assignment, Assignment 2 (2500 words), 50%. Report, Analysis of risk and human response (1300 words), 25%.

VQB5612 Scientific Principles for Fire Professionals

Locations: City Flinders.

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. Interpret the fundamentals of the physio-chemical processes of fire 2. Evaluate fire properties of various materials and fire behaviour of building contents and lining materials; 3. Quantify heat transfer, fluid dynamics and fire dynamics; 4. Review visibility through smoke, and smoke toxicity; 5. Diagnose structural vulnerabilities during fire; 6. Illustrate the use of computational tools to evaluate the effects of fire

Class Contact: Lab 4.0 hrs Lecture 6.0 hrs Over a one week period, there will be 30 hours consisting of 6 hour lectures per day. Students are also expected to complete an equivalent amount of structured self-directed studies. In addition, there will be a practical session relating to ignition propensity/fire dynamics of simple solid and liquid fuels lasting about 4 hours (conducted at the Werribee Campus)

Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material. Drysdale, D., (2011) 3rd ed. An introduction to fire dynamics John Wiley and Sons, London Holman, J.P., (2010) 10th ed. Heat transfer McGraw Hill Higher Education, Boston

Assessment: Assignment, Assignment 1 (2000 words), 40%. Case Study, Fire scenarios (2000 words), 40%. Assignment, Evaluating structural properties in relation to fire (1000 words), 20%.

VQB5641 Fire Safety Systems Design

Locations: City Flinders.

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. Recommend appropriate responses to a variety of building fire safety events 2. Assess the fire safety and associated risks of a building 3. Evaluate various fire safety system options and analyse how these systems affect building fire safety; 4. Critically evaluate the role and capabilities of fire brigade; and 5. Assess occupational health and safety issues related to fire fighting and rescue operations.

Class Contact: Lecture 2.0 hrs Over a one week period, there will be 25 hours of lectures, and additionally, a 5 hour field visit. Students are also expected to complete an additional 25 hours of structured self-directed studies.

Required Reading: In addition, a very comprehensive set of course notes will be available that cover most topics. These notes will contain further references and reading material. Australian Building Codes Board (2017) Building Code of Australia Australian Building Codes Board. Australian Building Codes Board (2005) International fire engineering guidelines Australian Building Codes Board. Drysdale, D., (2011) 3rd ed. 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.

Assessment: Assignment, Assignment 1: Fire prevention and fire spread (1500 words), 30%. Assignment, Assignment 2: Fire dynamics (2000 words), 45%. Report, Workplace Assessment (1000 words), 25%.

VQB5642 Performance Codes Methodology and Structure

Locations: City Flinders.
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: 1. Analyse and interpret performance-based building codes; 2. Report on the design, structure and performance of buildings 3. Interpret the legal, statutory and design integrity requirements; 4. Critically assess a performance-based fire safety solution document 5. Review compliance of design requirements throughout the operational life of a building.
Class Contact: Lab2.0 hrsOver a one week period, there will be 26 hours of lectures. Students are also expected to complete an additional 26 hours of structured self-directed studies. In addition, the practical examination (3 hours) will be followed by a 1 hour discussion.
Required Reading: In addition to the texts below, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.Australian Building Codes Board (2017) Building code of Australia Australian Building Codes Board. Australian Building Codes Board (2005) International fire engineering guidelines Australian Building Codes Board. Drysdale, D., (2011) 3rd ed. An introduction to fire dynamics John Wiley and Sons, London.
Assessment: Assignment, Assignment: Legislation and regulations (800 words), 15%. Report, Fire safety engineering approval and practice (1600 words), 35%. Examination, Exam (3 hours, hurdle requirement), 50%. The examination requires students to critically evaluate and assess building reports, and is required by the Victorian Building Authority and the Australian Institute of Building as necessary for professional accreditation.

