COLLEGE OF ENGINEERING AND SCIENCE HANDBOOK 2018

DISCLAIMER

The information contained in Victoria University's 2018 College of Engineering and Science was current at 20 December 2017

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

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

IMPORTANT INFORMATION

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

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

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HOW TO USE THIS HANDBOOK

Victoria University's 2018 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 2018.

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 2018.

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

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

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

OTHER INFORMATION

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

CONTENTS

College of Engineering and Science

Below are details of courses offered by the College of Engineering and Science in 2018.

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

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

Master of Engineering (Building Fire Safety and Risk Engineering)

Course Code: EMQB
Campus: Werribee.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Develop advanced technical knowledge and skills in the specialist discipline of fire science and technology and apply to a range of building and structural settings; 2. Understand and apply legislation and fire safety engineering design codes; 3. As a team member develop the ability to plan, co-ordinate, complete and evaluate complex projects, taking into consideration social, economic, cultural and environmental impacts; 4. Apply the techniques and advanced modelling tools to analyse effectiveness of proposed fire safety design solutions; 5. Reflect how engineers apply rational engineering principles and techniques to identify cost-effective fire safety system designs; 6. Adopt sound research methodologies in the independent investigation of building and occupant characteristics and associated hazards; 7. Communicate verbally and in writing utilising a range of professional formats to a variety of associates including peers, professional and industry representatives and community members; 8. Apply the skills learnt within the course to a realistic research project; 9. Gain industry experience; 10. Demonstrate critical reflection of own learning goals and strategies in relation to career advancement.

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

Course Duration: 2 years

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

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

COURSE STRUCTURE

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

- 132 credit points of Core Studies units;
- 24 credit points of Industrial Experience (VQB5773), and;
- 48 credit points of Research Project (VQT6061 and VQT6062) units.

Year 1, Semester 1

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

Year 1, Semester 2

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

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

VQB5773	Industrial Experience On Fire Safety	24

Summer Units:

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

Students who have an engineering or science degree may receive recognition of prior learning (RPL) for VQB5781 and VQB5791.

Year 2, Semester 1

VQB5751	Fire Technology Modelling	12
VQB5761	Fire Safety Systems Modelling	12

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

VQT6061	Building Fire Research A	24

Year 2, Semester 2

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

Graduate Certificate in Performance-Based Building & Fire Codes

Course Code: ETQB
Campus: Werribee.

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

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

COURSE STRUCTURE

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

Year 1, Semester 1

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

Year 1, Semester 2

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

Assessment

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

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

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

Bachelor of Science (Science For Teaching)

Course Code: NBAS
Campus: Werribee, Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Demonstrate a critical understanding of the principles and concepts of mathematical and scientific knowledge and practical skills that underpin the profession of science in industrial and educational settings; 2. Develop and apply in-depth knowledge of specialist areas, including accessing, analysing and evaluating information and resolving complex problems with creativity and intellectual independence; 3. Apply independent, collaborative and interpersonal skills to effectively communicate contemporary changes in science, education and industry to wide ranging audiences; 4. Critically review, analyse, adapt and apply broad and coherent theoretical and technical knowledge of scientific and mathematical principles in diverse contexts; 5. Exhibit professional judgement, by adapting the knowledge and skills obtained to make effective decisions that reflect social, political

and/or ethical contextual factors; 6. Exercise high levels of cultural competence to work effectively in socially and culturally diverse communities and settings.

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

Course Duration: 3 years

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

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

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

COURSE STRUCTURE

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

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

Plus one of the following: Option A:

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

Option B:

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

First Year Core Units

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

Majors

NMABCH	Biological Chemistry
NMAEBI	Environmental Biology
NMAECH	Environmental Chemistry

Minors

NMNCHE	Chemistry
NMNBIO	Biology
NMNENV	Environment
EMILIT	Literary Studies (Education Minor)
EMIMTH	Mathematics (Education Minor)
EMIPSY	Psychology (Education Minor)
NMIPHY	Physics
EMIAGL	Aboriginal Yulendj (Knowledge) and Community

