

**COLLEGE OF  
ENGINEERING  
AND SCIENCE  
HANDBOOK 2021**

# **DISCLAIMER**

The information contained in Victoria University's 2021 College of Engineering and Science was current at 01 December 2020

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](http://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](http://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](http://www.vu.edu.au/courses/course-handbooks-and-guides)

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# HOW TO USE THIS HANDBOOK

Victoria University's 2021 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 2021.

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 2021.

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](http://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 unforeseen 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 2021.

This information is also available online on the University's searchable courses database at [www.vu.edu.au/courses](http://www.vu.edu.au/courses)

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

## 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 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 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 of 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 |
| NBD3103 | Building Design Studio 1       | 12 |

#### Year 3, Semester 2

|         |                               |    |
|---------|-------------------------------|----|
| NBC3003 | Building Services Management  | 12 |
| NBC3204 | Complex Construction          | 12 |
| NBD3003 | Commercial Sustainable Design | 12 |
| NBD3104 | Building Design Studio 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 NBIP 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 of 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

|       |                 |
|-------|-----------------|
| NMITC | 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 of 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                     |
| NMICT  | ICT Management                         |
| AMITEM | The Entrepreneurial Mindset            |

## 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  |    |
| NMACH                 | Analytical Chemistry                  |    |
| NMIESC                | Environmental Science                 |    |
| NMIPHY                | Physics                               |    |
| BMITAS                | Tourism and Aboriginal Sustainability |    |
| AMITEM                | The Entrepreneurial Mindset           |    |

## Graduate Diploma in Building Surveying

**Course Code:** NGBS

**Campus:** City Flinders.

**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 buildings of any size and complexity. 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 approval and 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 planning and construction processes in diverse contemporary contexts using independent thinking and judgement;
2. Generate creative solutions to a range of complex building surveying problems, considering issues of compliance with relevant codes and standards, performance-based building codes, fire safety design, 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. Advocate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world; and
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.

**Course Duration:** 1 year

**Admission Requirements:** Completion of an Australian Bachelor degree or equivalent in a cognate discipline including but not limited to building surveying, construction management, building design, quantity surveying, architecture, civil/structural engineering; OR Completion of the Victoria University Graduate Certificate in Performance-Based Building and Fire Codes course; OR A combination of qualifications deemed to be equivalent to any of the qualifications listed in the AIBS Scheme for Level 2 (Limited) Building Surveyor plus minimum five years of approved building surveying experience.

### COURSE STRUCTURE

To attain the award of Graduate Diploma in Building Surveying students will be required to complete:

- 96 credit points of Core studies

## Year 1, Semester 1

|         |  |    |
|---------|--|----|
| VQB5611 | Risk Assessment and Human Behaviour          | 12 |
| VQB5612 | Scientific Principles for Fire Professionals | 12 |
| NBS6001 | Building Studies                             | 12 |
| NBS6002 | Building Controls and Regulations            | 12 |

## Year 1, Semester 2

|         |   |    |
|---------|---|----|
| VQB5641 | Fire Safety Systems Design                  | 12 |
| VQB5642 | Performance Codes Methodology and Structure | 12 |
| NBS6003 | Building Engineering                        | 12 |
| NBS6004 | Planning and Assessment Process             | 12 |

## Graduate Diploma in Cyber Security

**Course Code:**NGCS

**Campus:**Footscray Park.

**About this course:**Cybersecurity is the protection of computers, networks, information systems and data from unauthorised access, change or destruction. With an increasing number of companies adopting cloud services and storage, valuable data and information systems are increasingly under threat from hackers and industrial spies. Beyond just accessing information hackers can even penetrate enterprise networks, encrypt the hard drive of computers and extort the organisation or computer owners to pay for unlocking the system. 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 Graduate Diploma 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 insights into the latest developments in this field. The Graduate Diploma 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 and data encryption;
- 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. Conceptually map the most recent developments in cyber security and justify the utility in various contexts; 2. Critically apply cyber security knowledge and skills to

new and uncertain situations in professional practice, exhibiting a high level of personal autonomy and accountability; 3. Investigate and evaluate cyber security architecture and state-of-the-art technologies and transmit this knowledge to specialist and non-specialist audiences; and 4. Apply commercial tools to secure computers and networks in enterprise and cloud systems to ensure privacy and prevent data loss and develop corresponding security policies and regulations.

**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:**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 successfully attain the Graduate Diploma in Cyber Security, students will be required to complete:

- 96 credit points of Core Studies

## Year 1, Semester 1

|         |                                |    |
|---------|--------------------------------|----|
| NIT6130 | Introduction to Research       | 12 |
| NIT5110 | Networking Systems             | 12 |
| NIT5081 | Fundamentals of Cyber Security | 12 |
| NIT5082 | Cloud Security                 | 12 |

## Year 1, Semester 2

|         |   |    |
|---------|---|----|
| EPM5700 | Project Management and Information Technology | 12 |
| NIT6150 | Advanced Project                              | 12 |
| NIT5083 | Enterprise Security Management                | 12 |
| NIT5084 | Cyber Security Law, Regulation and Policy     | 12 |

## 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.

Graduates can apply the project management skills learnt during this course to projects in sectors including: engineering, business, information technology and administration. The internationally recognised 'A Guide to the Project Management Body of Knowledge (PMBOK® Guide)' 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. Design and develop comprehensive project management plans which meet stakeholder expectations;
3. 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; and
4. Demonstrate an understanding of theoretical concepts, methodologies, recommendations and professional decisions, and communicate with specialist and non-specialist stakeholders utilising a variety of professional oral and written forms.

**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 (up to one BMO unit can be chosen from the approved electives list)

Core Units:

|         |                                    |    |
|---------|------------------------------------|----|
| EPM5500 | Fundamentals of Project Management | 12 |
| EPM5610 | Project Planning and Control       | 12 |
| EPM5620 | Project Governance                 | 12 |
| EPM5630 | Project Management and People      | 12 |

48 credit points from the approved electives list:

Elective Units:

|         |   |    |
|---------|---|----|
| BMO6050 | Art and Practice of Leadership                | 12 |
| BMO6506 | Work and Organisation Systems                 | 12 |
| BMO6622 | Managing Innovation and Entrepreneurship      | 12 |
| BMO6624 | Organisation Change Management                | 12 |
| EPM5510 | Project Program and Portfolio Management      | 12 |
| EPM5530 | Project Management Practice                   | 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 |

#### 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.

**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 of 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).

**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 |
| NBD2002 | Building Contract Documentation   | 12 |

24 credit points selected from the Building Compliance Minor

## Year 2, Semester 2

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

## Year 3, Semester 1

|         |                                      |    |
|---------|--------------------------------------|----|
| NBC2101 | Building and Construction Surveying  | 12 |
| NBC3001 | High Rise Development and Compliance | 12 |
| NBC3006 | Construction Site Operations         | 12 |
| NBC3101 | Project Management Practice          | 12 |

## Year 3, Semester 2

|         |                         |    |
|---------|-------------------------|----|
| NBC2006 | Professional Estimating | 12 |
| NBC3004 | Construction Economics  | 12 |
| NBC3005 | Construction Law        | 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 selected from the Building Compliance Minor |                           |    |
| Compulsory Minors  |                           |    |
| NMBCP  | 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;
- An average HD grade for the final year units, NEF4101 Research Project 1 and NEF4201 Research Project 2.

### First Year Core Units:

|         |   |    |
|---------|---|----|
| 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 |
| NEM1001 | Algebra and Calculus                                  | 12 |
| Year 2  |   |    |
| NEA2102 | Architectural Design and Theory                       | 12 |
| NEC2102 | Solid Mechanics                                       | 12 |
| NEC2103 | Engineering Materials & Construction                  | 12 |
| NEF2101 | Fluid Mechanics 1                                     | 12 |
| NEA2201 | Building Development and Compliance                   | 12 |
| NEC2201 | Introduction to Structural Engineering Design         | 12 |
| NEF2201 | Building HVAC Systems                                 | 12 |
| NEF2251 | Fundamentals of Electrical and Electronic Engineering | 12 |

### Year 3

|         |                     |    |
|---------|---------------------|----|
| NEC3101 | Structural Analysis | 12 |
|---------|---------------------|----|

|         |                                      |    |
|---------|--------------------------------------|----|
| NEF3101 | Project Management                   | 12 |
| NBD3002 | Residential Sustainable Design       | 12 |
| NEE3103 | Electrical Machines                  | 12 |
| NEC3203 | Structural Engineering Design 1      | 12 |
| NEC2203 | Hydraulics                           | 12 |
| NBD3003 | Commercial Sustainable Design        | 12 |
| NEF3202 | Research Methods                     | 12 |
| Year 4  |                                      |    |
| NEC4102 | Structural Engineering Design 2      | 12 |
| NEF4101 | Research Project 1                   | 12 |
| NEF4105 | Professional Engineering Practice    | 12 |
| NEF4108 | Architectural Lighting and Acoustics | 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 of 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:

- 384 credit points of Core 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;
- An average HD grade for the final year units, NEF4101 Research Project 1 and NEF4201 Research Project 2.

### Year 1

|         |                                    |    |
|---------|------------------------------------|----|
| 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 |
| NEC4102     | Structural Engineering Design 2               | 12 |
| NEF4101     | Research Project 1                            | 12 |
| NEF4105     | Professional Engineering Practice             | 12 |
| Semester 2: |   |    |
| NEC4172     | Urban Development and Transportation          | 12 |
| NEF4206     | Advanced Engineering Design                   | 12 |
| NEF4207     | Engineering Applications                      | 12 |
| NEF4201     | Research Project 2                            | 12 |

## 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;

- An average HD grade for the final year units, NEF4101 Research Project 1 and NEF4201 Research Project 2.

## First Year Core Units

|         |                                    |    |
|---------|------------------------------------|----|
| 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 |
| NEM1001 | Algebra and Calculus               | 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

|         |                                 |    |
|---------|---------------------------------|----|
| NEE3103 | Electrical Machines             | 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 |  |    |
| NEE4110    | Electrical Power Systems, Analysis and Operation | 12 |
| NEF4101    | Research Project 1                               | 12 |
| NEF4105    | Professional Engineering Practice                | 12 |
| NEF4001    | Computational Heat and Fluid Flows               | 12 |
| Semester 2 |  |    |
| NEE4211    | Mobile Networks and Communications               | 12 |
| NEF4201    | Research Project 2                               | 12 |
| NEF4205    | Sustainable Energy Systems                       | 12 |
| NEF4206    | Advanced Engineering Design                      | 12 |

## 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;
- An average HD grade for the final year units, NEF4101 Research Project 1 and 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 |
| NEF4001 | Computational Heat and Fluid Flows | 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

NMMSM Modelling and Simulation

## 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 for suitably qualified persons to acquire the skills and expertise necessary to gain employment in the fast growing fields of Telecommunications and Power. Emphasis is on topics that are required to support international trends, in wireless mobile broadband, fibre optic and satellite communications. Growing applications such as sensor networks, vehicular networks and machine to machine communications: power transmission, generation and distribution; Deregulation of Electricity Supply industry; the National Electricity Market and Sustainability; New developments in renewable energy, energy efficiency and low emission energy sources that is critical in addressing the greenhouse challenge. 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. This course development aligns with the EA's accreditation framework.

**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 and evaluate Engineering projects or research which address complex issues and transmit subsequent findings to specialist and non-specialist audiences.
5. Formulate and implement project management strategies that 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 career options in a variety of organisations including:

- telecommunications operators
- telecommunications equipment manufacturers
- information technology companies
- specialised test and measurement companies
- installation and operations for private companies, defence and other government departments

Manufacturing/Processing; Consulting/ Engineering Services; Power Generation Transmission and Distribution corporations; Planning and analysis of engineering systems; Computer networking; Power System Communications; Electrical Power design; Implementation and management of complex Power Systems. The career opportunities in Power Engineering are as follows:

- system analysis and planning
- research and development
- design and procurement
- project implementation and management
- testing and commissioning
- asset management
- plant and system operation
- maintenance management
- market operation and management

**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 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:

|         |  |    |
|---------|--|----|
| 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 |
| 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 |
| NIT5082 | Cloud Security                           | 12 |

#### Research Units:

|         |                   |    |
|---------|-------------------|----|
| NEF6101 | Research Thesis 1 | 24 |
| NEF6102 | Research Thesis 2 | 24 |

#### Specialisations

|       |                   |
|-------|-------------------|
| NSPTL | Telecommunication |
| NSPEL | 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 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 developer/programmer, Artificial Intelligence (AI) professional, database administrator, data analyst, network professional, software engineer, cybersecurity specialist, IT consultant and ICT trainer. 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
- Data Analyst
- AI Professional
- Networking
- Networking Administration
- IT Consultancy
- Data Warehousing Specialist
- Cutting-edge/Leading-edge IT roles involving cloud technology, data mining, sensor networks or project management
- IT Training
- IT Project Manager
- Business Intelligence Analyst

**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 |
| NIT5084                                 | Cyber Security Law, Regulation and Policy     | 12 |
| NIT6003                                 | Applied Natural Language Processing           | 12 |
| NIT6004                                 | Neural Network and Deep Learning              | 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 Master of Project Management (NMPM), 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. Graduates can apply the project management skills learnt during this course to projects in sectors including: construction, engineering, business, information technology, administration etc. The internationally recognised 'A Guide to the Project Management Body of Knowledge (PMBOK® Guide) underpins both core units and applications. VU also have strong industry connections for real-world work practice.

**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. Plan, apply and implement 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. 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. Justify and interpret theories, methodologies, recommendations and professional decisions, and communicate with specialist and non-specialist stakeholders utilising a variety of professional oral and written forms; and
6. Integrate professional standards into their practice and professional development.

**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;
- 96 credit points of Elective studies.

### Year One

|         |                                    |    |
|---------|------------------------------------|----|
| EPM5500 | Fundamentals of Project Management | 12 |
|---------|------------------------------------|----|



|  |   |    |
|--|---|----|
| EPM5620  | Project Governance                            | 12 |
| EPM5630  | Project Management and People                 | 12 |
| EPM5640  | Research Methods                              | 12 |
| AND  |   |    |
| 48 credit points from the approved electives list: |   |    |
| Year Two   |   |    |
| EPM5600  | Principles of Project Management              | 12 |
| EPM5610  | Project Planning and Control                  | 12 |
| PLUS   |   |    |
| NEF6001  | Research Project Part A                       | 12 |
| NEF6002  | Research Project Part B                       | 12 |
| OR   |   |    |
| NEF6101  | Research Thesis 1                             | 24 |
| AND  |   |    |
| 48 credit points from the approved electives list: |   |    |
| Elective Units:                                    |   |    |
| BMO6050  | Art and Practice of Leadership                | 12 |
| BMO6506  | Work and Organisation Systems                 | 12 |
| BMO6622  | Managing Innovation and Entrepreneurship      | 12 |
| BMO6624  | Organisation Change Management                | 12 |
| EPM5510  | Project Program and Portfolio Management      | 12 |
| EPM5530  | Project Management Practice                   | 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.

**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:** 1 year

**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.

|            |   |    |  |                                    |    |
|------------|---|----|--|------------------------------------|----|
| Semester 1 |   |    | EPM5500                                      | Fundamentals of Project Management | 12 |
| NIT5081    | Fundamentals of Cyber Security            | 12 | EPM5610                                      | Project Planning and Control       | 12 |
| NIT5082    | Cloud Security                            | 12 | EPM5620                                      | Project Governance                 | 12 |
| Semester 2 |   |    | EPM5630                                      | Project Management and People      | 12 |
| NIT5083    | Enterprise Security Management            | 12 | Elective Units:                              |                                    |    |
| NIT5084    | Cyber Security Law, Regulation and Policy | 12 | Select 24 credit points from the list below: |                                    |    |

## 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. Graduates can apply the project management skills learnt during this course to projects in sectors including: engineering, business, information technology, and administration. The internationally recognised 'A Guide to the Project Management Body of Knowledge (PMBOK® Guide) 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. Design and develop comprehensive project management plans which meet stakeholder expectations; and
3. Demonstrate an understanding of theoretical concepts, methodologies, recommendations and professional decisions, and communicate with specialist and non-specialist stakeholders utilising a variety of professional oral and written forms.

**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 Project Management units, and;
- 24 credit points of Elective units

Project Management Units:

Select 24 credit points from the list below:

|         |   |    |
|---------|---|----|
| EPM5510 | Project Program and Portfolio Management      | 12 |
| EPM5530 | Project Management Practice                   | 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 |

# 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 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 complementary 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:** Footscray Park, Werribee

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 |
| NPU3103 | Techniques in Pharmaceutical Synthesis | 12 |
| NPU3104 | Drug Testing and Analysis              | 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 | NIT3202 | Data Analytics for Cyber Security | 12 |
| RBF3620 | Conservation and Sustainability | 12 | NIT3213 | Mobile Application Development    | 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 |

### NMIACH Analytical Chemistry

**Locations:** Footscray Park, Werribee

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

### NMAST 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

### NMBCP 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

### NMBIM 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

### NMBIO 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:** Footscray Park, Werribee

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.

#### Level 1 Units

|         |              |    |
|---------|--------------|----|
| RCS1601 | Chemistry 1A | 12 |
| RCS1602 | Chemistry 1B | 12 |

#### Level 2 Units

|         |                      |    |
|---------|----------------------|----|
| NPU2101 | Analytical Methods 1 | 12 |
| NPU2103 | Organic Synthesis    | 12 |

### NMIEAA Ecology and Environmental Management

**Locations:** Footscray Park, Werribee

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:** Footscray Park, Werribee

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

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

### NMIICT ICT Management

**Locations:** Footscray Park, 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:**Footscray Park, Werribee

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 |

### **NMMSM 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:**Footscray Park, Werribee

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. Complementing 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 | HBM2106 | Human Genetics                                  | 12 |
| NPU3103 | Techniques in Pharmaceutical Synthesis | 12 | HBM3205 | Clinical Genetics and Cellular Basis of Disease | 12 |

### NMPHY Physics

**Locations:** Footscray Park, Werribee

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

NSC2102 Physics 2B

### NMPWR 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

|         |                            |    |
|---------|----------------------------|----|
| NEF4205 | Sustainable Energy Systems | 12 |
|---------|----------------------------|----|

|         |                             |    |
|---------|-----------------------------|----|
| NEF4206 | Advanced Engineering Design | 12 |
|---------|-----------------------------|----|

### NMNBIO Biology

**Locations:** Footscray Park, St Albans, Werribee

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.

|         |                   |    |
|---------|-------------------|----|
| NEF3001 | Applied Project 1 | 12 |
|---------|-------------------|----|

|         |                      |    |
|---------|----------------------|----|
| RBM2560 | Medical Biochemistry | 12 |
|---------|----------------------|----|

### NMNCHE Chemistry

**Locations:** Footscray Park, Werribee

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 |
|---------|---------------------------|----|

### NMNEV Environment

**Locations:** Footscray Park, Werribee

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 outputs, capabilities and facilities which were major contributors to the Australian Research Council's 2018 (Excellence in Research Australia) ERA=5 (well above world standard) ranking in electrical engineering and contributed to the Engagement and Impact Outcomes rating of HIGH for Engineering impact.

|         |  |    |
|---------|--|----|
| 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, VU Sydney.