VQB5751 Fire Technology Modelling

Locations: City Flinders.
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. Analyse chemical decomposition, with the pyrolysis of solids and evaporation of liquid fuels, and combustion 2. Evaluate fire properties of building materials and contents 3. Compute advanced heat transfer, fluid dynamics and fire dynamics 4. Evaluate a number of commonly used modelling tools for fire and smoke growth and propagation.
Class Contact: Lecture2.0 hrsOver a one week period, there will be 30 hours consisting of 15 x 2 hour lectures. Students are also expected to complete an equivalent amount of structured self-directed studies.
Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These notes will contain further references and reading material. Drysdale, D., (2010) 3rd ed. An Introduction to Fire Dynamics John Wiley and Sons, London Australian Building Codes Board (2005) International Fire Engineering Guidelines Australian Building Codes Board International fire engineering guidelines (2005) is the most recent edition.
Assessment: Exercise, Fire dynamics (1500 words), 25%. Assignment, Combustion chemistry and toxicity (1500 words), 25%. Report, Field and zone modelling (2500 words), 50%.

VQB5761 Fire Safety Systems Modelling

Locations: City Flinders.
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. Analyse fire detection methods and tools 2. Evaluate smoke hazards and appropriately use fire safety system options to reduce the risks; 3. Model active and passive fire safety systems, and their interactions 4. Model occupant evacuation during an emergency 5. Implement fire brigade intervention model.
Class Contact: Lecture2.0 hrsOver a one week period, there will be 30 hours consisting of 15 x 2 hour lectures. Students are also expected to complete an equivalent amount of structured self-directed studies.
Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These notes will contain further references and reading material.Australian Building Codes Board (2005) International Fire Engineering Guidelines Australian Building Codes Board Drysdale, D., (2010) 3rd ed. An Introduction to Fire Dynamics John Wiley and Sons, London International fire engineering guidelines (2005) is the most recent edition.
Assessment: Case Study, Building evacuation (1000 words), 25%. Assignment, Fire detection and suppression (1500 words), 30%. Report, Smoke development and management (2500 words), 45%.

VQB5771 Fire Safety Engineering Application

Locations: City Flinders.
Prerequisites:VQB5611 - Risk Assessment and Human BehaviourVQB5642 -

Performance Codes Methodology and StructureVQB5751 - Fire Technology ModellingVQB5761 - Fire Safety Systems Modelling

Description: In this capstone unit, 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 Work Integrated Learning (WIL) 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. Analyse probabilistic risk assessment of a real or simulated system 2. Analyse the Building Codes of Australia performance requirements and fire safety issues of a building 3. Create a framework for a fire engineering assessment 4. Quantify and review concept designs in relation to building fire safety

Class Contact: Lecture2.0 hrsThere will be 2 week long sessions for this unit, consisting of 20 hours of lectures (10 x 2 hour lectures). Additionally, 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 aswell as 190 hours will be required for the Major Project assessment.

Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material.Australian Building Codes Board (2016) Building Code of Australia Australian Building Codes Board Australian Building Codes Board (2005) 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: Report, Preliminary report (3000 words from team of 4-5), 20%. Report, Final report (team of 4-5) (9000 words), 60%. Presentation, Final presentation (30 minutes per team), 20%.

VQB5773 Industrial Experience On Fire Safety

Locations: City Flinders.

Prerequisites: Nil.

Description: This unit of study will serve as an industrial experience unit for the course in which students will undertake a substantial Work Integrated Learning (WIL) 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 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: Minimum of at least six (6) weeks. A total of two hundred and ten (210) hours of industrial experience is required.

Required Reading: Australian Building Codes Board, 2005 2005 ed. 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: City Flinders.

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: Online3.0 hrsThis 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 ed. Advanced Engineering Mathematics John Willey & Sons, NY. Thomas, G. B., Weir, M. D., Hass, J. and Giordano, F. R., (2009) 12th ed. 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%.

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

Locations: City Flinders.

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: Online 3.0 hrs 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 ed. An Introduction to Fire Dynamics John Wiley and Sons, London. Hibbler R.C., (2011) 8th ed. Structural Analysis Pearson International. White, F. M., (2011) 7th ed. Fluid Mechanic McGraw-Hill Series in Mechanical Engineering, New Jersey. Cengel, Y. A. and Boles, M. A., (2011) 7th ed. 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%.

VQT6061 Building Fire Research A

Locations: City Flinders.

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 Building Fire Research B. 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: City Flinders.

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 the unit Building Fire Research A. Students will be expected to apply the knowledge and skills gained from the coursework component of the Masters 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.