Bachelor of Building Design

Course Code: NBBD
Campus: Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Plan, implement and manage the delivery of efficient and effective building design strategies over the course of building design and construction processes in diverse contemporary contexts using independent thinking and judgement. 2. Generate creative solutions to a range of complex building design problems, taking into

account issues of compliance with relevant codes and standards, building construction process, technical and innovative changes, ethics and environmental sustainability (commercial and environmental) with initiative and professional judgement. 3. Critically evaluate sources and validity of information and use established processes for information management, integrating BIM and the latest architectural software, and including international perspectives and codes of practice as appropriate. 4. Advocate building design objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional forms (oral, written, working drawings). 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks. 6. Apply personal and interpersonal competencies including organisational and collaborative skills necessary to operate within broad parameters in the immensely divergent and complex global and Australian cultures. 7. Negotiate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world. 8. Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

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

Course Duration: 3 years

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

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

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

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

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

COURSE STRUCTURE

To attain the Bachelor of Building Design, students will be required to complete 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

NBD2100	Built Environment 1	12
NEA2102	Architectural Design and Theory	12
NBC2003	Building Systems and Services	12
NBD2001	Architectural History and Analysis	12

Year 2, Semester 2

NBD3001	Risk and Safety Management	12
NBD3100	Built Environment 2	12
NEA2201	Building Development and Compliance	12
NBD2002	Building Contract Documentation	12

Year 3, Semester 1

NBD3200	Urban Design and Development	12
NBC3101	Project Management Practice	12
NBD3002	Residential Sustainable Design	12
NBD3102	Building Design Project 1	12

Year 3, Semester 2

NBC3204	Complex Construction	12
NBD3003	Commercial Sustainable Design	12

NBC3003	Building Services Management	12
NBD3202	Building Design Project 2	12

Bachelor of Building Surveying

Course Code: NBBS
Campus: Footscray Park.

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

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

Course Objectives: On successful completion of this course, students will be able to: 1. Plan, implement and manage the delivery of efficient and effective building surveying strategies over the course of building construction processes in diverse contemporary contexts using independent thinking and judgement. 2. Generate creative solutions to a range of complex building surveying problems, taking into account issues of compliance with relevant codes and standards, building construction process, technical and innovative changes, ethics and environmental sustainability (commercial and environmental) with initiative and professional judgement. 3. Critically evaluate sources and validity of information and use established processes for information management. 4. Advocate building surveying objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms. 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks. 6. Apply personal and interpersonal competencies including organisational and collaborative skills necessary to operate within broad parameters in the immensely divergent and complex global and Australian cultures. 7. Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

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

Course Duration: 3 years

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

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

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

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

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

COURSE STRUCTURE

To attain the Bachelor of Building Surveying 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
NBC2003	Building Systems and Services	12
NBC2005	Building Materials	12
NBC2004	Building and Construction Studies	12

Year 2, Semester 2

NBD3001	Risk and Safety Management	12
NEA2201	Building Development and Compliance	12
NBC2109	Performance Based Solutions for Building	12
NBC2002	Building Regulations	12

Year 3, Semester 1

NBC3002	Advanced Building Surveying	12
NBC3001	High Rise Development and Compliance	12
NBC3101	Project Management Practice	12
NBC3110	Building Surveying Project 1	12

Year 3, Semester 2

NBC3204	Complex Construction	12
NBC3004	Construction Economics	12
NBC3003	Building Services Management	12
NBC3220	Building Surveying Project 2	12

Bachelor of Information Technology (Professional)

Course Code: NBIP
Campus: Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate and apply a broad and coherent body of knowledge of information technologies with depth in selected areas of study from the following areas: networking, security, virtualisation, enterprise network management, cloud, data analytics, ICT management, web application development, mobile application development and database; 2. Analyse and adapt the latest information technologies with intellectual independence, self-learning capabilities and creativity to identify and solve real-world problems with sound decisions and judgement in a broad range of sectors including ICT, government, banking and finance, retail, education, health, media and manufacturing; 3. Exhibit a range of technical, analytical, managerial, leadership and interpersonal skills; in depth understanding to the codes of ethics and conducts of IT professions; capacity to perform IT design and development practice in an independent or collaborative environment with a strong industry focus; and the responsibility and accountability as a lifelong learner for own learning and professional practice; 4. Present solid foundation and strong practical skills with the ability of life-long learning for industry certifications from large reputable vendors both locally and overseas, such as CISCO Certified Network Associate (CCNA) and Microsoft Certified Technology Specialist (MCTS).

Careers: Completion of the course will prepare graduates for the following roles:

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

Course Duration: 3.5 years

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Mathematics OR Completion of an Australian Diploma or Advanced Diploma (or equivalent); PLUS: IELTS (or equivalent): Overall score of 6 (with no band less than 6.0 in Listening, Reading, Writing and Speaking).