**Prerequisites:** Nil.

**Description:** This unit comprises three modules. In Module 1, participants will identify the roles of players and stakeholders engaged in specific projects and the interactions 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, participants will study project initiation, development of a project charter, scoping and network analysis, time management, cost management and quality management. In Module 3 participants will 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. Clarify and differentiate the notions of portfolios, programs and projects;
2. Critically implement knowledge, skills, tools and techniques to project activities through project management processes;
3. Conceptually map and elucidate 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. Articulate complex project information relevant to all stakeholders and at all levels of the organisation; and
6. Explicate strategies for risk assessment and safety in accordance with OHS legislation and regulations.

**Required Reading:** (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Further reading material will be provided by the instructor in class or through VU Collaborate.

**Assessment:** Assignment, Individual Assignment, 20%. Project, Group Project, 30%. Presentation, Class Presentation / Discussion, 20%. Test, Test, 30%.

## 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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. Project Management Institute (PMI) (2017) 4th ed. The Standard for Program Management Project Management Institute (PMI)

**Assessment:** Report, Individual Report (1000 words), 15%. Case Study, Individual Case Study (1500 words), 20%. Case Study, Group Case Study (1500 words per student plus 5 minutes presentation per each student), 25%. Examination, Examination (2 hours), 40%.

## EPM5530 Project Management Practice

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** This unit is designed to provide an understanding of the principles of project management practice and the roles and responsibilities of stakeholders and others in a project team. Utilising the PMBOK® (Project Management Body of Knowledge). Guide as a reference, the unit explores 10 Knowledge Areas in project management and instigates the process of applying these to contemporary and emerging project environments. The unit delivers a comprehensive understanding of how due diligence manifests in a project life cycle. It addresses what is to be delivered in a project (scope), how it is to be delivered (plan), the delivery and implementation (execution) and finally reporting and review. Theoretical models are proposed which integrate sustainable methods into the fabric of projects and operations and align project and business outcomes with organisational strategic goals.

**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. Critically review and apply Sustainable Project Management frameworks in accordance with government and industry standards;
5. Propose sustainability processes and practices which align with organisational goals; and
6. Appraise the dynamics of working collaboratively within a project environment and developing distributed leadership skills.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Larson, E.W. Gray, G.E., (2011) 7th ed. Project Management: the managerial process McGraw Hill – Irwin Series RECOMMENDED READINGS: Lock Dennis (2018) The essentials of project management, 2nd Edn, Routledge, New York, USA. Hartly, Stephen (2008) Project Management: integrating strategy, operations and change, 3rd edn, Tilde Publishing, Prahran, Victoria. Gido, Clements & Baker 2018, Successful project management, 7th edn, Cengage Learning Kloppenborg, T 2015, Contemporary project management, 3rd edn, Cengage Learning

**Assessment:** Assignment, Individual Assignment (1500 words), 20%. Project, Group Project (2000 words per student), 30%. Presentation, Class Presentation (approx. 10 minutes per student), 10%. Examination, Examination (2 hours), 40%.

## 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, infrastructure and IT). 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 and methodologies 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. Collaborate effectively as a member of a multi-disciplinary project team.

**Required Reading:** (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Further reading material will be provided by the instructor in class or through VU Collaborate.

**Assessment:** Case Study, Group Case Study, 20%. Project, Group project, 40%. Presentation, Student Presentation, 10%. Test, Test, 30%.

## EPM5610 Project Planning and Control

**Locations:** Footscray Park, VU Sydney.

**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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute

**Assessment:** Project, Group Project Stage 1 (2000 words per student plus 5 minutes presentation by each student), 30%. Project, Group Project Stage 2 (2000 words

per student plus 5 minutes presentation by each student), 30%. Examination, 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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute

**Assessment:** Assignment, Individual Assignment 1 (approx 1500 words), 20%. Report, Group Case Study report (group submission - approx. 1500 words per student), 20%. Presentation, Class Presentation & Discussion (approx. 15-20mins per student), 20%. Examination, Examination (2 hours), 40%.

## 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.

**Required Reading:** Further reading material will be provided by the instructor in class

or through VU Collaborate. McShane, S., Olekanlins, M. & Travaglione, T (2014) 4th ed. Organisational Behaviour: Emerging Knowledge, Global Insights. McGraw Hill  
**Assessment:** Assignment, Individual Assignment (approx. 1500 words), 20%. Report, Group Project (group submission - approx. 1500 words per student), 20%. Presentation, Class Presentation & Discussion (Approx. 15-20 minutes per student), 20%. Examination, 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 project management 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 data, the application of qualitative and/or quantitative methodologies, the analysis 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. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 2. Articulating a relevant research question worth addressing based on identification of a research problem; 3. Articulate and apply literature review strategies to critically analyse the existing literature; 4. Select and develop the appropriate methods for data collection and analysis; 5. Justify the selection and application of research methodology.

**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

**Assessment:** Project, Individual Assignment 1: research formulation (approx. 1000 words plus 10 minutes presentation/discussion), 15%. Project, Individual Assignment 2: literature review (approx. 1500 words plus 10 minutes presentation/discussion), 25%. Presentation, Research proposal presentation (approx. 10 minutes), 10%. Report, Research Proposal report (approx 4000 words), 50%.

## EPM5700 Project Management and Information Technology

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** Nil.

**Description:** This unit addresses the ways in which information technology (IT) can facilitate the project management process in relation to feasibility and sensitivity analysis, planning and monitoring, information processing and decision support functions. It focuses on the application of software packages in the areas of both General Project Management Information Systems and Specialised Project Management Information Systems. The subject content includes computerised procurement considerations, identification of available computer hardware and software and analysis of current IT trends. IT based Project Management analytical systems (spreadsheets/financial models, planning and resource control, Data Base

Management Systems (DBMS), and Quantitative and Qualitative Risk Analysis) are critically reviewed. Problem solving in relation to change and risk management and issues of quality control are also addressed. Learning scenarios which highlight the emergent and dynamic nature of IT and project management will be used to contextualise course content.

**Credit Points:** 12

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

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Paul Harris (2016) . MS Project Training Manuals 2016 . Recommended Text: Kathy Schwalbe, (2018) Information Technology Project Management 7e, Cengage Learning, Bodton, MA.

**Assessment:** Assignment, Individual Assignment (1500 words), 20%. Project, Group Project (2000 words per student), 30%. Presentation, Student Presentation (approx. 5-10 min per student), 10%. Examination, Examination (2 hours), 40%.

## EPM5710 Project Procurement Management

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** This unit develops the students' understanding of the phases in Project Procurement; from Planning, Conducting, Controlling to Close Out. It takes the student on a journey from defining project requirements planning through to developing contract strategy, tendering, contract management and contract closure. The unit provides students with an understanding of key contractual terms, applicable models of contracts delivery and the major activities in each phase of the procurement process. Tools and techniques applicable at each phase will be discussed. Where appropriate, relevant cases and examples will be used in class discussion. The course will cover how project demands are pulled together to form a tender and eventual contract document. It considers the supply side of identifying suppliers and developing contracting strategies. It looks at the Governance process of tenders, the Evaluation process and the Execution of a Contract Award. An essential element of procurement, Contract Management, will be covered. The course intends to interactively draw on procurement experiences of students and to bring to life the issues involved. It is imperative that students actively participate in these discussions and inject their own actual work experiences into the class. This enables the student to better appreciate the content of the material in the course.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Understand the general principles of the procurement process, the importance of contractual terms and supporting sections of contracts; 2. Formulate the procurement requirements, profile the supply market capability and develop a go-to-market sourcing strategy; 3. Build the Tender document which includes the Contractual Terms & Conditions, Scope of Works, Schedule of Rates, Technical and Administration. Basis of the tender document will become the eventual Contract Document; 4. Establish the tender evaluation methodology and scoring criteria for supplier selection; 5. Establish contract performance monitoring parameters following contract

execution; and 6. Develop Contract Closure and Handover plans.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. Recommended text: Carter J. W., (2018) Contract law in Australia 6th ed. Chatswood, N.S.W. : LexisNexis Butterworths Austroads Building and construction procurement guide: principles and options Austroads (PMBOK® GUIDE) (2017) A Guide to the Project Management Body of Knowledge 6th ed. Project Management Institute.

**Assessment:** Report, Individual Report (1500 words), 25%. Case Study, Group Case Study Project (2000 words per student plus 5 minutes presentation by each student), 35%. Examination, Examination (2 hours), 40%.

### EPM5730 Project Stakeholder Management

**Locations:** Footscray Park, VU Sydney.

**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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. Guide to Project Management Body of Knowledge Project Management Institute

**Assessment:** Assignment, Individual Assignment (approx. 1500 words), 20%. Report, Group Project (group submission - approx. 1500 words per student), 20%. Presentation, Class Presentation & Discussion (approx. 15-20 minutes per student), 20%. Examination, Examination (2 hours), 40%.

### EPM5740 Project Risk Management

**Locations:** Footscray Park, VU Sydney.

**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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Following Standards are available through VU Library: ISO 31000: 2009 Risk Management Principles and Guidelines ISO Guide 73:2009, Risk management – Vocabulary ISO/IEC 31010:2009, Risk management – Risk assessment techniques HB 436:2004 Risk Management Guidelines HB 254:2005 Governance, Risk Management and Control Assurance HB 89- 2012 Risk Management-Guidelines on Risk Assessment Techniques Recommended text: Hopkin, P 2018, Fundamentals of risk management – understanding, evaluating and implementing effective risk management, 5th Edn, Kogan Page Ltd, Great Britain

**Assessment:** Assignment, Individual Assignment (1500 words), 20%. Project, Group Project (2000 words per student), 30%. Presentation, Class Presentation (approx. 10 minutes per student), 10%. Examination, 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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. (PMBOK® GUIDE) (2017) 6th ed. A Guide to the Project Management Body of Knowledge Project Management Institute

**Assessment:** Case Study, Individual Case Study Assignment (1500 words), 20%. Report, Group Project (2000 words per student), 30%. Presentation, Group Presentation (approx. 5 min per student), 10%. Examination, Examination (2 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.

**Required Reading:** Further reading material will be provided by the instructor in class or through VU Collaborate. Construction Extension to the PMBOK® Guide (2016), Project Management Institute.

**Assessment:** Case Study, Individual Case Study Assignment (1500 words), 20%. Report, Group Report (2000 words per student), 30%. Presentation, Group Presentation (approx. 5 min per student), 10%. Examination, Examination (2 hours), 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 building permits in accordance with 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 applications and building permits and ensure adherence to relevant administrative processes; 2. Investigate relevant planning 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 applications and building permit; 4. Assess all

non-compliance and produce a range of alternative solutions for client consideration; and 5. Develop and document final building permit for each building project, noting specific conditions and validity of each permit.

**Required Reading:** Available for free online (no cost): 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:** Exercise, Exercise, 10%. Test, Tests (3), 30%. Assignment, Team design project, 50%. Presentation, Team design project oral presentation, 10%.

## 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 Building Legislation; 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 up to 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.

**Required Reading:** Available for free online (no cost): 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:** Test, Three (3) Quizzes (10% each), 30%. Report, Two (2) Individual reports (15% each), 30%. Assignment, Team design project and oral presentation, 40%.

## 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 and designed building services installations; 2. Develop energy efficient and sustainable design with respect to building services, including lighting, power, heating, cooling, mechanical services, hot water, and water usage; 3. Analyse design documentation and carry out on-site inspections of services installations and assess their compliance with relevant statutes, codes and standards. 4. Identify and interpret factors affecting human thermal comfort, indoor air quality and building acoustics; and 5. Effectively collaborate with others to conduct total building performance evaluations in all building types.

**Required Reading:** National Construction Code Series (2019) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2019) Volume 1 Energy Efficiency Provisions ABCB Publications, Canberra National Construction Code (2019) Volume 2 Energy Efficiency Provisions ABCB Publications, Canberra Handbook (2016) Using on-site renewable and reclaimed energy sources ABCB Publications, Canberra

**Assessment:** Assignment, Individual assignment (2), 30%. Case Study, Team design project and oral presentation, 30%. Test, Tests (2) combination of multiple choice, true or false, fill in the blank, short answer and long answer questions (90mins each), 40%.

## NBC2004 Building and Construction Studies

**Locations:** Footscray Park.

**Prerequisites:** NBC1111 - Fundamentals of Building Construction

**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.

**Required Reading:** No texts required for this unit. A range of resources will be available through VU Collaborate

**Assessment:** Presentation, Team Project Oral Presentation, 5%. Assignment, Team Project Report, 35%. Test, Three (3) Class Tests, 60%.

## 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, including the significance of Green Star Ratings.

**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 both traditional and contemporary construction and building materials such as masonry, aluminium, glass, polymers and composites 3. Identify the application and installation requirements of construction materials and components in various environments; 4. Distinguish the factors which influence the choice and selection of sustainable materials for adequate performance, including life cycle analysis and recyclability; and 5. Describe the importance of the WHS and environmental requirements for working in a construction site with specific materials

**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 Lab Reports (2), 20%. Report, Team Report and Presentation, 40%. Test, Tests (2) (week1 and 4), 40%.

## NBC2006 Professional Estimating

**Locations:** Footscray Park.

**Prerequisites:** NBC1113 - Measurement and Estimating

**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 involving architectural, structural and service drawings to apply shortened/simple form methods; 2. Apply building principles and methods to a range of civil/building infrastructure construction elements; 3. Quantify 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; 4. Create estimating documentation to the level of a novice professional for a moderately complex building project in collaboration with team members; and 5. Develop and assess tender documentation demonstrating professional judgment.

**Required Reading:** Australian Institute of Quantity Surveyors Latest ed. Australian Standard Method of Measurement of Building Works .

**Assessment:** Test, Test, 20%. Project, Team Project portfolio, 40%. Presentation, Oral presentation, 10%. Test, Test, 30%.

## NBC2101 Building and Construction Surveying

**Locations:** Footscray Park.



**Prerequisites:**NBC1101 - Maths for BuildersNBC1103 - Basic Structural MechanicsCompletion of minimum of 96cp.

**Description:**This unit introduces students the principles of effective site and geotechnical investigations for the establishment and preparation of construction works. The unit will introduce standard survey techniques to 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. In addition the impact of site development on traditional owners or custodians are considered in relationship to 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, 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.Critically review the principles of effective site and geotechnical investigations across a range of challenging situations; 2.Critically review and demonstrate appropriate standard survey techniques to set out and monitor construction work on large building sites; 3.Analyse and assess protection work requirements and demolition techniques and processes relevant to construction site establishment and operations; 4.Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice; and 5.Propose site management strategies to facilitate traditional owners or custodians to exercise their full range of connection to country responsibilities consistent with international standards on human rights, sustainable development and the environment.

**Required Reading:**There are no required textbooks for this unit.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:**Test, In-class test, 10%. Assignment, Practical Team Fieldwork, 25%. Assignment, Group project - Site investigation and Report (1000 words), 25%. Test, In-class test, 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.Justify and document performance based solution decisions and prepare and evaluate appropriate assessment reports; 3.Judge performance based solutions in relation to the impact on building maintenance and refurbishment; 4.Evaluate and justify the potential benefits in using performance based solutions in place of deemed-to-satisfy provisions; 5.Analyse ethical and professional behaviour in practice; and 6.Exemplify effective communication with a range of skilled professionals, including architects,

builders and engineers.

**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, Quiz 1, 20%. Test, Quiz 2, 20%. Case Study, Team design project, 40%. Presentation, Project Oral Presentation, 20%.

## 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.Discriminate and prescribe 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.Adapt integrated design and development of building systems, structure and services and how this integration can be facilitated; and 5.Critically review building regulatory procedures, codes and standards to present graphical and written designs and specifications details for different high rise development scenarios.

**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 RECOMMENDED TEXTS: Ching, FDK, Onoye, BS, Zuberbuhler, D 2014, Building structures illustrated: patterns, systems and design, John Wiley & Sons, Hoboken, New Jersey.

**Assessment:**Test, Tests (2) (1 hour each), 30%. Assignment, Individual report, 15%. Case Study, Design project (teams of 4 students) and oral presentation., 40%. Portfolio, Portfolio, 15%. The portfolio is to feature work done in the classes 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. Critically assess 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.

**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 (2019 Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra

**Assessment:** Test, Tests (2), 40%. Project, Team project, 45%. Presentation, Presentation, 15%.

### NBC3003 Building Services Management

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** This unit is designed to provide students with the knowledge in managing services in commercial and industrial buildings for compliance with relevant legislation, Australia Standards and the National Construction Code (NCC) of Australia. Students will learn energy-efficient design principles, including standard heating, ventilation and air-conditioning (HVAC) systems available (the basis for mechanical system selection), vertical transport, fire protection, water management, and building energy management systems (BEMS) for ensuring efficiency, quality, and sustainability.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Investigate and rationalise principles of systems management in commercial and industrial buildings; 2. Analyse and assess design documentation and building services for commercial and industrial buildings for compliance with the various statutes, codes and standards; 3. Articulate the importance of building services maintenance and management in terms of function, procedures and operations; 4. Validate service installations in commercial and industrial buildings; and 5. Critically review the implications of energy-efficient design principles upon building services design and apply appropriate energy budgets.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Test, Tests (2), 30%. Assignment, Individual assignment, 30%. Project, Group project and oral presentation, 40%.

### 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 analyse 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 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.

**Required Reading:** Reading materials and other resources are listed in VU Collaborate.

**Assessment:** Assignment, Individual assignment report, 20%. Report, Group report and presentation, 30%. Test, Tests (2), 50%.

### NBC3005 Construction Law

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** Construction law is an important area of legal specialisation concerned with building and infrastructure projects. This unit introduces the Australian legal system, provides an overview of common law and statutory framework governing the construction industry and explains the liabilities and responsibilities of key parties in construction contracts. Project delivery methods and risk mitigation, dispute avoidance, management and resolution are also covered.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Locate and review relevant legal information in Australian databases; 2. Apply contract practices, procurement procedures and standard forms of contracts for building and infrastructure projects; 3. Critically analyse the relationships, liabilities and responsibilities of key parties in construction contracts; 4. Assess legal risks related to construction processes, and devise associated risk mitigation measures; and 5. Critically evaluate different types of dispute avoidance, management and resolution mechanisms.

**Required Reading:** A comprehensive set of notes will be available which 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, Individual Assignment, 20%. Case Study, Group Reports (2), 60%. Presentation, Group Presentation, 20%.

### 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 5. Analyse and assess environmental protection requirements and waste minimisation measures relevant to construction site operations.

**Required Reading:** Recommended readings will be made available on VU Collaborate.

**Assessment:** Assignment, Group progress report, 10%. Assignment, Group assignment report (2000 words equivalent), 35%. Presentation, Group assignment presentation, 15%. Test, In-class tests, 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.

**Required Reading:**Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.RECOMMENDED TEXTS: (PMBOK® GUIDE) (2017), A Guide to the Project Management Body of Knowledge 6th Edition, Project Management Institute Larson E W, Gray G W (2018) Project Management: the managerial process 7th Edition, McGraw Hill - Irwin Series Lock Dennis (2013) Project Management 1 Ashgate Publishing Ltd Hartley, Stephen (2014) Project Management: Integrating strategy, operations and change, 3rd Edition, Tilde Publishing.

**Assessment:**Test, Test, 20%. Assignment, Assignment 1 - Individual, 20%. Assignment, Assignment 2 - Group & Oral Presentation, 30%. Test, Test, 30%.

## 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.Diagnose and plan the rectification of common building faults and verify the regulatory inspections made when constructing a complex or high-rise building project;  
4.Assess and report on the issues encountered by complex or high-rise buildings including funding, ownership, design, construction and social and environmental issues; and 5.Advocate the development and implementation of

innovative high-rise building practices.

**Required Reading:**National Construction Code Series (latest ed) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code (latest ed) Volume 1 Energy efficiency provisions ABCB Publications, Canberra

**Assessment:**Report, Individual assignment, 20%. Test, Tests (2), 40%. Case Study, Team project, 30%. Presentation, Team oral presentation, 10%.

## NBC4001 Procurement Management

**Locations:**Footscray Park.

**Prerequisites:**Nil

**Description:**This unit develops students' understanding of the responsibilities of various stakeholders as well as their liabilities by comparing different types of procurement systems and project delivery in built environment projects. The law relating to principles and practice of project procurement management is 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.Critically analyse a range of procurement systems to develop project delivery strategy for a variety of built environment projects;  
2.Evaluate complex problems associated with contract management to propose procurement solution for built environment projects;  
3.Critically review the general principles and application of contract management, including procurement strategies relating to tenders applied to projects; and 4.Analyse contractual risks for built environment projects and extrapolate principles to the allocation and management of a contract.

**Required Reading:**Reading materials will be provided in VU Collaborate.

**Assessment:**Project, Preliminary Report, 10%. Test, Tests, 50%. Project, Team Case Study, 30%. Project, Team Presentation, 10%.

## NBC4002 Advanced Construction

**Locations:**Footscray Park.

**Prerequisites:**Nil

**Description:**This unit introduces and facilitates the student's technical knowledge and skills in Building Information Modelling (BIM) and BIM management concepts as required by a BIM manager in the industry. The unit also 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.Develop a well-defined process using BIM to ensure collaboration between all project participants with the client requirements;  
2.Interpret the BIM terminologies and gain knowledge on project execution plans using BIM management concepts;  
3.Design for efficient management of resources and use of software in the application of Building Information Modelling (BIM) technology and management;  
4.Cross-examine the theoretical knowledge of the lean construction, prefabrication and simulation in construction with an introduction to green rating tools.

**Required Reading:**A list of recommended textbooks will be made available on VU Collaborate.

**Assessment:**Test, Two In-class tests (10% each), 20%. Review, Individual review and presentation, 15%. Assignment, Group assignment report and Presentation, 50%. Other, Focus group discussion (individually assessed), 15%.

## NBC4003 Cost Planning and Control

**Locations:**Footscray Park.

**Prerequisites:**NBC2006 - Professional Estimating

**Description:**This unit investigates the principles of design economics applied to buildings and the role of cost planning during design development. Students will be introduced to the principles of cost planning and design economics including various techniques in cost planning, stages of design development, adjustment of building historical prices and accuracy in cost control. Life cycle costing, including the use of discounting in comparative situations, and its importance in the assessment of environmental sustainability will also be discussed.

**Credit Points:** 12

**Learning Outcomes:**On successful completion of this unit, students will be able to: 1.Critically review the process and procedures of cost planning in the design and construction of buildings and different cost planning techniques in relation to a cost control system; 2.Interpret principles of design economics, forecast building prices and extrapolate historical data in relation to formulating cost plans during early building design stages; 3.Formulate cost planning actions in design briefing stage, outline proposal stage, sketch design stage and tender documentation stage to compute elemental cost plan; 4.Analyse life cycle cost studies including life cycle costing (LCC) basic principles, methodology of LCC, application of discounting in LCC calculations; and 5.Devise an appropriate life cycle cost evaluation of different design options to the client and stakeholders.

**Required Reading:**Required reading materials will be available in VU Collaborate.

**Assessment:**Assignment, Preliminary Report, 10%. Test, Test 1, 20%. Project, Team Case Study, 30%. Project, Team Presentation, 10%. Test, Test 2, 30%.

## NBC4101 Construction Management

**Locations:**Footscray Park.

**Prerequisites:**Nil

**Description:**The unit focuses on introducing key construction management theories and techniques 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. Key topics include effective resource planning; cost, time and quality optimisation techniques; and risk and safety management.

**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.

**Required Reading:**A list of recommended textbooks will be made available on VU Collaborate.

**Assessment:**Test, Tests (2), 40%. Exercise, Individual Problem Based Exercise, 20%. Project, Group Case Study Project (2000-2500 words equivalent), 40%.

## NBD2001 Architectural History and Analysis

**Locations:**Footscray Park.

**Prerequisites:**Nil.

**Description:**This unit provides an introduction to the diverse developments of world architecture from the pre-historic settlement to the late twentieth century, examining the theoretical, historical and cultural contexts of the discipline. The unit also explores to influential architectural projects, theoretical writings and design practices from across this period. Students will examine these influences 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 articulate 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.

**Required Reading:**RECOMMENDED TEXTS: Architecture: From Prehistory to Post-Modernism, Authors: Marvin Trachtenberg, Isabelle Hyman, 1986 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, Case study and presentation, 20%. Portfolio, Architectural Analysis and Presentation, 20%. Test, Tests, 35%. Report, Team Report on History of Architecture and presentation, 25%.

## NBD2002 Building Contract Documentation

**Locations:**Footscray Park.

**Prerequisites:**Nil.

**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.Identify different business structures and legal principles in contract administration including copyright and consumer legislation; 2.Review the formation of contract and tort in construction projects and examine organisational privacy and security policies; 3.Critically examine and explain standard form contracts within the construction industry; 4.Explain the principles, structure and practices of contractual requirements including business planning in construction projects; 5.Undertake contract administration procedures and risk management in accordance with professional standards and achieve effective communication within skilled project stakeholders.

**Required Reading:**A list of recommended textbooks will be made available on VU Collaborate.

**Assessment:**Project, Preliminary Report, 10%. Project, Team Case Study, 30%. Project, Team Presentation, 10%. Test, Tests, 50%.

## NBD2100 Built Environment 1

**Locations:** Footscray Park.

**Prerequisites:** NBD1101 - Building Design Documentation, NBD1100 - Built Environment Communication and Skills, NBC1112 - Building Science

**Description:** This project-based 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. In this commercial design project, you will conduct a site survey, site analysis, conceptual plan, architectural drawings and working drawings with construction details. Students will use 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. Bushfire Attack Level (BAL) assessment and integration into design and construction will be conducted at the end of the design project.

**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 and integrate concepts of environmental perception, environmental psychology in design;
2. Evaluate circulation patterns within proposed spatial designs including disabled access and emergency egress;
3. Produce site analysis, conceptual design, final architectural drawings and construction detail; and
4. Effectively articulate with a range of skilled professionals, including architects, builders and engineers and effectively contribute to group outcomes while maintaining accountability for own learning and work.

**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, Two (2) Team Case Studies and Presentation, 25%. Portfolio, One (1) Team Portfolio and Presentation, 25%. Portfolio, One (1) Individual Portfolio, 40%. Presentation, One (1) Individual Presentation, 10%.

## NBD3001 Risk and Safety Management

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** This unit provides the foundations for developing and maintaining a safety culture on building sites and other workplaces, analyse risks and develop risk mitigation strategies, apply safety requirements in the workplace, and examines WorkCover requirements in accordance with the OH&S regulations. Students will also learn about fire safety and supervision of onsite operatives specifically with respect to compliance requirements for management of hazards and risks in the workplace.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Conceptualise risk management and hazardous situations on construction sites;
2. Critically apply the understanding of regulations for health and safety and wellbeing on construction projects;
3. Analyse risks as a part of risk assessment activities and complying with occupational health and safety requirements; and
4. Critically examine principles of fire safety and building egress to manage and control project risks.

**Required Reading:** Reading materials will be provided in VU Collaborate.

**Assessment:** Project, Team Case Study 1, 20%. Project, Team Case Study 2 and Presentation, 35%. Test, Individual Tests (3 in-class tests), 45%.

## NBD3002 Residential Sustainable Design

**Locations:** Footscray Park.

**Prerequisites:** Nil.

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**Description:** Housing is a fundamental human right and plays a significant role in determining the health and quality of life. It also has a significant influence on the built and natural environments throughout its life cycle from construction to demolition. The main objective of residential sustainable design is to reduce problematic environmental and social impacts whilst saving money on the cost of living over the life of the house. This unit focuses on the design, assessment (the Built Environment Sustainability Scorecard, BESS and the Nationwide House Energy Rating Scheme (NatHERS) and documentation process of a single sustainable dwelling. It combines the theoretical knowledge of the environmental performance of residential buildings, covering management, water, energy, stormwater, indoor environmental quality (IEQ), transport, waste, urban ecology and innovation, with the design process in accordance with planning permit requirements. Students will learn how to use these skills to deliver sustainable, net-zero energy and practical residential building design and to prepare environmentally sustainable design (ESD) report. These skills are closely aligned with industry expectations for positions, such as building designers and ESD consultants in architectural, building design, engineering and construction companies.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Critically analyse the principles, materials, structure and strategies used in residential buildings and integrate theoretical knowledge, building environmental performance assessments and creativity to deliver sustainable and net-zero energy residential building;
2. Critically review the residential building codes (BCA), Australian Standards requirements and guidelines that are used in planning and building permit applications, and the environmental performance of the residential buildings;
3. Demonstrate a clear understanding of Built Environment Sustainability Scorecard (BESS), Codes for Sustainable Homes, Nationwide House Energy Rating Scheme (NatHERS) and other environmental building performance tools;
4. Conduct, interpret and apply Bushfire Attack Level (BAL) assessment and integrate bushfire protection requirements into building design and construction; and
5. Formulate an environmentally sustainable design (ESD) report for residential buildings.

**Required Reading:** A very comprehensive set of notes will be available. 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, Case Study, 20%. Project, Portfolio and presentation demonstrating design outputs, 30%. Report, Environmental performance evaluation of the initial design to comply with the regulations, 15%. Report, ESD Report, 35%.

## NBD3003 Commercial Sustainable Design

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** Global warming has reinforced the importance of designing environmental friendly buildings with less energy consumption. This unit of study focuses on both environmental sustainability and commercial building design. In the first stage of the unit, students will become familiar with environmental sustainability principles for their commercial sustainable design. The second stage of the unit covers an introduction to building performance analysis tools for students to analyse and explore alternative design scenarios to optimise the environmental performance of buildings.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Critically analyse the construction principles, materials and design strategies of commercial building design;
2. Demonstrate design skills to develop environmentally friendly commercial buildings from initial concept stage to detailed design;
3. Critically review the environmental performance of commercial buildings by modelling and

stimulating the building design in the areas of indoor environmental quality, natural and mechanical ventilation and natural/artificial lighting; and 4. Communicate design ideas and strategies effectively to targeted audience.

**Required Reading:** Reading resources will be provided on VU Collaborate.

**Assessment:** Case Study, Individual - Part A: Presentation (10%); Part B: Report (10%), 20%. Project, Group - Part A: Presentation (10%); Part B: Report (20%); Part C: Presentation (20%), 50%. Presentation, Group - ESD Presentation, 10%. Report, Group - ESD Report, 20%.

## NBD3100 Built Environment 2

**Locations:** Footscray Park.

**Prerequisites:** NBD1101 - Building Design Documentation NBD1100 - Built Environment Communication and Skills NBC1112 - Building Science

**Description:** This project-based unit will introduce you to a range of key concepts in environmental sustainability principles, roles and responsibilities of building design professionals in relation to the design and planning of the built environment, and the impact of current design trends in reducing the environmental footprints. In this residential design project, you will conduct a site survey, site analysis, conceptual plan, architectural drawings and working drawings with construction details. At the end of the design project, students will propose retrofitting methods (using computer modelling systems).

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:  
1. Critically assess interactions between buildings and their surroundings and evaluate the impact of alternative design approaches on environmental sustainability;

2. Critically analyse, model and simulate integrated building designs in the area of building envelop, thermal comfort, daylighting, and facade design and formulate deep insights into a wide range of technological approach to retrofit buildings; 3. Produce site analysis, conceptual design, final architectural drawings and construction detail; 4. Conduct, interpret and apply Bushfire Attack Level (BAL) assessment and integrate bushfire protection requirements into building design and construction; and 5. Communicates final designs to a wide audiences (skilled professionals, government officials, architects, builders and engineers) through effective technical skills, high level graphical illustration skills, and oral communication.

**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) Team Case Study and Presentation, 25%. Portfolio, One (1) Team Portfolio and Presentation, 25%. Portfolio, One (1) Individual Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Individual Presentation (fifteen (15) minutes), 10%.

## NBD3103 Building Design Studio 1

**Locations:** Footscray Park.

**Prerequisites:** Completion of at least 144 credit points.

**Description:** Building Design Studio 1 is the culmination of student experience in the Bachelor of Building Design 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. Students will design low-rise buildings (one to three storeys high). Students will develop their understanding of the fundamentals of the project briefing and design process through a design-based project. Students will take responsibility for the design, planning, organisation, implementation and evaluation of the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams.

Building Design Project 1 focuses on the scoping, designing and planning of the project. Project proposals will be presented as a written report, portfolio, physical model, poster and oral presentation.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Apply design knowledge to an architectural problem at an advanced level;  
2. Critically review and synthesise a body of practical and theoretical knowledge to justify an effective design process of a low rise building in accord with the design briefing; 3. Demonstrate design skills through an iterative and considered creative design process, to resolve the ideas from concept formation through to design development at an advanced level; 4. Communicate design ideas at an advanced level, demonstrating through the building design and its representation, the aims and claims that are made for the building design; and 5. Work effectively and collaboratively as a team, and manage multiple tasks in a timely and professional manner.

**Required Reading:** Materials will be provided on VU Collaborate.

**Assessment:** Project, Site Analysis and Precedent Case Study, 20%. Project, Initial Site Responsive Design Submission and Schematic Design Submission, 20%. Presentation, Final Oral Presentation., 40%. Project, Individual Final Portfolio Submission, 20%.

## NBD3104 Building Design Studio 2

**Locations:** Footscray Park.

**Prerequisites:** Completion of at least 144 credit points.

**Description:** Building Design Studio 2 is the culmination of student experience in the Bachelor of Building Design 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. Students will design high-rise buildings (over 25 metres high). Students will develop their understanding of the fundamentals of the project briefing and design process through a design-based project. Students will take responsibility for the design, planning, organisation, implementation and evaluation of the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Design Studio 2 focuses on the scoping, designing and planning of the project. Project proposals will be presented as a written report, portfolio and oral presentation.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Apply design knowledge to an architectural problem at an advanced level with due consideration and integration of building systems and services; 2. Critically review and synthesise a body of practical and theoretical knowledge to justify an effective design process of a high rise building in accord with the design brief and the site context; 3. Demonstrate design skills through an iterative and considered creative design process, to resolve the ideas from concept formation to detailed design development at an advanced level; 4. Communicate design ideas at an advanced level through the building design and its representation, the concepts and justifications that are made for the building design; and 5. Work effectively and collaboratively as a team, and manage multiple tasks in a timely and professional manner.

**Required Reading:** Materials will be provided on VU Collaborate.

**Assessment:** Case Study, Individual Case Study Presentation Report, 20%. Portfolio, Team Portfolio: Site Analysis, Site Responsive Design, Schematic Design, 40%. Presentation, Final Design Presentation, 20%. Portfolio, Individual Portfolio, 20%.

## NBD3200 Urban Design and Development

**Locations:**Footscray Park.

**Prerequisites:**Nil.

**Description:** In this unit, students are introduced to the concept and meaning of urban design, and the diverse challenges cities are faced in the era of rapid urbanization. Students will engage in independent and collaborative analysis of urban spaces using different methods and techniques to inform conceptual design ideas and develop a deep understanding of the fundamentals of the project briefing and design process through a design-based project. Throughout the design process, student will review and deepen the existing knowledge of sustainable communities, liveable neighbourhoods, public spaces, environmental planning and the movement of pedestrians and traffic in cities. In this unit students will analyse existing urban spaces and propose conceptual designs for the master plan. The final design project will be presented and communicated through posters, power points, and physical models.

**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 projects; 2. Propose creative strategies to analyse urban spaces and communicate effectively with a range of skilled professionals, including architects, builders and engineers; 3. Adapt knowledge and skills to design for liveable neighbourhoods and sustainable communities; and 4. Design and develop the urban conceptual master plan demonstrating a deep level of understanding of the existing design issues and a high level of analytical and critical skills.

**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, Case Study 1, 20%. Test, In-Class tests (5), 20%. Portfolio, Individual Portfolio, 20%. Portfolio, Team portfolio, poster presentation and physical model which reflect students' skills in urban design and development., 40%.

## NBS6001 Building Studies

**Locations:**City Flinders.

**Prerequisites:**Nil.

**Description:** This unit of study examines the challenges of the contemporary construction industry, its key stakeholders and the role of a Building surveyor. The objectives, function statements and performance requirements of the National Construction Code of Australia (NCC) are analysed and interpreted. The performance-based approach vs the prescriptive approach is compared and critically reviewed.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Critically review real world scenarios and propose building and construction solutions relevant to sustainable urban development, design for sustainable development, the reuse of buildings and building materials, the durability of materials, and the minimisation and disposal of construction waste; 2. Critically analyse the fundamentals of building design and construction processes including building components and systems and services in the context of the contemporary construction industry and its challenges; 3. Deconstruct the role and responsibilities of a building surveyor and extrapolate these to a known or unknown building construction context; 4. Validate a good understanding of energy efficiency design principles, including the application and assessment of performance-based design solutions; and 5. Exemplify a thorough understanding of the professional and ethical responsibilities and practices of a building surveyor/certifier.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Case Study, Case Study: Contemporary construction industry (1000 words), 20%. Assignment, Assignment 1: Fundamentals of building design and construction (1000 words), 20%. Assignment, Assignment 2: Energy efficiency design principles (3000 words), 60%.

## NBS6002 Building Controls and Regulations

**Locations:**City Flinders.

**Prerequisites:**Nil.

**Description:** In this unit of study, the Australian legal system, the regulatory framework surrounding the construction industry, the National Construction Code (NCC) and associated legislation are elucidated in the context of the building construction industry. The unit aims to analyse and interpret statutory controls and assessment; enforcement proceedings; how occupational health and safety, environmental and heritage legislation interact with the Building Legislation; 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 federal, state and local building regulations, codes and standards in building design and development; 2. Identify and specify compliance requirements for design and development of buildings of any size and complexity; 3. Critically review building regulatory procedures, codes and standards to present graphical and written designs and specifications details for different development scenarios; 4. Formulate sound and safe practices in relation to permits and inspections on site; and 5. Exemplify effective and relevant interpersonal skills, including the ability to communicate effectively within the workplace and with the general public.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Assignment, Assignment 1: Residential building compliance (1500 words), 30%. Assignment, Assignment 2: Commercial building compliance (1500 words), 30%. Report, Report: Permits and inspections practice on site (2000 words), 40%.