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

Selection Processes:, OtherStudents that are currently studying NBIT Bachelor of Information Technology, may be eligible to transfer to this course if they meet the following criteria: Completion of a least 192 credits (equivalent to 16 units) with a Distinction (70%) or above average from the Bachelor of IT; and the recipient of an Industry Based Scholarship.

COURSE STRUCTURE

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

- 96 credit points of First Year Core studies;

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

- 2 x 48 credit points of Industry Placement studies.

First Year Core Units

NIT1101	Web Development and CMS	12
NIT1102	Introduction to Programming	12

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

Industry Placement Units

NIT3001	IT Professional 1	48
NIT3002	IT Professional 2	48

Compulsory Minors

NMIITC	Graduating Core

Majors

NMAWMD	Web and Mobile Application Development
NMANSC	Network and System Computing

Bachelor of Information Technology

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

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

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate and apply a broad and coherent body of knowledge of information technologies with depth in selected areas of study from the following areas: networking, security, virtualisation, enterprise network management, cloud, data analytics, ICT management, web application development, mobile application development and database; 2. Analyse and adapt the latest information technologies with intellectual independence, self- learning capabilities and creativity to identify and solve real-world problems with sound decisions and judgement in a broad range of sectors including ICT, government, banking and finance, retail, education, health, media and manufacturing; 3. Exhibit a range of technical, analytical, managerial, leadership and interpersonal skills; in depth understanding to the codes of ethics and conducts of IT professions; capacity to perform IT design and development practice in an independent or collaborative environment with a strong industry focus; and the responsibility and accountability as a lifelong learner for own learning and professional practice; 4. Present solid foundation and strong practical skills with the ability of life-long learning for industry certifications from large reputable vendors both locally and overseas, such as CISCO Certified Network Associate (CCNA) and Microsoft Certified Technology Specialist (MCTS).

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

Course Duration: 3 years

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

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Mathematics OR Completion of an Australian Diploma or Advanced Diploma (or equivalent); PLUS: IELTS (or equivalent): Overall score of 6 (with no band less than 6.0 in Listening, Reading, Writing and Speaking).

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

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

COURSE STRUCTURE

To attain the Bachelor of 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

Majors

NMAWMD	Web and Mobile Application Development
NMANSC	Network and System Computing

Minors

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

Bachelor of Pharmaceutical and Health Science

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

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

Course Objectives: On successful completion of this course, students will be able to: 1. Analyse the fundamental principles underpinning the knowledge and practice of human health and disease, and the development and testing of pharmaceutical products; 2. Identify and solve problems with intellectual independence using the principles of pharmaceutical and health science in a range of situations related to health and drug interactions, taking into consideration social, cultural, economic and environmental factors; 3. Research, interpret and critically evaluate (local, national and international) information in the discipline and assess its relevance to a range of situations including real case scenarios; 4. Collect, interpret and analyse scientific data in order to solve problems in the pharmaceutical and Health Sciences and reflect upon the relevance of the outcomes for public health; 5. Devise and apply scientific methodology, individually and with peers, to undertake laboratory exercises, scientific research and practical investigations, employing ethical principles and practice and industry and research protocols; 6. Communicate effectively utilising a number of oral and written formats to a range of stakeholders including health practitioners, researchers, colleagues and peers.

Careers: The Bachelor of Pharmaceutical and Health Science, aims to produce graduates who have skills and knowledge in the areas of both Chemistry and Health, by combining the areas of human health and disease with the complementary areas of pharmaceutical analysis and pharmaceutical design and synthesis. Possible careers for graduates from this course and are found in industry, government and education. Some possible examples include:

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

Course Duration: 3 years

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

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

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

COURSE STRUCTURE

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

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

First Year Core Units

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

Year 2, Semester 1

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

Year 2, Semester 2

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

Year 3, Semester 1

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

Year 3, Semester 2

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

Bachelor of Science

Course Code: NBSC
Campus: Werribee, Footscray Park.

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

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

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

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

Breadth Minor:

- Tourism and Aboriginal Sustainability

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

Course Objectives: On successful completion of this course, 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. Industries that employ our chemistry graduates include: agricultural chemicals, brewing and wine, chemical analysis, cosmetics, dairy, environmental science and water, food, forensics, horticulture, industrial chemicals, materials and polymers, petrochemicals, pharmaceutical, scientific sales, state and federal government departments. Careers in ecology and environmental management include: landcare/bushcare coordinator; environment officer or environmental planner; restoration ecology and land management officer; marine and freshwater ecosystem management officer; environmental educator; botanist/zoologist/ecologist and ecological and resource assessor.