## NBS6003 Building Engineering

**Locations:**City Flinders.

**Prerequisites:**Nil.

**Description:** In this unit of study, the analysis and design of structures in buildings and the behaviour of the most widely used construction and building materials are examined. Various forms of structural systems typically adopted in timber, reinforced concrete and steel construction, design loads on buildings, soil classification, ground behaviour and footing systems are analysed and interpreted. The important link between ecologically sustainable design and building material choice is appraised, including the significance of Green Star Ratings.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Contextualize knowledge of both traditional and contemporary construction and building materials behaviour and their properties; 2. Interrogate contemporary issues related to the choice and selection of sustainable materials for adequate performance, including life cycle analysis and recyclability; 3. Critically analyse the application and installation requirements of construction and building materials and components in various environments and the most appropriate forms of construction for various building sizes and types; 4. Critically evaluate structural and geotechnical design principles and characteristics for various construction forms and materials; and

5. Exemplify effective and relevant interpersonal skills, including the ability to communicate effectively within the workplace and with the general public.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Case Study, Case Study: Traditional vs contemporary construction practices and building materials (1000 words), 20%. Assignment, Assignment: Sustainable materials in building construction (1500 words), 30%. Report, Report: Geotechnical and structural design (2500 words), 50%.

## NBS6004 Planning and Assessment Process

**Locations:** City Flinders.

**Prerequisites:** Nil.

**Description:** This unit of study examines planning principles, processes and practices in Australia. Private and municipal building surveyors carry out the statutory role of ensuring that proposed building projects meet relevant compliance requirements prior to issuing building permits in accordance with planning permits. Planning and preparation required to assess planning application, assessment of planning application documentation, assessment of revised design plans and finalisation of planning permits are explored in the context of sustainability, indigenous culture and heritage, private land conservation and non-renewable natural resources.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Critically analyse and interpret relevant approving authority requirements for assessing and issuing planning applications and building permits to ensure adherence to relevant administrative processes, historical context and contemporary issues;
2. Critically evaluate relevant planning documentation, including drawings, for various building projects and assess applications for compliance with relevant legislation, codes, regulations and local planning authority requirements;
3. Formulate a final building permit for a building project, noting specific conditions and validity of each permit;
4. Exemplify the ability to conduct research and write reports; and
5. Advocate, respect and value cultural diversity and indigenous rights and develop creative solutions to contribute to a sustainable world.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Assignment, Assignment 1: Planning documentation assessment (1000 words), 20%. Assignment, Assignment 2: Building permit (1500 words), 30%. Research Paper, Historical context and contemporary issues (2500 words), 50%.

## 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 immerses 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 rationale, 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.

**Required Reading:** A comprehensive set of notes will be available for most topics.

These notes will contain further references and reading material. **RECOMMENDED TEXTS:** Elements of Architecture, Irma Boom, Rem Koolhaas, 2018 Architecture, form, space & order, Frank Ching, 1979 Introduction to Architecture, Francis D. K. Ching, James F. Eckler, 1979

**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 sections 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. Exercise, In class activity (2), 20%. Case Study, Team Case study and presentation, 20%. Portfolio, Team Portfolio and Presentation, 20%. Portfolio, Individual Portfolio and Presentation, 40%.

## 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 constraints in building design from start of design process to building construction completion stage. They will learn how to develop construction details to respond to governmental mandatory requirement. They also learn about various building trades, professions and authorities involved in building design and construction and how they communicate and how this communication can be facilitated using project documentation.

**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. Demonstrate understanding and skills of building design and construction processes using project documentation; and
5. Develop and design new innovative and conventional building construction details according to international and Australian standards.

**Required Reading:** National Construction Code Series (2019) Volume One Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code Series (2019) Volume Two Building Code of Australia Class 1 to Class 10 Buildings ABCB Publications, Canberra **RECOMMENDED TEXTS:** Ching, F.D.K., (2014) Building construction illustrated 5th ed. John Wiley & Sons, Inc, Hoboken, New Jersey



**Assessment:** Test, Tests (2) (90mins duration each), 30%. Presentation, Group Presentation, 25%. Exercise, In-class Exercises, 10%. Project, Design Project and Oral Presentation, 35%. 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.

## NEC2102 Solid Mechanics

**Locations:** Footscray Park.

**Prerequisites:** NEF1102 - Engineering Physics 1 NEF1205 - Engineering Fundamentals NEM1001 - 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. Calculate internal actions in a member including forces and moments, and derive associated diagrams; 2. Evaluate centroids, centre of gravity, and moment of inertia of engineering cross-sections; 3. Determine the various types of stresses present in a structure, incorporating the mechanical properties of engineering materials; 4. Deduce principle stresses and strains using Mohr's circle and transformation formulas; 5. Analyse the deflection of engineering beams and shafts, and failure modes of compression members; 6. Formulate and solve problems by undertaking basic engineering analysis and write technical reports.

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources. Hibbeler, R.C. (2017) 5th ed. in SI units Statics and mechanics of Materials Pearson/Prentice Hall, Singapore.

**Assessment:** Assignment, Individual Homework Problems, 25%. Project, Group Project Report, 25%. Test, Tests (Individual), 50%. The tests focus 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 tests 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 40% in the tests in order to pass 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 and Architectural 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 architectural engineering construction work (i.e. concrete, steel and timber); 2. Demonstrate an appropriate knowledge of other construction materials including masonry, aluminium, glass, polymers and composites; 3. Distinguish between the types of plant and equipment, and apply construction processes for a variety of civil and architectural engineering construction processes; 4. Investigate materials, equipment and construction techniques for a specific project; and 5. Evaluate OH&S and environmental requirements for working on a construction site with specific material, plant or project.

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources.

**Assessment:** Report, Group Laboratory Report(s), 25%. Report, Group PBL-Type Report and Individual Report Poster, 15%. Presentation, Individual Scientific Poster, 10%. Test, Two (2) Tests (Individual), 50%.

## NEC2104 Engineering Surveying

**Locations:** Footscray Park.

**Prerequisites:** NEF1201 - Engineering Mathematics 2 or

**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 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. Measure and evaluate 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.

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources. Ghilani, C D & Wolf, P R. (2011) 13th ed. Elementary Surveying: An Introduction to Geomatics New York: Pearson Education

**Assessment:** Practicum, Individual Fieldwork Practicals (3), 30%. Assignment, Individual Written Assignment, 20%. Test, Individual Tests x 2 (25% each), 50%.

## NEC2201 Introduction to Structural Engineering Design

**Locations:** Footscray Park.

**Prerequisites:** NEC2102 - Solid Mechanics

**Description:** This unit provides a basic introduction to the design of structural timber and steel elements. Topics include: Timber: Calculations of dead and live loads and specific loads, material and design properties, beams, columns, and nailed and bolted connections in simple shear. Steel: Stability of elements, beams, members

under axial compression, members in tension, and bolted and welded connections in simple shear or tension.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Compute dead and live loads on structural members and structures; 2. Demonstrate professional understanding of timber material and design properties; 3. Design timber beams, timber columns and timber connections; 4. Apply the theory of stability to the design of steel elements; and 5. Design steel beams, steel members in axial compression and tension, and steel connections in shear or tension.

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources.

**Assessment:** Assignment, Assignment 1: Tutorial Problems in Timber Design, 20%. Test, Test 1 (Timber Design), 30%. Assignment, Assignment 2: Tutorial Problems in Steel Design, 20%. Test, Test 2 (Steel Design), 30%. The assignments may be undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The tests focus 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 test 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 Test 1 and a minimum mark of 40% in Test 2 and 50% in the overall unit assessment in order to pass the unit.

## 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 conditions and improvement techniques. Students will also be introduced to a range of hands-on activities and laboratory practices aimed at determining types and properties of soil and rock, which might be present on any particular site. Key topics include: Engineering geology; Classification, description and engineering properties of soil and rock; In-ground stress due to gravity loads and the principle of effective stress; Permeability and seepage of water through soil; Shear strength of soil; Slope failure mechanisms and related stability analyses; Earthworks and compaction of soils; Geotechnical site investigation; Introduction to geo-energy.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Evaluate and analyse basic soil / rock information using various sources including geological maps, laboratory and field investigations, websites and texts; 2. Classify major soil and rock types, and explain their typical applications for engineering uses; 3. Predict the behaviour of various soil and rock types under different in-situ conditions by quantitatively and qualitatively assessing key soil and rock parameters; 4. Apply numerical simulation techniques to model geomechanics problems and characterize soil / rock behaviour under various in-situ conditions; and 5. Conduct some key geotechnical laboratory tests, analyse data and interpret results according to the relevant Australian Standards.

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources. Smith, I. (2014) 9th ed. Elements of Soil Mechanics Wiley Blackwell

**Assessment:** Test, Online quiz., 10%. Laboratory Work, Laboratory reports, 15%.

Assignment, Team-based problem solving exercise and report., 15%. Test, Two individual written tests (2hrs each) (30% each), 60%. The tests 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. As the test 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 tests (and 50% in the overall unit assessment) in order to pass the unit.

## NEC2203 Hydraulics

**Locations:** Footscray Park.

**Prerequisites:** NEF2101 - Fluid Mechanics 1

**Description:** This unit builds on Fluids Mechanics 1 that was covered in Semester 1 (it is also a pre-requisite). 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.

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources. Hamill, L. (2011) 3rd ed. Understanding Hydraulics MacMillan Press

**Assessment:** Practicum, Individual Lab based practicum, 15%. Report, Site visit based group report, 10%. Laboratory Work, Computer based individual lab work, 35%. Test, Individual Test (2 hours), 40%. The Test 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.

## 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, superelevation, 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;

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources.

**Assessment:** Assignment, Group Assignment., 25%. Project, Individual Project, 25%. Test, Individual Tests (2), 50%.

### 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 energy method for determination of deflections and rotations, the 'stiffness' method of analysis for beams and rigid frames, the force method of analysis for statically indeterminate trusses, beams, frames and composite structures and the matrix structural analysis of trusses, beams and frames.

**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. Critically evaluate a range of approximate solutions for common structures; and
5. Determine solutions and undertake standard structural engineering analyses.

**Required Reading:** RECOMMENDED TEXTS: Refer to VU Collaborate for recommended reading and additional resources. Hibbler R.C., (2018) Structural Analysis 10th ed. Pearson International.

**Assessment:** Exercise, Exercise 1, 20%. Exercise, Exercise 2, 20%. Test, Test 1, 30%. Test, Test 2, 30%.

### 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. The ground must be strong enough to resist the applied load through the foundation and must not 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. Bearing 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. Review 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. Analyse earth pressure theory and design retaining walls and related structures when subjected to a range of backfill soil types and moisture conditions;
5. Review the principles and carry out basic design work related to dewatering, soil improvement systems and the use of geosynthetic materials;

**Required Reading:** Refer to VU Collaborate for recommended reading and additional resources. Smith, I. (2014) 9th edn, Elements of Soil Mechanics, Wiley Blackwell

**Assessment:** Test, Online test, 10%. Assignment, Assignment 1: Team-based report, 15%. Assignment, Assignment 2: Team-based problem solving / design and report, 15%. Test, Two written tests (30% each), 60%. The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The Tests 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 test 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.

### 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 apply the theoretical knowledge acquired in problem solving and develop critical thinking skills. 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 systems using computer software SOURCE; 5. Initiate, coordinate and manage team projects in water resources management and to recommend and present the optimum solutions professionally.

**Required Reading:** Class notes can be accessed from VU Collaborate.

**Assessment:** Portfolio, SOURCE portfolio (Computer Simulation), 10%. Test, Tests (3), 60%. Project, Team project presentation, 25%. Exercise, Rob exercise (simulation exercise), 5%. 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. 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. Analyse 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. Analyse, 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. Analyse 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. Analyse, 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; and 6. Work effectively as a member and/or leader of a small team and demonstrate good communication skills, based on technical reports and team discussion.

**Required Reading:** All resources, notes and readings are available on VU Collaborate.

**Assessment:** Exercise, Short-answer Design questions, 15%. Project, Group Design Projects x 2 (2,500 words plus figures/tables), 40%. Test, MCQ Tests x 2 (30mins each), 20%. Exercise, Short-answer Design questions, 25%. The Design Projects focus 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, 2.2, 3.2 and 3.5.). Students must complete assessments for all learning outcomes in order to pass this unit.

## NEC3202 Civil Engineering Design 1

**Locations:** Footscray Park.

**Prerequisites:** NEC2203 - Hydraulics NEC2204 - Highway Engineering NEC3103 - Hydrology and Water Resources

**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 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, a report and presentation. To increase student exposure to current real-world practice and requirements, at least one of these designs will be offered and run by an external civil engineering organisation in collaboration with the unit convenor.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Investigate key issues in a typical civil engineering design problem, formulate the problem, and use a systems approach to solve it; 2. Locate, evaluate and use additional data and information from a variety of sources relevant to a particular design; 3. Analyse the implementation of preliminary designs for projects in the broad fields of water and road engineering; 4. Evaluate design options against technical and other criteria; and 5. Collaborate effectively as a member and/or leader of a small design team.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Presentation, Presentations (2), 30%. Test, Test, 20%. Assignment, Two team-based design reports, 50%.

## 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 collaborate as a member of a team in undertaking design tasks.

**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. (2018) 3rd ed. Reinforced & Prestressed concrete: Analysis and design with emphasis on the application of AS3600-2009 Cambridge Press Refer to VU Collaborate for recommended reading and additional resources.

**Assessment:** Test, Mid-block test (1.5 hours equivalent to 1000 words), 30%. Portfolio, Portfolio Problems, 15%. Project, PBL design project, 40%. Presentation, Design Project Oral Presentation, 15%. The test 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 portfolio or project. As the test 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 40% in the examination in order to pass the unit.

## NEC4101 Environmental Engineering 1

**Locations:** Footscray Park.

**Prerequisites:** NEC2203 - Hydraulics and NEC3201 - Hydraulic Engineering

**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 the visit.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Demonstrate an in-depth understanding of the options to treat waste water and stormwater based on engineering concepts and the socio-economic factors that influence it; 2. Develop basic design plans for key elements of different types of wastewater collection systems, treatment plants and reuse systems; 3. Explicate and solve, manually or via appropriate software packages, a range of water pollution and water sensitive urban design (WSUD) problems; and 4. Communicate using industry standard technical language.

**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, 15%. Exercise, Problem-Solving Exercises x 2, 55%. Report, Team Based Research Report, 20%. Presentation, Report Presentation, 10%.

## 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.

**Required Reading:** Reading materials and other resources will be listed on VU Collaborate.

**Assessment:** Assignment, Tutorial Problems, 15%. Project, Design Project (Report maximum 35 A4 pages including design calculations and drawings), 25%. Test, Mid-block Test, 30%. Test, Final Test, 30%. The design project is undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The test 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 test 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 test 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, 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; and sustainable transport.

**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. Construct 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. Determine and implement

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.

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

**Assessment:**Assignment, Individual Assignment, 25%. Project, Group Project, 25%. Test, Individual Tests (2), 50%. The tests focus upon the individual students' ability to demonstrate their 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 test 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;

**Required Reading:**Alexander, C.K. and M.N.O. Sadiku. (2020). 7th ed. Fundamentals of Electric Circuits. McGraw-Hill.

**Assessment:**Laboratory Work, Practical Lab Assessment, 20%. Report, Two Team Lab Reports, 30%. Test, Tests (3), 50%.

### 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 and application of Simulink to analyse electrical circuits.

**Credit Points:** 12

**Learning Outcomes:**On successful completion of this unit, students will be able to: 1. Effectively apply the concepts 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.

**Required Reading:**No

**Assessment:**Laboratory Work, Four (4) Laboratory Based Problem Solving and Programming Exercises, 20%. Test, Four (4) Tests, 40%. Project, One (1) Group Project, 40%.

### 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 class 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; Apply statistical analysis of random signals and the characterization of such signals in terms of correlation and power spectral density functions and the concept of signal-to-noise ratio; 2. Translate the information bearing nature of signals and the bandwidth considerations; Determine the types of noise present in telecommunication systems and the characterisation of thermal noise; 3. Apply the principles behind frequency translation and its depiction as various types of modulation; 4. Employ the signal transition in linear and non-linear systems, and the recognition of such systems in terms of filters and other components; 5. Translate the assessment of performance in digital communication systems in terms of bit error probability.

**Required Reading:**Nil

**Assessment:**Project, Individual Research Project Report, 20%. Test, Test, 15%. Test, Test, 20%. Laboratory Work, Laboratory Reports (3), 45%.

### 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 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. 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. Articulate solutions clearly (orally and in writing) to professional and non-professional audiences.

**Required Reading:** Recommended TEXTS: 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. A Guide to Writing as an Engineer, David F. Beer, David A. McMurrey (2014), 4th Edition, Wiley.

**Assessment:** Project, Practical Lab Assessments (2), 30%. Presentation, Team Oral Presentation & Project Demonstration, 30%. Report, Team Technical Report, 30%. Assignment, Individual Reflective Essay, 10%.

### 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.

**Required Reading:** Alexander, C.K., & M.N.O. Sadiku (2020) 7th ed. Fundamentals of Electric Circuits McGraw-Hill

**Assessment:** Laboratory Work, Practical Lab Assessment, 10%. Test, Tests (3), 50%. Report, Laboratory Reports (3), 40%.

### NEE2204 Power System Supply Chain Management

**Locations:** Footscray Park.

**Prerequisites:** Nil.

**Description:** The unit explores two key areas – Power System Supply Chain and Transmission. 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; Overhead lines and underground cables; Power distribution networks and substation layouts; Auxiliary networks, protection equipment and SCADA. 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 the roles of transmission and distribution systems and auxiliary networks; 2. Contextualise alternative generations such as hydro, wind, solar and other energy systems; 3. Apply principles in the modelling of transmission lines of various lengths with ABCD constants and analyse transmission lines under steady state conditions including power transfers; 4. Illustrate and map transmission line travelling waves and transient conditions in relation to Lattice diagrams; and 5. Assess the use of AC and DC voltages and selection of voltage levels for transmission in wide ranging settings.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Test, Test (45 mins), 20%. Laboratory Work, Group Lab Reports x 2 (1000 words equivalent per report), 30%. Other, Problem solving activity x 2 (250 words each), 20%. Test, Test (1.5 hours), 30%.

### 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. Examples of practical issues, such as biasing and amplifier configuration will be covered from the perspective of a single device type i.e. selected from 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 amplifiers; 5. Differentiate between the linear op-amp device and discrete semiconductor devices as amplifiers.

**Required Reading:** Sedra, A. & Smith, K., (2014). 7th ed. Microelectronic Circuits. Oxford University Press.

**Assessment:** Test, Tests (2), 20%. Test, Tests (2), 20%. Practicum, Laboratory work, 30%. Report, Laboratory Reports (2), 30%.

## NEE2210 Engineering Design and Practice 2B

**Locations:** Footscray Park.

**Prerequisites:** NEE2205 - Analogue Electronics

**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. A language and communication staff member will assist with the development of communications and other 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. Articulate 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. Demonstrate the capacity to undertake lifelong learning by locating, evaluating, managing and using information effectively.