Course Duration: 3 years

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

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

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

COURSE STRUCTURE

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

- 96 credit points of First Year Core studies, and;
- 96 credit points of Major studies from the list below:

Biotechnology; Chemistry; Ecology and Environmental Management.

- 96 credit points of either Option A or Option B.

OPTION A

- 96 credit points of Major studies from the list below:

Biotechnology; Chemistry; Ecology and Environmental Management. OPTION B

- 96 credit points of Minor studies from the list below (including the Breadth Minor - BMITAS Tourism and Aboriginal Sustainability):

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

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

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

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

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

- Analytical Chemistry;
- Pharmaceutical Chemistry;
- Cell Biology/Microbiology;
- Molecular Biology;
- Mathematics/Statistics OR Physics;
- Tourism and Aboriginal Sustainability.

First Year Core Units

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

Majors

NMABIT	Biotechnology

NMACHE	Chemistry
NMAENV	Ecology and Environmental Management

Minors

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

Graduate Diploma in Project Management

Course Code: NGPM
Campus: Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Explain key theoretical project management frameworks and apply them to a range of project management scenarios, taking into consideration social, cultural, environmental and economic factors. 2. Differentiate research methods to investigate complex project management problems in order to generate solutions. 3. Design, develop and implement comprehensive project management plans which meet stakeholder expectations. 4. Evaluate the impact of organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation. 5. Communicate effectively to specialist and non-specialist stakeholders utilising a variety of professional oral and written forms to demonstrate an understanding of theoretical concepts, methodologies, recommendations and professional decisions.

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

Course Duration: 1 year

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

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

COURSE STRUCTURE

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

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

Core Units

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

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

Semester 1 units

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

Semester 2 units

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

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

Units are offered subject to availability

Bachelor of Construction Management (Honours)

Course Code: NHCM
Campus: Footscray Park.

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

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

Course Objectives: On successful completion of this course, students will be able to: 1. Plan, implement and manage the delivery of efficient and effective strategies over the course of construction processes in diverse contemporary contexts using independent thinking and judgement; 2. Generate creative solutions to a range of complex construction problems, taking into account issues of constructability, financial and human resources, compliance with relevant codes and standards, ethics and environmental sustainability (commercial and environmental) with initiative and professional judgement; 3. Critically evaluate sources and validity of information and use established processes for information management including international perspectives and codes of practice as appropriate; 4. Advocate design and management objectives and outcomes effectively to specialist and non-specialist stakeholders using a variety of professional oral and written forms; 5. Exemplify collaboration and requisite interpersonal and supervisory skills and characteristics to influence personal work, community and networks; 6. Apply personal and interpersonal competencies including organisational and collaborative skills necessary to operate within broad parameters in the immensely divergent and complex global and Australian cultures; 7. Advocate, respect and value cultural diversity and indigenous rights and develop capacities and creative solutions to contribute to a sustainable world; 8. Exhibit responsibility and accountability for own learning and professional practice in collaboration with others and within broad parameters.

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

Course Duration: 4 years

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

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

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

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

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

COURSE STRUCTURE

To attain the Bachelor of 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 NBC4108 Major 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
NBC2003	Building Systems and Services	12
NBC2006	Professional Estimating	12
NBC2005	Building Materials	12

Year 2, Semester 2

NBD2002	Building Contract Documentation	12
NEA2201	Building Development and Compliance	12
NBC2101	Building and Construction Surveying	12

12 credit points (equivalent to one unit) selected from the Building Compliance Minor

Year 3, Semester 1

NBC3001	High Rise Development and Compliance	12
NBC3005	Construction Law	12
NBC3006	Construction Site Operations	12
NBC3101	Project Management Practice	12

Year 3, Semester 2

NBC3004	Construction Economics	12
NBC3007	Research Methods	12
NBD3001	Risk and Safety Management	12

12 credit points (equivalent to one unit) selected from the Building Compliance Minor

Year 4, Semester 1

NBC4001	Procurement Management	12
NBC4101	Construction Management	12
NBC4002	Advanced Construction	12
NBC4107	Major Project 1	12

Year 4, Semester 2

NBC4003	Cost Planning and Control	12
NBC4108	Major Project 2	12

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

Minors

NMIBCP	Building Compliance

Bachelor of Engineering (Honours) (Architectural Engineering)

Course Code: NHEA
Campus: Footscray Park.