**Required Reading:** RECOMMENDED TEXTS: The following books are recommended readings: Williams, A., (2013). Analog Filter and Circuit Design Handbook 1st ed., McGraw-Hill Education. Sedra, A.S. Smith K.C., (2010) (2014) Microelectronic Circuits. 6th 7th ed., Oxford University Press. Van Valkenburg, M. E., (1982) Analog filter design, Holt, Rinehart, and Winston

**Assessment:** Project, Practical Lab Assessments (2), 20%. Presentation, Oral Presentation and Project Demonstration, 30%. Report, Team Technical Report, 30%. Portfolio, Individual Portfolio, 20%.

## NEE3103 Electrical Machines

**Locations:** Footscray Park.

**Prerequisites:** NEE2101 - Electrical Circuits or NEE2251 - Fundamentals of Electrical and Electronic Engineering

**Description:** This unit introduces students to Magnetic circuit theory. 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 including applications of transformers in power systems and their performance analysis using equivalent circuits will 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

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performance on infinite bus, synchronous condenser, 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.

**Required Reading:** Refer to VU Collaborate for recommended reading and other resources.

**Assessment:** Laboratory Work, Two Group Laboratory Reports (1500 words each; Team of Two), 40%. Test, Tests (3), 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, 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 with example circuits.

**Required Reading:** Refer to VU Collaborate for recommended reading and other resources.

**Assessment:** Test, Tests, 20%. Test, Tests, 20%. Practicum, Laboratory work, 30%. Report, Laboratory Reports (2), 30%.

## NEE3201 Introduction to Control Systems

**Locations:** Footscray Park.

**Prerequisites:** NEE2201 - Linear Systems with Matlab Applications or

**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.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Articulate and differentiate the purposes and requirements of open-loop and closed-



loop control systems; 2. Compute an overall transfer function using Mason's Gain Formula and Block Diagram Reduction, as well as apply 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. Analyse the relative stability and performance of LTI SISO systems by using Root-locus technique and Bode diagram; and 5. Design P, PI, PID controllers, lead, lag, lag-lead compensators to meet time-domain and frequency-domain specifications of LTI SISO closed-loop systems.

**Required Reading:** RECOMMENDED TEXTS: Dorf, R. C. & Bishop, R.H. (2017). *Modern control systems* (13th ed.). Upper Saddle River, NJ: Prentice Hall. Nise, N. (2019). *Control systems engineering* (8th ed.). Hoboken, NJ: Wiley.

**Assessment:** Laboratory Work, Lab Report (1), 15%. Laboratory Work, Lab Reports (2), 30%. Test, Three Tests (20%, 20%, 15%), 55%.

### NEE3203 Embedded Systems

**Locations:** Footscray Park.

**Prerequisites:** NEE2106 - Computer Programming for Electrical Engineers

**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 converters (ADC), pulse width modulation (PWM), standard communication with external devices e.g., USART, SPI, I2C. Software programming techniques such as polling and interrupts 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 system; 3. Analyse a real-time, embedded industrial control system using an embedded microcontroller with associated interface either in simulation or hardware; 4. Discuss the implementation of a communications device to the embedded microcontroller application.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Laboratory Work, Practical Lab Assessments (3), 30%. Report, Lab Reports (2), 30%. Test, Tests (2), 40%.

### 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;

**Required Reading:** All reading texts and other resources will be made available on VU Collaborate.

**Assessment:** Laboratory Work, Two Laboratory Team Reports (1500 words each), 20%. Test, Test (1 hour), 30%. Assignment, Part (A), 25%. Assignment, Part (B), 25%.

### NEE3208 Signal Processing

**Locations:** Footscray Park.

**Prerequisites:** NEE2201 - Linear Systems with Matlab Applications

**Description:** The unit covers digital signal processing techniques by introducing students to the fundamentals of deterministic discrete signals and noise. The topics to be covered include the introduction to discrete-time signals and systems, discrete Fourier Transform and its properties, the z-transform and its properties, sampling of continuous-time signals, anti-aliasing filters analogue to digital signal conversion, analysis of discrete-time signal processing systems using transform techniques, examples of design and realization of finite impulse response (FIR) filters and infinite impulse response (IIR) filters. Application of fundamental signal processing techniques will be demonstrated using software e.g. MATLAB.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Articulate time domain and frequency domain characteristics of digital signals and systems; 2. Analyse digital signals, differentiating noise and information using quantitative measures such as essential bandwidth, energy density and correlations; 3. Apply signal transforms such as the z-transform and discrete Fourier transform to represent discrete signals in different domains; and 4. Apply digital filters to denoise signals.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** There are 6 labs (session 2,3,5,6,8,9) which cover all learning outcomes (Lab 1+2 = L01, Lab 3, 4 = L02, Lab 5,6 = L03 and L04). Practical assessment of individual student's performance in the lab is done on 3 labs (worth 10% each) in Session 3, 8, 9. The group laboratory report is a group report (1500 words each) on 2 labs (worth 15% each) done in Session 2 and 5. The written tests (worth 20% each) are done in Session 6 and Session 11 cover the theoretical understanding of concepts. The tests cover all learning outcomes of the unit (L01-L04). Test 1 = L01+L02, Test 2 = L03+L04. Laboratory Work, Practical Assessment (3), 30%. Report, Lab Reports (2), 30%. Test, Tests (2), 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. Complex power flow analysis in single-phase circuits will be investigated. 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. Gauss-Seidel load flow analysis method will be examined in the solution of complex networks in planning and design of electrical distribution and transmission networks. Symmetrical and unsymmetrical faults in power systems will be analysed. Power system automation and control concepts will be investigated

in the operational protection planning of smart grids.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Construct a multi-bus system and carry out complex flow studies investigating real power flow dependencies; 2. Design computer-aided solutions to power system analysis problems; 3. Evaluate load flow analysis in the steady-state analysis of an interconnected power system; 4. Analyse balanced and unbalanced power system faults; and 5. Investigate automation, protection and control concepts in smart grid design.

**Required Reading:** List of materials and teaching resources are available on VU Collaborate

**Assessment:** Laboratory Work, Practical Lab Assessment (Team of two), 20%. Project, One Project Report (Team of two; 1500 words), 20%. Test, Tests (2), 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' modelling and design 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; and 4. Survey and investigate the operation of the key wireless standards, GSM, WCDMA LTE and dimension networks accordingly;

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Assignment, Problem solving activity 1 (1 hour), 30%. Laboratory Work, Laboratory Reports (1200 words each; Team of Two), 20%. Assignment, Problem solving activity 2 (1.5 hours), 50%.

## 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.

**Required Reading:** Class Notes and additional resources on VU Collaborate. Hamill, Les. (2011) 3rd ed. Understanding Hydraulics MacMillan Press

**Assessment:** Exercise, Individual Quizzes (2), 20%. Practicum, Individual Lab experiment based assessments (2), 30%. Test, Individual Test (1), 50%.

## 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. Classify the components of cooling and heating loads in buildings, evaluate methods used for their estimation, and apply 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.

**Required Reading:** Stanfield, C and Skaves, D (2017) 3rd ed. Fundamentals of HVAC Pearson

**Assessment:** Exercise, In-class exercises, 10%. Test, Tests (2) (20% each) (1.5hr each duration), 40%. Assignment, Team Project, 30%. Presentation, Oral Presentations, 20%.

## NEF2251 Fundamentals of Electrical and Electronic Engineering

**Locations:** Footscray Park.

**Prerequisites:** NEF1205 - 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. Electrical circuits 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. Digital Electronics begins with a discussion of arithmetic operations, Boolean expressions and their reduction techniques.

**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, 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; and  
4. Identify different Logic Gates, truth tables and examine their use in given contexts.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Test, Test 1 (1hr), 20%. Laboratory Work, Two Laboratory Reports (1000 word equivalence), 50%. Test, Test 2 (1.5hrs), 30%.

### NEF3001 Applied Project 1

**Locations:** Footscray Park, VU Sydney.

**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 multiple block (NEF3002), substantial applied project, related to their discipline area. Students will take responsibility for the design, planning and organisation of the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Students are encouraged to work in small teams for the projects. 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 (NEF3002) 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 propose 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.

**Required Reading:** Any project specific readings will be provided in VU Collaborate.

**Assessment:** Project, Project Plan (1500 words or equivalent), 30%. Project, Project Proposal (2500 words or equivalent), 50%. Presentation, Oral Presentation, 20%. The above assessment word equivalents are for individual contributions to a group, or the expectation for students undertaking an individual project.

### NEF3002 Applied Project 2

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NEF3001 - Applied Project 1 Completion of 144 credit points.

**Description:** Applied Project 2 is the implementation of the negotiated project (NEF3001 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 organisation, implementation and evaluation of the various components required for successful completion of the project. In some cases projects will be conducted in collaboration with industry partners. Projects undertaken by small student teams are encouraged. 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.

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

**Assessment:** Journal, Project Diary (10 entries), 10%. Report, Project Final Report (4000 words or equivalent), 70%. Presentation, Oral Presentation (15 minutes), 20%. The above assessment word equivalents are for individual contributions to a group, or the expectation for students undertaking an individual project.

### 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 including economic feasibility and project evaluation, contract administration and tendering processes.

**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. Devise project plans/schedules and conduct

critical path analysis; apply commercially available software, such as Microsoft Project to evaluate budget, resource and time management within an engineering project; 5. Formulate project cash flows and budgets with respect to project control at various stages of projects.

**Required Reading:** RECOMMENDED TEXTS: Class Materials and associated Notes will be distributed to students as required. Harris, P. E. (2019). Planning and control using Microsoft Project 2013 or 2016 and PMBOK guide (6th ed.). Doncaster Heights, VIC: Eastwood Harris Pty Limited. (PMBOK® GUIDE) (2017) A Guide to the Project Management Body of Knowledge 6th ed. Project Management Institute Meredith, J.R., Mantel, S.J., Hoboken, H. and Jr. Meredith, J.R. (2017) Project management: a managerial approach (10th ed). NJ: John Wiley. There are a number of other textbooks that can be used in conjunction with the recommended 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:** Project, Develop and present a Project charter (PC) and a Project Management Plan (PMP), 20%. Case Study, Develop a Project Execution Plan (PEP) using MS Project, 20%. Test, Open Book Tests (2), 60%.

### NEF3202 Research Methods

**Locations:** Footscray Park.

**Prerequisites:** Completion of 192 Credit Points.

**Description:** Effective implementation and management of successful engineering projects, 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 and elaborate the principles involved in planning and executing a research project; 2. Propose a conceptual framework for a research problem and assess it in the context of engineering, building design and/or construction; 3. Formulate a research question(s) or a hypothesis; 4. Select and develop the appropriate methodology and measurement instruments for data collection; 5. Critically analyse sources of information and justify the selection and application of methods for data collection and analysis.

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

**Assessment:** Assignment, Research Brief (1 page), 10%. Project, Capstone Project Outline (400 words) (hurdle), 0%. Report, Part A (30%), Part B (40%), 70%. Presentation, Final Formal Research Presentation, 20%.

### NEF4001 Computational Heat and Fluid Flows

**Locations:** Footscray Park.

**Prerequisites:** NEF1201 - Engineering Mathematics 2 and NEF1202 - Engineering

Physics 2 and Completion of 240 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.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Analyse the heat transfer in steady heat conduction for plane, cylindrical and spherical surfaces; 2. Analyse the heat transfer for forced heat convection in laminar and turbulent flows and for internal and external surfaces; 3. Generate CFD models of simple, verifiable geometries with predictable results and of complex geometries with unknown flow fields; 4. Critically evaluate the validity of CFD results and interpret their meaning; and 5. Model heat removal systems using CFD and interpret results indicating necessary adjustments.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Exercise, Analysing steady heat conduction problems., 15%. Test, Test on the understanding of the theory of Heat Transfer., 35%. Assignment, Application of CFD for solving electro and mechanical problems., 25%. Test, Theory on Computational Fluid Dynamics and in class CFD simulations., 25%.

### NEF4101 Research Project 1

**Locations:** Footscray Park.

**Prerequisites:** NEF3202 - Research Methods Completion of at least 288 credit points.

**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 unit focuses on undertaking a literature review and developing a research proposal for a substantial discipline related project. The project will then be executed in NEF4201 Research Project 2. 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.

**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 the discipline; 2. Evaluate the feasibility of a range of solutions by using discipline-relevant research methods; 3. Critically analyse existing literature and/or designs related to the project; and 4. Develop an effective proposal within the constraints of the project brief.

**Required Reading:** None required.

**Assessment:** Journal, Project Diary (5 entries minimum), 10%. Presentation, Oral Presentation (10mins + Q&A), 20%. Report, Project Proposal (7000 words or equivalent), 70%. The Project Proposal is a hurdle assessment as it is the only task that addresses all Engineers Australia Competency listed below.

### 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 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. Investigate and analyse intellectual property matters affecting the engineering profession;
5. Compare business types, appraise regulatory requirements of starting a business and create a business plan with emphasis on securing funding.

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

**Assessment:** Assignment, Individual Employment Documents (1000 words), 20%. Other, Mock Interview, 20%. Presentation, Presentation on Inquiry into Professional Conduct & Development and Ethics (Team of two; 15 minutes), 20%. Assignment, Business Plan Report (Team of two; 2500 words), 40%.

## 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 facade 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 and paper-based methods.

**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 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 lighting and acoustic systems of a commercial building in accordance with Australian standards and current best practices in industry;
2. Design the lighting for a commercial building using computer calculations;
3. Exhibit professional lighting capabilities in presentation of concept plans, collaboration methods with other industry professionals, basic understanding of terminology and demonstration of three dimensional planning;
4. Formulate the range of solutions and equipment for designing building acoustic systems, and be able to categorise the applicability of alternate systems for a given building; and
5. Select appropriate forms of specification (for tendering) for the installation of building lighting systems.

**Required Reading:** Reading texts and other resources will be made available on VU Collaborate.

**Assessment:** Assignment, Problem-solving exercise for acoustic and lighting, 15%. Project, Project A) Presentation of project concept and plan - 35% Project B) Developed acoustic and lighting project - 35%, 70%. Portfolio, Portfolio, 15%.

## 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 unit continues from Research Project 1 and students are expected to carry out the project in accordance with the project proposal developed therein.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Implement research and/or design methodologies appropriate to the problem and the relevant discipline;
2. Analyse data to demonstrate the validity of results or design solutions;
3. Produce a comprehensive technical report describing the problem along with results and solutions;
4. Effectively collaborate with all stakeholders in an ethical

and professional manner; and 5. Justify and defend ideas, solutions, and interpretation of results.

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

**Assessment:** Journal, Project Diary (5 entries minimum), 10%. Report, Project Implementation and Findings (7000 words or equivalent), 70%. Presentation, Oral Presentation (10 minutes + Q&A), 20%. The final report of Project Implementation and Findings and Oral Presentation are both hurdle assessments as they are both required to meet the Engineers Australia Competencies listed below.

## NEF4205 Sustainable Energy Systems

**Locations:** Footscray Park.

**Prerequisites:** Completion of 192 credit points including unit NEF1202 Engineering Physics 2.

**Description:** This unit of study aims to provide applied and creative knowledge and skills in the area of sustainable energy systems and environmental safety. The unit reflects on the concept of sustainability in the electricity 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, and hydro 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. An introduction to acoustics, noise level measurements, properties of acoustic materials, and noise control for safe working environment will be delivered.

**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 acoustic, noise level and its control; 5. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice; and 6. Critique safety in the working environment.

**Required Reading:** Required reading and other resources will be made available on VU Collaborate.

**Assessment:** Project, Preliminary report for Group project, 20%. Project, Final Report for Group project, 40%. Test, Final Test, 40%.

## NEF4206 Advanced Engineering Design

**Locations:** Footscray Park.

**Prerequisites:** NHEE students require: NEF3101, 288 credit points and NEE2204. NHEM students require: NEF3101, 288 credit points and NEM3102. NHEC students require: NEF3101, 288 credit points and NEC4102 Others require: NEF3101, 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 computer aided design software, 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 two (2) design reports that will be supported by oral presentations. 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. Identify design problems, propose solutions and implement a range of advanced engineering design skills to complete projects across a broad range of engineering fields; 2. Research and critically review relevant design information and data to inform resolution of design problems; 3. Conceptually map and adopt a system approach to design and evaluate the feasibility of solutions taking into account technical, environmental, economic and social criteria; 4. Collaborate effectively as a member and/or leader of a design team; and 5. Demonstrate sound communication skills in preparing requisite technical reports, contributing to team discussions and making oral presentations.

**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, Regular updates on design progress and skills development (written or oral), 20%. Presentation, Oral presentations providing updates on the design process and demonstration of skills developed, 20%. Report, Report 1: design report (including design calculations and drawings), 30%. Report, Report 2: design report (including design calculations and drawings), 30%. The reports focus upon the students' ability to demonstrate their fluent application of engineering techniques, tools and resources. The portfolio and presentations assess the individuals' capability against the learning outcomes for that assessment. They also evaluate effective team membership and team leadership, which been defined in Engineers Australia competencies 2.2 and 3.6. As the presentations are the only way by which these competencies can be assessed, students must achieve a minimum mark of 50% in the presentation(s) in order to pass the unit.

## NEF4207 Engineering Applications

**Locations:** Footscray Park.

**Prerequisites:** NEF3101 - Project Management NEC3203 - Structural Engineering Design 1

**Description:** This integrated unit focuses on the applications of advanced environmental and structural engineering design technologies in engineering practice. It offers you a distinctive opportunity to apply technical knowledge and skills learned in this integrated unit and previous units to solve practical environmental and structural engineering design problems. You will gain technical knowledge in environmental and structural engineering, and improve your problem solving and communication skills and employability.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Apply technical knowledge and skills learned to solve practical environmental and structural engineering design problems; 2. Develop solutions to complex engineering design problems incorporating a system approach; 3. Work effectively and accept

responsibilities for contributions to team works; and 4. Demonstrate good communication skills in team discussions and technical report writing.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Test, Online Quiz, 15%. Assignment, Problem worksheet, 35%. Project, Design Project, 25%. Test, Final test, 25%. The design project is undertaken by groups, and assesses the student's ability to problem solve and interact in a team situation. The online quiz, problem worksheet and final test focus upon the individual student's ability to demonstrate 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. .

## NEF6001 Research Project Part A

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** For Master of PM students: EPM5640 Research Methods. For Master of Applied IT students: Minimum 60 CPs.

**Description:** This unit provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in their master degree study. The unit provides students with a firm foundation from which they can undertake a research problem. The requirements of this unit have been developed to enhance students' theoretical application in problem solving, communication skills, individual and group project participation and other professional capabilities necessary for their degree. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. They will apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base research. A final report of approximately 8000 words should be submitted at the end of the project. Completion of this unit is typically followed by NEF6002 Research Project B.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Select an appropriate research methodology based on the content of the research;
2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area;
3. Articulate and apply literature review strategies to critically analyse the existing literature;
4. Prepare a rigorous research report addressing an important research problem; and
5. Draw conclusions and make recommendations to a variety of audiences – specialised and non-specialised.

**Required Reading:** For Engineering students, reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. For Project Management students the required text is: Collins J. & Hussey R., (2014) Business Research: A practical guide for undergraduate and postgraduate students 4th ed. Palgrave London. For IT students - the research material will be provided by the unit convenor and the supervisor appropriate to their research topic.

**Assessment:** Research Project A is typically the first of a two-unit research project. On the completion of the second unit Research Project B, students receive the final grade which includes work and assessment conducted during this unit. Total weighting for the assessment conducted in this unit is as follows: Presentation, Project Presentation, 20%. Report, Progress Report, 30%. Report, Final Report (approx. 8000 words), 50%.

## NEF6002 Research Project Part B

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** For Master of PM students: EPM5640 - Research Methods For Master of Applied IT students: Minimum 60 CPs and NIT6041 OR NIT6043 OR NEF6001

OR NEF6101.

**Description:** This unit provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in their master degree study. The unit provides students with a firm foundation from which they can undertake a research problem. The requirements of this unit have been developed to enhance students' theoretical application in problem solving, communication skills, individual and group project participation and other professional capabilities necessary for their degree. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. They will apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base research. A final report of approximately 8000 words should be submitted at the end of the project. This unit is typically following the completion of NEF6001 Research Project A.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Select an appropriate research methodology based on the content of the research;
2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area;
3. Articulate and apply literature review strategies to critically analyse the existing literature;
4. Prepare a rigorous research report addressing an important research problem; and
5. Draw conclusions and make recommendations to a variety of audiences – specialised and non-specialised.

**Required Reading:** Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. For Project Management students the required text is: Collins J. & Hussey R., (2014) Business Research: A practical guide for undergraduate and postgraduate students 4th ed. Palgrave London. For IT students - the research material will be provided by the unit convenor and the supervisor appropriate to their research topic.

**Assessment:** Presentation, Project Presentation, 20%. Report, Progress Report, 30%. Report, Final Report (approx. 8000 words), 50%.

## NEF6101 Research Thesis 1

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** For Master of PM students: EPM5640 - Research Methods For Master of Applied IT students: Minimum 60 CPs

**Description:** This unit provides an opportunity for students to undertake research in a specialised area field relevant to their own area of work or interest and/or related to theories explored in their master degree study. The unit provides students with a firm foundation from which they can undertake a research problem. The requirements of this unit have been developed to enhance students' theoretical application in problem solving, communication skills, individual and group project participation and other professional capabilities necessary for their degree. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. They will apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base research.

**Credit Points:** 24

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Select an appropriate research methodology based on the content of the research;
2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area;
3. Articulate and apply literature review strategies to critically analyse the existing literature;
4. Prepare a rigorous research report addressing an important research problem; and
5. Draw conclusions and make recommendations to a variety of audiences – specialised and non-specialised.

**Required Reading:** Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. For Project Management students the required text is: Collins J. & Hussey R., (2014) Business Research: A practical guide for undergraduate and postgraduate students 4th ed. Palgrave London For IT students - the research material will be provided by the unit convenor and the supervisor appropriate to their research topic For Engineering students the texts are: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

**Assessment:** Presentation, Project Presentation, 20%. Report, Progress Report, 30%. Report, Final Report (approx. 14,000 words), 50%.

## NEF6102 Research Thesis 2

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NEF6101 - Research Thesis 1

**Description:** This unit, together with NEF6101, provide an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in their master degree study. The unit provides students with a firm foundation from which they can undertake a research problem. The requirements of this unit have been developed to enhance students' theoretical application in problem solving, communication skills, individual and group project participation and other professional capabilities necessary for their degree. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. They will apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base research and compose a research thesis.

**Credit Points:** 24

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Select an appropriate research methodology based on the content of the research; 2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 3. Articulate and apply literature review strategies to critically analyse the existing literature; 4. Prepare a rigorous research report addressing an important research problem; and 5. Draw conclusions and make recommendations to a variety of audiences – specialised and non-specialised.

**Required Reading:** Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. For IT students - the research material will be provided by the unit convenor and the supervisor appropriate to their research topic. For Engineering students the texts are: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.

**Assessment:** Presentation, Project Presentation, 20%. Report, Progress Report, 30%. Report, Final Research Thesis (approx. 14,000 words), 50%.

## NEM2101 Mechanical Engineering Design

**Locations:** Footscray Park.

**Prerequisites:** NEF1204 - Introduction to Engineering Design NEF1205 - Engineering Fundamentals NEC2102 - Solid Mechanics

**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 unit will focus on the design of mechanical components as well as 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

**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 and a minor assignment on technical drawing, 17.5%. Portfolio, Design Optimisation Portfolio: Includes minor homework submissions and one minor written report., 17.5%. Test, Tests (3), 65%.

## 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 cementitious 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 systematic decision-making process for areas of optimum engineering design and adapt as necessary for a range of contexts; 4. Attribute the role materials play in maintaining a sustainable environment; 5. Report and justify recommendations effectively through written technical reports individually and as a part of a team.

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

**Assessment:** Students will work in groups but present individual components in the team reports. The reports will be used for formative assessment. Assignment, Team report and oral presentation, 30%. Laboratory Work, Demonstration of laboratory skills, and analysis of data. 3 Laboratory Reports (8%, 4%, 8%), 20%. Test, Three (3) Tests (10%, 20%, 20%), 50%. Students are required to demonstrate their development of skills in a laboratory.

## NEM2104 Numerical Modelling of Mechanical Systems

**Locations:** Footscray Park.

**Prerequisites:** NEF1201 - Engineering Mathematics 2NEF1104 - Problem Solving for Engineers NEF1205 - Engineering Fundamentals

**Description:** This unit builds upon knowledge from first year units by introducing



students to the application of numerical techniques to model, simulate and predict the behaviour of fundamental mechanical systems and processes. Numerical modelling is becoming increasingly 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;; 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. Perform linear regression analysis on real data and interpret the results;
2. Generate well-defined graphical representations of results and interpret graphical information;
3. Employ numerical differentiation and integration techniques for a range of dynamic events;
4. Implement and interpret statistical analyses and generate best-fitting probability functions; and
5. Apply numerical techniques to solve simple ordinary differential equations for engineering applications.

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

**Assessment:** Test, Open book test (45 mins), 20%. Test, Open book test (45 mins), 25%. Test, Open book test (45 mins), 25%. Portfolio, Portfolio, 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 First 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. The applications of these laws of Thermodynamics to determine the properties of the mixture of ideal gases.

**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 properties of the mixture of ideal gas mixture.

**Required Reading:** Comprehensive class, laboratory and activity notes. On-Line material. Readings will be made available via VU Collaborate.

**Assessment:** Exercise, Exercise, 15%. Laboratory Work, Laboratory Report, 20%. Test, Class test; calculations, sketches (3), 65%.

## NEM2202 Dynamics

**Locations:** Footscray Park.

**Prerequisites:** NEF1202 - Engineering Physics 2 NEM1001 - Algebra and Calculus

**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 and work as effective members of a team; and
4. Apply experimental techniques to real world engineering problems.

**Required Reading:** Meriam J.L., & Kraige L.G. (2018) 9th ed. Engineering mechanics: Dynamics John Wiley and Sons

**Assessment:** Test, Online Quiz, 10%. Report, Lab Report (2 parts) - Group, 40%. Test, Tests (2), 50%.

## NEM3101 Engineering Analysis and Modelling

**Locations:** Footscray Park.

**Prerequisites:** NEM2104 - Numerical Modelling of Mechanical Systems

**Description:** This Unit of Study addresses a range of modern and sophisticated techniques for analysing random data and processes that are pertinent to engineering. With increasing reliance on the monitoring of systems and machines as well as intensive measurement of environmental process related to engineering systems, a thorough appreciation of the various techniques available to analyse the data is essential for Mechanical Engineers. Application examples include: Atmospheric processes (temperature humidity and wind), ocean waves, seismic motion, road surfaces and structures, vehicle vibrations, acoustics, rotating and reciprocating machines, biomedical applications and many more. Students will be introduced to various techniques for dealing with dynamic processes focussing on random / non-deterministic processes. These include, statistical distributions, moving statistics, Frequency analysis (including Fourier Analysis and the Fourier Transform, Frequency Response Functions), digital sampling and filters and the Laplace Transform.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Employ appropriate Frequency domain analysis techniques on various signal types and properly interpret the results;
2. Evaluate the frequency response functions of mechanical systems using Fourier analysis;
3. Formulate the correct strategies for sampling a variety of signal types and applying the appropriate digital filter;
4. Employ appropriate statistical analyses on a range of data sets;
5. Apply Laplace transform techniques to solve differential equations related to mechanical systems; and
6. Create and validate computer code to perform the above analyses and produce written technical reports individually and as part of a team.

**Required Reading:** Refer to VU Collaborate for recommended reading and other resources.

**Assessment:** Students will work in groups of two but prepare individual portfolios. Portfolio, Written reports based on class work and labs, 30%. Test, Test 1 (1.5hr), 35%. Test, Test 2 (1.5hr), 35%. The portfolio needs to be a hurdle assessment as it is the only task that assesses LO 6.

## NEM3102 Design of Mechanical Systems

**Locations:** Footscray Park.

**Prerequisites:** NEM2101 - Mechanical Engineering Design NEM3203 - Stress Analysis

**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 learning experience 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.

**Required Reading:** Budynas, RG & Nisbett, JK (2018) 11th ed Shigley's Mechanical engineering design. McGraw Hill Education, New York, NY

**Assessment:** Portfolio, Mechanical Design Skills, 10%. Test, Test - Hurdle, 50%. Project, Group Report & Presentation, Design Project, 40%. The project 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 test 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 test 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 test (and 50% in the overall unit assessment).

## NEM3103 Thermodynamics 2

**Locations:** Footscray Park.

**Prerequisites:** NEM2201 - Thermodynamics 1

**Description:** This unit is the continuation from Thermodynamics 1 and is specifically for Mechanical Engineering students. The Thermodynamics 2 will focus on the applications of the principles learnt from Thermodynamics 1. This includes learning to analyse the refrigeration, air-conditioning systems, various engines, power plants and simple combustion process. It is expected that the students can analyse 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. Analyse the various concepts of refrigeration, and determine the performance of ideal and actual refrigeration systems; 2. Deep understanding of the various concepts of air-conditioning processes, and analyse the energy and mass balances in air

conditioning systems; 3. Review and analysis of the various cycles related to petrol engines, diesel engines, gas turbines, and jet engines and determine their performances under ideal and real engineering conditions; 4. Review and analysis of the various cycles related to steam power cycles, determine their performance in large power stations, and recommendations of performance improvement existing power stations; and 5. Acquire the knowledge and skills in develop the combustion equations and determine the air to fuel ratio and flame temperature.

**Required Reading:** Comprehensive class, laboratory and activity notes. On-Line material. Recommended Texts: Cengel, Y. A. and Boles, M. A. (2019)

Thermodynamics - An Engineering Approach 9th ed. McGraw Hill

**Assessment:** Test, Class Test 1; calculations, sketches, 25%. Laboratory Work, Laboratory Experiment and Report on Refrigeration; calculations, sketches, 20%. Laboratory Work, Laboratory Experiment and Report on Air Conditioning; calculations, sketches, 25%. Test, Final Test, 30%.

## NEM3201 Manufacturing Materials

**Locations:** Footscray Park.

**Prerequisites:** NEM2102 - Introduction to Engineering Materials

**Description:** This unit aims to extend the knowledge of materials science and engineering in the context of structure, properties, processing and applications of basic engineering materials such as ferrous (steel) alloys, leading edge non-ferrous alloys, polymers, ceramics and composites; and integrate it into issues of sustainable engineering product design and manufacturing technologies. The subject will provide students the concepts related to designing the structure of various class of materials to attain a predetermined set of properties. This subject will also give students an understanding of the engineering practice through an introduction to problem solving methodology and knowledge of the responsibilities of the professional engineer.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of structure, properties and processing of various materials and key issues relating to engineering science in manufacturing and environment; 2. Demonstrate an ability to select materials and design their structure with a predetermined set of properties; 3. Conduct research to identify the structure/property correlations of a range of materials in engineering applications; 4. Solve a range of numerical and engineering problems found in materials engineering practice and design; and 5. Evaluate and apply formulation and solution, effective communication, system approach to design and undertake life-long learning.

**Required Reading:** Callister, D.W. Jr (2013) Materials Science and Engineering - An Introduction John Wiley & Sons Kapakjian, S., 2010 Manufacturing Engineering and Technology Addison- Wesley

**Assessment:** Project, Reports (2), 15%. Other, Portfolio (approx. 7-10 pages), 25%. Test, Tests (2), 60%.

## 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). Topics may include conservation of momentum, dimensional analysis, similarity and modelling with applications to full scale engineering devices, losses in pipe networks, lift and drag. Various flows are investigated in more detail including external boundary layers. Students will support their learning of these fluid mechanics concepts through experimental investigations and practical demonstrations.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:  
1. Adapt fundamental fluid mechanics and scientific skills to solve typical engineering problems; 2. Analyse fluid mechanics problems using conservation laws, boundary layer theory or dimensional analysis and develop solutions; 3. Collaborate to undertake experimental investigations and to apply knowledge and skills in diverse contexts; and 4. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

**Required Reading:** White, F.M, adapted by Prof. Rhim, Yoon Chul., (2016) 8th ed. Fluid mechanics New York, NY McGraw-Hill Education

**Assessment:** Portfolio, Portfolio (group), 20%. Test, Test (hurdle), 55%. Test, Quiz, 15%. Report, Report (group), 10%. Test: is a hurdle, students must achieve a grade of at least 50% on the test to pass the unit. The test is opportunity to individually assess learning outcomes 1 and 2. Report: 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 NEM2101 - Mechanical Engineering Design

**Description:** Building on knowledge of structures and equilibrium of forces gained in previous units, 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. In particular, 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.

**Credit Points:** 12

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

**Required Reading:** Refer to VU Collaborate for recommended reading and other resources.

**Assessment:** Portfolio, Evidence of Competency, 25%. Test, FEA Skills Audit - Stress analysis test, 15%. Test, Test (hurdle), 50%. Case Study, Presentation, 10%. The case study is undertaken by groups; it assesses a student's ability to problem solve and interact in a team situation. The test 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 test 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 test (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 NEM3101 PLUS completion of 240 Credit points

**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. 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. Construct numerical models of vibratory systems such that they can be used to predict and enhance performance; 4. Compute and predict the vibration behaviour of complex systems (including two and multi degree-of-freedom) using vibration theory; 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.

**Required Reading:** Rao S.S. (2011) 5th Ed. Mechanical Vibrations Addison-Wesley Publishing Company Inman D.J. (2014) 4th Ed. Engineering Vibration Prentice Hall Online Material.

**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. Report, Project-based reports. Assessment undertaken in groups (hurdle assessment, 4 parts), 30%. Test, Tests (two open book tests), 70%. The Report will be used to give students structured feedback about their capability development of GC1 as applied to real-life vibration problems and challenges. Workshops will develop GC2 and GC3 by studying real-life systems, structures, machines and installations.

### NEM4102 Finite Element Analysis

**Locations:** Footscray Park.

**Prerequisites:** Completion of 240 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.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Analyse the heat transfer in steady heat conduction for plane, cylindrical and spherical surfaces; 2. Analyse the heat transfer for forced heat convection in laminar and turbulent flows and for internal and external surfaces; 3. Generate CFD models of simple, verifiable geometries with predictable results and of complex geometries with

unknown flow fields; 4. Critically evaluate the validity of CFD results and interpret their meaning; and 5. Model heat removal systems using CFD and interpret results indicating necessary adjustments.

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

**Assessment:** Exercise, The ability of analysing steady heat conduction problems.,

15%. Test, Test on the understanding of the theory of Heat Transfer, 35%.

Assignment, Application of CFD for solving electro and mechanical problems, 25%.

Test, Theory on Computational Fluid Dynamics and in class CFD simulations, 25%.

The assessments focus upon the 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 assessments are the only way by which these competencies can be assessed, this is a hurdle assessment task.

## NEM4202 Advanced Engineering Analysis

**Locations:** Footscray Park.

**Prerequisites:** NEM3101 - Engineering Analysis and Modelling NEM3101 PLUS

Completion of 288 credit points.

**Description:** Advanced Engineering Analysis introduces students to the theory and application of automatic control systems in a mechanical engineering context. The concept of open and closed loop control is introduced followed by properties of time-invariant systems, Transfer Functions in the Laplace domain, system stability transient response, frequency response (Bode plots), feedback control design and errors, control strategies (PID control) and root locus analysis. 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. Describe and interpret the design process for a control system and analyse its behaviour; 2. Develop and justify appropriate mathematical model for dynamical and control systems; 3. Analyse the performance and stability of single-input – single-output electromechanical systems; 4. Design, evaluate and optimise real-time feedback control systems using PID control strategies; and 5. Work in teams to implement and evaluate real-time feedback control systems on an electro-mechanical device.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Test, Tests (two open book tests), 40%. Project, Project-based reports.

Assessment undertaken in groups (hurdle), 60%. The project is a hurdle assessment as it is the only task that assesses LO 4 and 5.

## NIT2102 Cyber Security Essentials

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT1104 - Computer Networks

**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. Investigate 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.

**Required Reading:** Lecturer may supply additional/alternative material. Mark Ciampa (2017) 6th ed. CompTIA Security + Guide to Network Security Fundamentals Cengage Learning UK Security 2.0 REFERENCE TEXTS: Jie Wang, Zachary A. Kissel (2015) Introduction to Network Security: Theory and Practice 2nd ed. John Wiley & Sons (Asia)

**Assessment:** Laboratory Work, Practical Lab Work, 20%. Assignment, Individual Assignment (solving practical problems), 40%. Test, Written Test, 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 object 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. Elaborate and apply 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.

**Required Reading:** Lewis J., DePasquale P., & Chase J. (2017) 4th ed. Java Foundations: Introduction to program design and data structures, Pearson International Edition.

**Assessment:** Laboratory Work, Lab Tests, 10%. Assignment, Assignment (programming tasks), 40%. Test, Written Tests, 50%.

## NIT2113 Cloud Application Development

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT1102 - Introduction to Programming or BC01102 - Information Systems for Business

**Description:** This unit introduces the basic concept and fundamental principles of cloud computing and cloud development platforms. Students will learn programming skills in cloud and design and develop cloud applications in various platforms. 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 selected platforms.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Apply knowledge of concepts of cloud; 2. Apply the current cloud technologies, framework architecture and principles in cloud application development; and 3. Analyse the usage of cloud computing in different sectors and the impact of cloud on society.

**Required Reading:** Nil

**Assessment:**Test, Test 1, 25%. Laboratory Work, Cloud application development 1, 25%. Laboratory Work, Cloud application development 2, 25%. Test, Test 2, 25%.

## 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), firewalls, IPSec protocols.

**Credit Points:** 12

**Learning Outcomes:**On successful completion of this unit, students will be able to: 1.Explain the fundamental principles of database, operating systems, and server administration to recommend functional solutions suitable in a range of small-scale operations; 2.Develop basic server administration and maintenance skills to effectively manage a stable, small-scale networked environment; and 3.Configure the functionality of simple, multi-component real-life network infrastructures to achieve effective communications in a variety of contexts.

**Required Reading:**Palmer, M. (2018) 2nd Hands-On Microsoft Windows Server 2016 Cengage Learning

**Assessment:**Laboratory Work, Weekly Lab Assessments (10% each), 30%. Presentation, Presentation, 20%. Test, Mid-semester and Final tests, 50%.

## NIT2124 Network Management

**Locations:**Footscray Park, VU Sydney.

**Prerequisites:**NIT1104 - Computer Networks

**Description:**This unit explores the fundamentals and practice aspects of computer networks and systems management including fundamentals of network management concept, architectures, protocols, standards and also current related research topics. The students will have the chance to be familiar with current research efforts on network and system management by focusing on SNMP-based network & internetwork management.

**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.Apply the available tools; and 4.Demonstrate the ability to perform network management tasks.

**Required Reading:**CISCO (2018) SNMP Configuration Guide (online) CISCO Recommended reading: Mani Subramanian (2010), Network Management: Principles and Practice, 2nd ed, MA: Addison-Wesley. 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, 30%. Project, Demonstration (Group work), 35%. Test, Written Tests (2), 35%.

## 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; 3.Propose an ICT service agreement for collaboration with other service teams; and 4.Design an ICT strategic management plan for an organisation.

**Required Reading:**Schilling, M (2015) 5th ed. Strategic Management of Technological Innovation McGraw-Hill, USA Recommended Reading: Fitzsimmons, J.A & M.J Fitzsimmons (2018) Service Management: Operations, Strategy, Information Technology, 9th ed. McGraw-Hill, USA. Reynolds, G (2015). Information Technology for Managers, Cengage: Boston, MA. Adomi, Esharenana E. (2010) Frameworks for ICT Policy: Government, Social and Legal Issues: Government, Social and Legal Issues, IGI Global

**Assessment:**Test, Tests (2), 20%. Exercise, Tutorial Assessments (one per session), 20%. Test, Quizzes (one per session), 20%. Assignment, Group assignment, 40%.

## NIT2201 IT Profession and Ethics

**Locations:**Footscray Park, VU Sydney.

**Prerequisites:**Nil.

**Description:**The unit examines a wide range of ethical and privacy issues and concepts in the ICT field. The unit introduces 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; codes of ethics; social issues of privacy; intellectual property.

**Credit Points:** 12

**Learning Outcomes:**On successful completion of this unit, students will be able to: 1.Demonstrate an understanding of codes of ethics in Information and Communication Technology; 2.Demonstrate an understanding of the different principles underlying ethical decision making; 3.Critically discuss social, ethical and privacy issues in Information and Communication Technology domains; 4.Identify and relate appropriate privacy measures and their management for computing environments; and 5.Communicate effectively on a range of social, ethical and privacy issues.

**Required Reading:**Reading material will be provided by the unit coordinator and will be appropriate to the topic under investigation.

**Assessment:**Test, Test 1, 10%. Test, Test 2, 25%. Laboratory Work, Lab assessment, 25%. Presentation, Presentation, 40%.

## NIT2202 Big Data

**Locations:**Footscray Park, VU Sydney.

**Prerequisites:**NIT1102 - Introduction to Programming orNIT1201 - Introduction to Database Systems

**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. Apply architectural components and programming models of commonly used Big Data; 4. Install and execute a technological solution using open-source software framework.

**Required Reading:** Erl, T., Khattak, W., & Buhler, P. (2016) Big data fundamentals: Concepts, drivers & techniques Prentice Hall: Boston, MA Yan, Y. & Yan, J. (2018) Hands-On Data Science with Anaconda Packt Publishing.

**Assessment:** Test, Test 1, 20%. Test, Test 2, 20%. Laboratory Work, Practical Lab work, 30%. Case Study, Group assignment and presentation, 30%.

### 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. Apply knowledge of concepts of software engineering and UML to design of software systems; 2. Design software systems using UML; 3. Apply a UML-based modelling tool in the design of software systems; and 4. Apply the different types of models of UML to design of software systems.

**Required Reading:** Reading materials will be listed on VU Collaborate

**Assessment:** Test, Practical Knowledge Test, 20%. Laboratory Work, Assessable Laboratory, 40%. Test, Test, 40%.

### NIT2222 Networking Technologies

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT1104 - Computer Networks

**Description:** This unit enhances and deepens the knowledge on internetworking technologies and protocols. Content includes: Routing algorithms and protocols including EIGRP and OSPF, Network Address Translation (NAT), IP V6, Wide Area Networks (WANs), Transmission Control Protocol, and network design and implementation with industry standard equipment like Cisco routers and switches.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Explain the mechanisms and algorithms of major switching and routing technologies; 2. Design networks with appropriate network structures, addresses and routing protocols; and 3. Design and implement networks with industry standard technologies for LANs, WANs and the Internet (e.g. with Cisco Routers and WAN Switches).

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Assignment, Assignment 1, 20%. Assignment, Assignment 2, 30%. Test, Test, 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 a highly dynamic sector, therefore, ICT change management is an ongoing challenge to modern organisations. Students will investigate change management and how to effectively mitigate risks. The content includes ICT change management process, ICT change plan, ICT change recording and documentation, ICT change automation, and 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. Plan and develop ICT change management strategies and skills; and 3. Identify risk and develop risk mitigation plans.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Test, Two tests (10% each), 20%. Test, Short Tests, 20%. Report, Group Change Management Report (equivalent to 1,000 words), 40%. Other, Contributions to group discussions, 20%.

### 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 knowledge of relevant industry practices such as 'Web and Mobile Application Development', 'Network and System Computing', time management, project management, team skills and client liaison. Because this is a placement unit, students can expect to encounter complex situations that they will need to pro-actively manage with support from their mentor and the unit convenor.

**Credit Points:** 48

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Demonstrate critical reflective practice in the assessment of their personal strengths and development needs in the context of their work-readiness and career planning; 2. Manage their roles and responsibilities in a professional capacity, including identifying risks to their development and actively seeking to resolve them; 3. Identify and convey the knowledge, skills and attributes required in a professional IT workplace; and 4. Identify and develop teamwork skills required for working on an industry project.

**Required Reading:** Nil.

**Assessment:** Journal, Reflective Journal, 20%. Presentation, Presentation of Skills and Learning, 30%. Report, Industry Experience Report, 50%. Reflective Journal: completed at the end of each week of placement (weeks 3-14). Presentation of Skills and Learning: completed in week 16. Industry Experience Report on the project: completed within the 12 weeks of industry placement and submitted in Week 16.

### 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. The placement needs to be approved by the Course Coordinator. Students will identify a project that can be completed within the constraints of the unit and complete the project using the knowledge and skills developed in the Industry Placement 1. The students will also demonstrate leadership, teamwork and

conflict resolution skills by working collaboratively within a team. Because this is a placement unit, students can expect to encounter complex situations that they will need to pro-actively manage with support from their mentor and the unit convenor.

**Credit Points:** 48

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Enhance an existing product or create a new product in their respective workplace;
2. Apply leadership and team work skills by working collaboratively in a team, responding to feedback and advancing project outcomes;
3. Pitch the contribution effectively to the target audience; and
4. Articulate how the skills learned in the project experience connect with future professional pathways.

**Required Reading:** Nil.

**Assessment:** Journal, Reflective Journal, 20%. Presentation, Presentation of Project, 30%. Report, Industry Experience Report on the project, 50%. Reflective Journal: completed at the end of each week of placement (weeks 3-14). Presentation of Project: completed in week 16. Industry Experience Report on the project: completed within the 12 weeks of industry placement.

### NIT3112 Advance Web Application Development

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT1101 - Web Development and CMS or NIT2112 - Object Oriented Programming or NIT2213 - Software Engineering

**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 the latest web technologies and frameworks.

**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 advanced web application frameworks in designing large and complex web application; and 3. Create, develop and deploy large web applications with current popular technologies.

**Required Reading:** Further reading and resources are available in VU Collaborate. Fagerberg, J. (2017) ASP.NET Core 2.0 MVC & Razor pages for beginners: how to build a website, Create Space Independent Publishing Platform Scotts Valley, CA Albahari, J & Albahari, B (2017) C# 7.0 in a nutshell: the definitive reference O'Reilly Media, Sebastopol, CA.

**Assessment:** Laboratory Work, Lab assessments (3), 45%. Test, Tests (2), 55%.

### NIT3114 Online Business System Development

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT1204 - Web Application and Server Management or NIT2112 - Object Oriented Programming or NIT2213 - Software Engineering

**Description:** The Building Online Business Systems unit introduces broad fundamental concepts of business information systems, online systems and e-commerce, information management in organisations. The unit will address designing and developing online business systems along with other topics including information strategies, Ebusiness, Web 2.0, 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. Articulate knowledge of business concepts and information systems; 2. Devise online business systems using the current technologies and frameworks; and 3. Articulate knowledge of business site categorisation and their characteristics.

**Required Reading:** Reading materials and other resources will be listed on VU Collaborate.

**Assessment:** Test, Test 1, 20%. Laboratory Work, Assessable laboratory, 40%. Test, Test 2, 40%.

### NIT3122 Enterprise Network Management

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT2122 - Server Administration and Management

**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. Construct and configure small-scale enterprise network; 3. Analyse and identify potential issues in managing enterprise network; and 4. Manage and maintain enterprise network infrastructure.

**Required Reading:** Further reading and resources are available in VU Collaborate. Tomsho, G. (2018) MCSA guide to identity with windows server 2016: MCSE/MCSA: exam #70-742 Cengage, Boston, MA.

**Assessment:** Laboratory Work, Lab Assessments (3), 45%. Test, Tests (2), 55%.

### NIT3171 ICT Business Analytics and Data Visualisation

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT2171 - Introduction to ICT Management or NIT2202 - Big Data or NIT2271 - ICT Change Management

**Description:** As the use of big data become increasingly important to businesses, it is essential to analyse the data and provide meaningful view and knowledge to support judgment and action plans. This unit provides students with advanced analytical methodologies and data mining models for ICT business analytics, as well as contemporary techniques to visualise the data for decision support. The content includes data preparation, association rule analysis, classification, clustering, regression, anomaly detection, building analytic models using SQL and data visualisation.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Review in a group (team work) the current algorithms, methodologies and modelling for ICT business analytics; 2. Evaluate in a group (team work) the various ICT business analytic tools and techniques; 3. Review in more depth the current algorithms, methodologies and modelling for ICT business analytics based on the outcome of the student group assignment deliverable; 4. Evaluate various ICT business analytic tools and techniques for the business interesting points finding from the student group work deliverable; and 5. Propose a business analytics report to solve practical problems identified in an ICT business project.

**Required Reading:** A list of recommended textbooks will be made available on VU Collaborate.

**Assessment:** Test, Tests, 30%. Project, Group Project on BA solution development, 35%. Assignment, Case Study, 35%.

### NIT3202 Data Analytics for Cyber Security

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT2102 - Cyber Security Essentials or NIT2202 - Big Data

**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; and, big data technologies.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Adapt appropriate data analytics methodologies and tools to generate the business intelligence; 2. Implement data analytics techniques using a current programming language; and 3. Design analytics solutions to achieve cyber security.

**Required Reading:** Lecturer may supply additional reading material. REFERENCE TEXTS: Conway D, White J. Machine learning for hackers. " O'Reilly Media, Inc."; 2012 Feb 15. Verma RM, Marchette DJ. Cybersecurity Analytics. CRC Press; 2019 Nov 27.

**Assessment:** Laboratory Work, Practical Lab Work (3), 30%. Assignment, Assignment with presentation, 20%. Test, Tests (2), 50%.

### 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 computing platforms. Major mobile platforms (e.g., Android and iOS) will be used for teaching programming techniques and the development process of applications. This unit will focus on the tools and technologies required for developing applications for current and emerging mobile computing devices.

**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 by applying current software technologies; 2. Design and develop graphical user interfaces according to design principles and interface guidelines; and 3. Articulate knowledge of concepts underpinning current mobile platforms.

**Required Reading:** Reading materials and other resources will be listed on VU Collaborate.

**Assessment:** Test, Tests (2) Test 1 - 20% Test 2 - 40%, 60%. Laboratory Work, Assessable laboratory work, 40%.

### NIT3222 Virtualisation in Computing

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT2122 - Server Administration and Management or NIT2222 - Networking Technologies

**Description:** This unit provides students with knowledge and skills of virtualisation in computing, including design, implement and management of virtualisation. Virtualisation is one of the most important technologies enabling cloud and distributed computing. It is a software layer between operation systems and computer hardware, which enables operating systems and applications to run on virtual machines rather than physical machines. This can improve the hardware utilisation by more than 10 times, largely reduce the management effort and significantly improve the scalability. The content of the unit includes: architecture of virtualisation in computing and its benefits, server virtualisation and implementation, storage virtualisation, desktop virtualisation, application virtualisation, container technologies, manage and administration of virtualised systems, design and develop high available and disaster resistant virtualised environments.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Implement core knowledge of virtualisation; 2. Manage a virtualisation environment with industry products; 3. Design and develop virtual machines with

main-stream industry technologies; and 4. Design, develop and manage desktop and application virtualisation.

**Required Reading:** Andy Syrewicze, Richard Siddaway (2018) Pro Microsoft Hyper-V 2019: Practical Guidance and Hands-On Labs Apress Recommended reading: John Savill (2016) Mastering Windows Server 2016 Hyper-V 1 SYBEX

**Assessment:** Practicum, Practical Test, 25%. Assignment, Design and implement virtualised environment (group or individual design project), 30%. Test, Problem-Based Test, 45%.

### NIT3274 Small IT Business

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT2171 - Introduction to ICT Management or NIT2271 - ICT Change Management

**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. Compose a proposal for starting and running a business; and 4. Evaluate sources of finance for starting and running the business.

**Required Reading:** Reading materials will be provided on VU Collaborate.

**Assessment:** Test, Tests (2) (20% each), 40%. Assignment, Part A: Business Proposal (30%) Part B: Implementation (30%), 60%.

### 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. Students will have an opportunity to study different types of malware and the potential attack vectors, including viruses, trojans and ransomware; and use network and system tools to manage security issues and maintain a safe working environment. Students will be introduced to contemporary information technologies related to network security, such as cryptography and block chain, to secure interactions.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:

1. Critically review and analyse cybersecurity architecture and state-of-the-art security technologies; 2. Exhibit mastery of skills and knowledge required to support and secure network environments; 3. Design and implement security system using network and system tools; and 4. Evaluate security risks and prepare incident response plan.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Laboratory Work, Lab submissions and a Practical Test, 30%. Assignment, Project-based Assignment, 30%. Test, Open book test, 40%.



## 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 introduced to data residency, data privacy and Industry & Regulation Compliance. Students will deal with both basic and advanced technologies related to cloud security, such as identity and access management, virtual private cloud, operational auditing and risk auditing of cloud accounts, and cloud firewall.

**Credit Points:** 12

**Learning Outcomes:**On successful completion of this unit, students will be able to:

1.Implement data/service security features, such as encryption, data integrity, security groups, enabling inbound and outbound filtering, and identity access management; 2.Critically review cloud security threats and propose protection solutions; 3.Implement logically isolated sections and virtual networking environments, as well as virtual storage services; and 4.Evaluate and adapt governance, compliance, operational auditing, and risk auditing cloud technologies.

**Required Reading:**Required readings will be made available on VU Collaborate.

**Assessment:**Laboratory Work, In class Lab submissions x 10 (20%) and a practical assessment (20%), 40%. Test, Tests (2), 60%.

## 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.

**Required Reading:**Readings will be made available via VU Collaborate.

**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

**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:**Presentation, 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, subnetting, 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.

**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%.

## 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.

**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.

**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%.

### NIT6003 Applied Natural Language Processing

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT5150- Advanced Object Oriented Programming

**Description:** This unit applies machine learning techniques to obtain leading results on solving the problems of natural language processing (NLP). NLP is considered as a critical step to create effective communications and interactions between machines and human beings. Through these applications in NLP the students will learn about the basic concepts of NLP, methodologies to represent human natural language in machines, and the application of cutting-edge techniques to train machines to achieve human-like abilities to understand natural language. The students will learn how to use machines to comprehend text, speech, and visual information, that are used in most AI systems.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Critically review NLP applications and developments; 2. Disaggregate and appraise the components in a typical NLP application architecture; 3. Investigate and apply knowledge discovery processes and associated models to complex NLP application scenarios; 4. Experiment with different combinations of data set to propose training frameworks and models, and evaluate the performance; and 5. Extrapolate knowledge and skills to design and develop an NLP application to support and provide business solutions.

**Required Reading:** Reading materials and other resources will be provided in class or through VU Collaborate.

**Assessment:** Assignment, Assignment, 20%. Project, Project, 40%. Test, Open book test (concepts, modelling, programming and scenario analysis), 40%. Assignment - Develop a simple NLP program to solve a basic practical problem, for example students will create a model to summarise a paragraph to show that a machine is able to understand the contents. Project - Solve a complex practical problem in a scenario, e.g. to receive oral commands from a person and process corresponding actions.

### NIT6004 Neural Network and Deep Learning

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** NIT5150- Advanced Object Oriented Programming

**Description:** In this unit, some of the most widely used prediction and classification models will be covered. A suitable software environment for business analytics will be used, and tools for handling large data sets will be introduced. Neural networks will be introduced to demonstrate how training can be achieved with backpropagation. Various forms of deep neural networks will be examined, for example multilayer perceptions, convolutional neural networks and recurrent neural networks. The mathematics of stochastic optimisation is used to explain the behaviour and training of these networks. Various programming approaches will be discussed and demonstrated for the training and deployment of neural networks. Deep learning technologies and design examples will be discussed in areas such as face recognition, speech recognition and personal cognitive assistants.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to: 1. Critically review the performance and applications of neural network and deep learning techniques; 2. Implement a systems approach to design and evaluate neural network architecture; 3. Interpret mathematical equations from linear algebra, calculus, statistics, and probability theory in terms of neural network architecture and deep learning methods; 4. Investigate and apply knowledge discovery processes and associated models to innovate deep learning applications to support and provide business solutions; and 5. Extrapolate knowledge and skills to design, develop, and evaluate a variety of deep learning tasks: modelling, clustering, dimensionality reduction, regression and classification.

**Required Reading:** Reading materials and other resources will be provided in class or through VU Collaborate.

**Assessment:** Assignment, Assignment, 20%. Project, Project, 40%. Test, Open book test (Concepts, modelling, training methods, programming and scenario analysis), 40%. Assignment – Develop and train a neural network that solves simple practical problems, for example big data classification. Project - Advanced application of deep learning technique, for example create a personal cognitive assistant for daily news review.

### NIT6120 Mobile Applications

**Locations:** Footscray Park, VU Sydney.

**Prerequisites:** Nil.

**Description:** This unit will address the creation of mobile applications across multiple platforms for contemporary and emerging popular smartphone use. It provides hands-on experience in developing applications for Google Android and Apple iOS. Topics covered include: smartphone platforms; the approach for developing identical applications for each platform; and Cross-Platform Development with Phone Apps. Multiple platforms emphasises the portability of apps that students create and encourages a deeper understanding of object-oriented 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. Implement various object-oriented programming techniques; 2. Design and implement innovative solutions to potential mobile applications in a variety of user domains; 3. Evaluate and verify the proposed new mobile applications, with consideration of various platforms and operating systems; and 4. Articulate complex aspects of product development and implementation to specialist and non-specialist audiences including potential users.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Laboratory Work, In class individual laboratory reports (10), 10%. Project, Project based assignments (2), 40%. Test, Online open book tests (2), 50%.

### 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.

**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 or NIT5130 - Database Analysis and Design or NIT5150 - Advanced Object Oriented Programming and EPM5600 - Principles of Project Management or EPM5700 - Project Management and Information Technology

**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.

**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 usability and functionality.

**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;

**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.

**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.

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

**Assessment:** 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.

**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.

**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 as well as manufacturers. 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. Implement 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.

**Required Reading:** To be advised by unit coordinator

**Assessment:** Project, Project 1 (1000 words), 20%. Laboratory Work, Laboratory Group Reports (team of max 4), 30%. Project, Project 2 (2500 words), 30%. Presentation, Presentation & Participation, 20%. In the Laboratory work hurdle assessment task has been included to demonstrate a critical laboratory skill, this complies with the learning outcomes 1 and 6.

## 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 relevant Standards. 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. Implement stringent requirements of insulation coordination principles to power system design; 3. Devise

overvoltage protection systems on random occurring lightning and switching transient surges; 4. Articulate 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.

**Required Reading:** To be advised by unit coordinator.

**Assessment:** Project, Project 1 (1000 words), 20%. Laboratory Work, Laboratory Group Reports (team of max 4), 30%. Project, Project 2 (2500 words), 30%. Presentation, Presentation & participation, 20%. In the Laboratory work hurdle assessment task has been included to demonstrate a critical laboratory skill, this complies with the learning outcomes 1, 3, 4 and 6.

## 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.

**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.

## 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.

**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.

**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 the 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. 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. Implement Maxwell equations to a system approach in the analysis, design and operational performance of a communication system; and 4. Implement modulation schemes to a given application in order to optimise communication links.

**Required Reading:** Recommended Texts Timothy Pratt & Jeremy Allnut, (2020), Satellite Communications 3rd Edition: Wiley Dharma P. Agrawal & Qing-An Zeng, (2016) Introduction to wireless & mobile systems 4th Edition: Cengage Ziemer, R & Tranter, W (2009). Principles of Communications 6th edition NY: John Wiley & Sons Haykin, S and Moher, M. (2009). Communication Systems 5th edition NY: John Wiley & Sons N. Benvenuto et al, (2007). Communication Systems 4th edition NY: Wiley Haykin, S (2005). Modern Wireless Communications 5th edition CH: Pearson Prentice Hall Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.

**Assessment:** Test, Problem solving (3), 60%. Assignment, Final Major Problem solving assessment, 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.

**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.

**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, VU Sydney.

**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.

**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:** Test, Problem solving (2), 50%. Laboratory Work, MATLAB Laboratory Report, 20%. Assignment, Network Design Problem Solving, 30%.

### NPU2101 Analytical Methods 1

**Locations:** Footscray Park.

**Prerequisites:** RCS1110 - Chemistry for Biological Sciences A or RCS1601 - Chemistry 1A and RCS1120 - Chemistry for Biological Sciences B or RCS1602 - Chemistry 1B

**Description:** Analytical Methods 1 builds upon the fundamental principles introduced in first-year chemistry studies and introduces students to instrumental analytical chemistry. This unit provides basic training in modern spectroscopic (infra-red, UV/Visible, atomic absorption) and chromatographic (liquid and gas chromatography) methods of analysis as currently used in the chemical and pharmaceutical industries. Laboratory exercises will link theory with practice and students gain 'hands-on' experience with modern analytical instruments and associated analytical and physicochemical 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 4 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 via designed laboratory experiments across the range of instruments; 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. Optimise standard methodologies 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.

**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:** Test, Tests (3), 30%. Presentation, Group Presentation, 20%. Laboratory Work, Reports (6), 50%. 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 10 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, liquid chromatography-mass spectrometry, as well as H and C nuclear magnetic resonance. 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 synthetic organic compound or 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 synthetic organic or pharmaceutical samples adopting the analytical process and using modern analytical techniques; 3. Interpret various analytical data including that from LC/MS, GC/MS and <sup>1</sup>H and <sup>13</sup>C NMR; and 4. Evaluate the quality of their own analytical data, review team members' data, and communicate the findings to peers and demonstrators with responsibility and accountability.

**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:** Test, Tests (3), 30%. Presentation, Oral Presentation (on laboratory work), 20%. Laboratory Work, Formative Assessment and Lab Notebook, 50%.

## NPU2103 Organic Synthesis

**Locations:** Footscray Park.

**Prerequisites:** 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. 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.

**Required Reading:** RECOMMENDED TEXT: McMurry, J.E., 2016, Organic Chemistry, 9th edn, Cengage.

**Assessment:** Test, Tests (3) (15% each), 45%. Presentation, Group Presentation, 15%. Laboratory Work, Formative and final assessment of lab notebook, 25%. Laboratory Work, Report, 15%. 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 with initiative and judgement; and 3. Critically review drug controversies and present evidence and reasoned argument.

**Required Reading:** Reading materials will be listed in VU Collaborate.

**Assessment:** Assignment, Briefing report on pharmaceutical development for medical purposes (1,000 words), 20%. Project, Report on drug discovery (2,000 words), 40%. Presentation, Poster presentation on a topic drawn from workshop discussions (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. Infer how various factors, including geomorphological, climatic, historical and evolutionary, have shaped present Australian landscapes and the various environments contained within, through field-based investigations and computer-based tools; 2. Review and interpret 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.

**Required Reading:** Attiwill, P.M and Wilson, B.A. (2006) Ecology: An Australian Perspective Oxford University Press Students will also use this text in the following units: RBF2610 Fundamentals of Ecology.

**Assessment:** Assignment, Written assignment, 20%. Report, Field Portfolio, 30%. Test, Tests, 30%. Presentation, Oral and written presentation, 20%.

### NPU3101 Pharmaceutical Regulatory Processes

**Locations:** Footscray Park, Werribee.

**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 Pharmacopoeia). 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. Develop risk assessments on laboratory practice including the identification of physical/chemical hazards and proposing methods of minimising risk; 2. Devise an

analytical protocol for a targeted pharmaceutical product incorporating method development, validation and review; 3. Apply standard methodology to the analysis of a selected pharmaceutical sample including method selection, sample preparation, instrumental operation and appropriate statistical data analysis; and 4. Review and present results in a professional format.

**Required Reading:** RECOMMENDED TEXT: Skaog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) Fundamentals of Analytical Chemistry 9th ed. Brooks/Cole, Cengage learning.

**Assessment:** Assignment, Written Risk Assessment (500 words), 10%. Laboratory Work, Laboratory Workbook (hurdle task), 20%. Report, Laboratory Report - portfolio of laboratory work describing the method development and validation., 40%. Project, Written Assignment (2500 words), 30%. 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 of this unit, a student MUST pass the laboratory component in order to pass the unit.

### NPU3102 Drug Design

**Locations:** Footscray Park.

**Prerequisites:** NPU2103 - Organic Synthesis NPU2104 - Drug Discovery and Development

**Description:** This unit follows on from NPU2104 Drug Discovery and Development and examines the modern approaches used to discover and design drug and to bring pharmaceutical products to market. Students will undertake studies in rational structure-based drug design (SBDD) utilizing computational chemistry techniques.

**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; 2. Devise appropriate methodology for the design of new drugs; 3. Using a representative computational chemistry software package, construct/ model potential drug molecules in terms of their structures and properties; and 4. Conceptualize how pharmaceutical products are brought to market.

**Required Reading:** A copy of the Spartan Tutorial and User Guide will be loaned to each student for the period of the block. RECOMMENDED TEXTS: Kristian Stromgaard, K., Krosgaard-Larsen, P., Madsen, U., (2017) Textbook of Drug Design and Discovery 5th ed. CRC Press Patrick, G.L., 2006, An Introduction to Medicinal Chemistry, 3rd edn, Pear Education Ltd.

**Assessment:** Assignment, Selection of topic for investigation and outline of plan for article, 10%. Assignment, Article on topic of choice (1000 words), 20%. Project, Computer-aided drug modelling including i) progress and ii) final assessment, 40%. Test, Short answer test based on class material and modelling experience (120mins), 30%.

### NPU3103 Techniques in Pharmaceutical Synthesis

**Locations:** Footscray Park, Werribee.

**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 bi-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 and the role of metals in organic synthesis; 5. Acquire and interpret various analytical data including infra-red and nuclear magnetic resonance spectra; 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.

**Required Reading:** Reading materials and other resources are listed in VU Collaborate.

**Assessment:** Assignment, Reflective Assignment, 10%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria, 50%. Test, Written knowledge assessment of key topics (2 hours), 40%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (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). Workshops 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 reflect on 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.

**Required Reading:** Reading materials and other resources are listed in VU Collaborate.

**Assessment:** Assignment, Reflective Assignment, 10%. Laboratory Work, Portfolio of Laboratory work, 50%. Test, Test, 40%.

### NPU3106 Conservation Genetics

**Locations:** Footscray Park.

**Prerequisites:** RBF1310 - Biology 1RBF1320 - Biology 2RBF2610 - 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. Students engage with real-world applications of genetic methods in biodiversity conservation.

**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 and application of the methods used in modern genetics and how these tools can be applied to the management of species and populations; and 4. Critically analyse data relating to taxonomy, phylogenetic relationships and population genetics and consider implications for conservation and reproductive interventions such as manual pollination or selective breeding.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Test, Tests, 30%. Report, Practical reports and simulations, 30%. Report, Lab Report, 40%.

### RBF2610 Fundamentals of Ecology

**Locations:** Footscray Park.

**Prerequisites:** RBF1310 - Biology 1RBF1320 - Biology 2

**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 interpret 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 conceptually complex ecological thought in both written and spoken form.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Test, Tests (3), 30%. Report, Field Portfolio, 40%. Presentation, Oral and Written Presentation, 30%.

### 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 algae 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 and differentiate between major families, genera and species of Australian plants with professional skill and judgement using high-level identification guides; 3. Devise tools for collecting and preserving plant specimens with creativity and initiative; and 4. 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.

**Required Reading:** Knox, B., Ladiges, P., Evans, B., & Saint, R. (2010) 5th ed. *Biology: An Australian Focus* McGraw-Hill Education

**Assessment:** Laboratory Work, Lab reports, 30%. Portfolio, Herbarium and Poster, 30%. Test, Tests, 40%.

## RBF2640 Australian Animals

**Locations:** Footscray Park.

**Prerequisites:** RBF1310 - Biology 1 RBF1320 - 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 phylogeny cladistic analysis, bauplans, 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. Analyse 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 adaptive features of animals living in either or terrestrial environment and assess the uniqueness of Australian fauna; 4. Contextualise the evolution and origin of biodiversity in marine and terrestrial environments demonstrating conceptual and technical understandings; and 5. Articulate clearly, orally, diagrammatically and in writing, complex information on the morphology, life cycles and relationships of various animal families and report on their evolutionary history.

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

**Assessment:** Portfolio, Report, 20%. Portfolio, Presentation (2), 50%. Test, Tests, 30%.

## RBF3110 Marine & Freshwater Ecology

**Locations:** Footscray Park.

**Prerequisites:** RBF1310 - Biology 1 RBF1320 - Biology 2 RBF2640 - 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 Victorian 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.

**Required Reading:** Refer to VU Collaborate for recommended reading and other resources.

**Assessment:** Literature Review, Literature review and research proposal, 20%. Report, Field report, 30%. Presentation, Presentation, 20%. Test, Tests, 30%.

## RBF3210 Environmental Rehabilitation

**Locations:** Footscray Park.

**Prerequisites:** RBF1310 - Biology 1 RBF1320 - 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 terrestrial environments and communities. Topics include the ecological parameters and processes for traditional and contemporary restoration of diverse environments and the key ecological principles for the reintroduction of key species to restore habitats. 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 frameworks to assess native reference ecosystems, and evaluate and conduct site specific rehabilitation programs.

**Credit Points:** 12

**Learning Outcomes:** On successful completion of this unit, students will be able to:  
1. Formulate and elucidate traditional (historical) and contemporary ecological principles to environmental rehabilitation practices with creativity and responsibility, contributing to local and global communities; 2. Create a feasibility plan for the reintroduction of specific species to restore ecological habitats; 3. Articulate in oral and written form to professionals and peers on approaches to rehabilitation based on complex ecological principles; 4. Justify the selected traditional and contemporary methods of assessment and management of restoring ecological communities, selected species and habitats, exercising professional judgement; and 5. Evaluate, argue and implement the principles of Restoration and Reconciliation Ecology to contemporary, environmental assessment issues and propose creative and sound solutions.

**Required Reading:** Thomas, C. D., (2017) *Inheritors of the Earth: how nature is thriving in an age of extinction* Hachette UK

**Assessment:** Presentation, Presentation (2) a - Videos (20%) b - Oral Presentation (10%), 30%. Report, Reports (2) 1 - Historical Ecology Report (35%) 2 - Feasibility Report (20%), 55%. Practicum, Field Skills Practicum, 15%.

## RBF3620 Conservation and Sustainability

**Locations:** Footscray Park.

**Prerequisites:** RBF1310 - Biology 1 RBF1320 - Biology 2 RBF2610 - Fundamentals of Ecology

**Description:** This unit ties together, in both theoretical and practical ways, concepts and practices for maintaining biological diversity, and how these concepts and practices can be integrated with social and economic needs. The unit focuses on 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, local, state and federal government agencies, Landcare and private landholders to the conservation and recovery of plant and animal species, from insects to mammals, and from fungi 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. Formulate a theoretical basis on which to base conservation and sustainability management decisions; 2. Evaluate and implement ecological and genetic principles to the conservation and management of plant and animal species and populations, and ecosystems in an ethical and fact-based manner; 3. Work individually and collectively to critically assess and formulate conservation management actions as they apply to in-situ and ex-situ conservation programs; 4. Argue, debate and report in written and oral form, conservation programs and principles to a range of end-users groups; and 5. Critically analyse a range of data types and published literature to support and justify sound decision-making processes in relation to conservation and sustainability.

**Required Reading:** Required readings will be made available on VU Collaborate.

**Assessment:** Essay, Essay, 30%. Report, Field Report, 50%. Presentation, Community participation and presentation, 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, simple experimental designs and simple logistic regression models for binary response. Students will learn how to build, diagnose and validate linear statistical models. Statistical software package from Excel 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. Apply key probability concepts to linear models in statistical analysis; 2. Create general linear regression models that produce binary responses; 3. Assess and diagnose general linear regression models by various numerical and graphical tools; and 4. Design simple experimental statistical models that predict outcomes.

**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:** Test, Test (1hr), 20%. Assignment, Data analysis report (10 pages including graphs), 25%. Test, Tests x 2 (1hr each), 55%.

## 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.

**Required Reading:** Bender, E. A. (2003), Introduction to Mathematical Modelling, Dover Publications Inc., New York

**Assessment:** Assignment, Assignment #1 consisting of Mathematical problems., 25%. Assignment, Assignment #2 consisting of Mathematical problems, 25%. Test, Test, 50%.

## 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 to solve such problems; 3. Reflect on the underlying assumptions, and on the sensitivity of the linear programming models; 4. Formulate integer linear programming models and apply heuristic techniques to approximate optimal solutions; and 5. Construct computer models for special linear and integer linear programming models and interpret the solutions obtained by the computer system.

**Required Reading:** Session notes and other material will be made available to students on the learning management system.

**Assessment:** Other, Quiz, 10%. Other, Written Reflection, 10%. Assignment, Written

Assignment 1 (approximately 6 pages of mathematics), 40%. Assignment, Written Assignment 2 (approximately 6 pages of mathematics), 40%. All assessment tasks are individual tasks. Although the two written assignments cover similar learning outcomes, the first assignment is more introductory, and the second will cover the material in more depth. Each of the written 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 Making orRCM2611 - Linear Statistical Models orRCM2911 - Linear Optimisation Modelling

**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 learn how to introduce students to the relevance of computational methods, relevant technology and applications. This unit will consist of: - error analysis & propagation; - use of technology (CAS Calculators & Desktop Tools) - solving non-linear equations; - solving systems of linear equations; - interpolation and extrapolation; - numerical calculus, including integration (quadrature) and differentiation; 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.Implement numerical techniques using a CAS Calculator as well as with desktop computer tools; 3.Critically evaluate a numerical process in terms of its speed of convergence, robustness, and ease of implementation; 4.Apply appropriate processes to a wide variety of mathematical problems; and 5.Critically review the use of technology in the secondary mathematics classroom.

**Required Reading:**No text is required; materials for the unit will be made available through the learning management system.

**Assessment:**Test, Online Quiz (MCx10), 10%. Other, Discussion Board Posts (5), 10%. Assignment, Written Computations (2), 60%. Presentation, Case Study of a real world problem, 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.

## VQB5611 Risk Assessment and Human Behaviour

**Locations:**City Flinders.

**Prerequisites:**Nil.

**Description:**The unit introduces students to basic fire safety engineering design concepts and presents the knowledge concerning occupant communication and response sub-models 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 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 application to fire safety engineering design;
- 2.Contextualise basic concepts of risk management and probabilistic risk assessment;
- 3.Propose fault tree and event tree;
- 4.Interpret and analyse fire statistical data;
- 5.Evaluate building evacuations in case of fire; and 6.Analyse toxicity and toxicological effects of fire and its effluents.

**Required Reading:**Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:**Assignment, Assignment 1 (1250 words), 25%. Assignment, Assignment 2 (2500 words), 50%. Report, Analysis of risk and human response (1250 words), 25%.

## VQB5612 Scientific Principles for Fire Professionals

**Locations:**City Flinders.

**Prerequisites:**Nil.

**Description:**This unit of study 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.Critically review visibility through smoke, and smoke toxicity; 5.Diagnose structural vulnerabilities during fire; and 6.Report the use of computational tools to evaluate the effects of fire

**Required Reading:**Recommended texts and other reading and course materials will be listed in VU Collaborate..

**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:**This unit of study provides students with an understanding of fire safety systems design principles and interaction between various sub-models 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, extinguishment and principles of evacuation. The unit includes 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. Articulate 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 review the role and capabilities of fire brigade; and 5. Assess occupational health and safety issues related to fire fighting and rescue operations.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**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 legislations (technical and administrative framework). It provides the student with an understanding of the structure of performance design and approval. The unit also covers estimation of acceptance criteria based on performance requirements, introduction to quantitative risk assessment and expected risk to life (ERL), and fire cost expectation (FCE). An introduction to legal issues, documentation, joint and several kinds of tortfeasor liability will be provided. Bushfire Regulations will also be introduced 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 with 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 review a performance-based fire safety solution document; and 5. Review compliance of design requirements throughout the operational life of a building.

**Required Reading:** Recommended texts and other reading and course materials will be listed in VU Collaborate.

**Assessment:** Assignment, Assignment: Legislation and regulations (800 words), 15%. Report, Fire safety engineering approval and practice (1700 words), 35%. Examination, Exam (3 hours), 50%. The examination requires students to critically evaluate and assess building reports.

### VQB5751 Fire Technology Modelling

**Locations:** City Flinders.

**Prerequisites:** VQB5612 - Scientific Principles for Fire Professionals VQB5641 - 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.

**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 Professionals VQB5641 - 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.

**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 Behaviour VQB5642 - Performance Codes Methodology and Structure VQB5751 - Fire Technology Modelling VQB5761 - 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

**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.

**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.

**Required Reading:** Kreyszig, E., (2010) 10th ed. Advanced Engineering Mathematics John Wiley & 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.

**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.

**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.

**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.