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

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

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

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

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

Course Duration: 4 years

Admission Requirements: 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 at least 20 in any Mathematics (any).

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

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

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

COURSE STRUCTURE

To attain the Bachelor of Engineering (Honours) (Architectural Engineering), students will be required to complete 384 credit points consisting of: 96 credit points of First Year Core studies, and; 240 credit points of Professional Architectural Engineering studies.

- 48 credit points of Minor studies (from the list below).

Students are required to produce documented evidence of the completion of 12 weeks professional experience. Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours, students must achieve:

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

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:

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

Semester 2:

NEA2202	Hydraulic Service Systems	12
NEF2251	Fundamentals of Electrical and Electronic Engineering	12
NEM2201	Thermodynamics 1	12

12 credit points (equivalent to one unit) from the selected Minor

Year 3

Semester 1:

NEA3101	HVAC Systems 1	12

NEA3102	Building Electrical Systems	12
NEF3101	Project Management	12

12 credit points (equivalent to one unit) from the selected Minor

Semester 2:

NBC3201	Research Methods	12
NEA3201	HVAC Systems 2	12
NEF3201	Engineering Management	12

12 credit points (equivalent to one unit) from the selected Minor

Year 4

Semester 1:

NEA4102	Residential Sustainable Design	12
NEF4105	Professional Engineering Practice	12
NEF4102	Capstone Project 1	12

12 credit points (equivalent to one unit) from the selected Minor

Semester 2:

NEA4204	Architectural Lighting and Acoustics	12
NEA4202	Building Fire Safety Systems	12
NEA4203	Commercial Sustainable Design	12
NEF4202	Capstone Project 2	12

Minors

NMIASC	Services and Compliance
NMIAST	Structure and Services

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 at least 20 in the following: Mathematics (any).

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

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

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

COURSE STRUCTURE

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

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

Students are required to produce documented evidence of the completion of 12 weeks professional experience. Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours, students must achieve:

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

Core First Year Units

NEM1001	Algebra and Calculus	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12

Year 2

Semester 1:

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

Semester 2:

NEC2201	Introduction to Structural Engineering Design	12
NEC2202	Geomechanics	12
NEC2203	Hydraulics	12
NEC2204	Highway Engineering	12

Year 3

Semester 1:

NEC3101	Structural Analysis	12
NEC3102	Geotechnical Engineering	12
NEC3103	Hydrology and Water Resources	12
NEF3101	Project Management	12

Semester 2:

NEC3201	Hydraulic Engineering	12
NEC3202	Civil Engineering Design 1	12
NEC3203	Structural Engineering Design 1	12
NEF3201	Engineering Management	12

Year 4

Semester 1:

NEC4101	Environmental Engineering 1	12
NEF4105	Professional Engineering Practice	12

12 credit points (equivalent to one unit) from the selected Minor

NEF4102	Capstone Project 1	12

Semester 2:

36 credit points (equivalent to three units) from the selected Minor

NEF4202	Capstone Project 2	12

Minors

NMISTE	Structural Engineering
NMIEWE	Environmental and Water Engineering

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

Course Code: NHEE
Campus: Footscray Park.

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

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

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

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with advanced specialist bodies of knowledge within the electrical and electronic engineering discipline; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the engineering discipline; 6. Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

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

- Electrical engineer
- Electronic engineer
- Communications engineer
- Power engineer
- Telecommunications engineer
- Embedded software engineer

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

Course Duration: 4 years

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

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Mathematics OR Completion of an Australian Diploma or Advanced Diploma (or equivalent) PLUS IELTS (or equivalent): Overall score of 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking).

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

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

COURSE STRUCTURE

To attain the Bachelor of 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;
- 240 credit points of Professional Core Engineering units, and;
- 48 credit points of Minor studies (from list below):

Students are required to produce documented evidence of the completion of 12 weeks professional experience. Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class

Honours: To be eligible for completion with First Class Honours, students must achieve:

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

First Year Core Units

NEM1001	Algebra and Calculus	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12

Year 2

Semester 1

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

Semester 2

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

Year 3

Semester 1

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

Semester 2

NEE3203	Embedded Systems	12
NEE3207	Analogue and Digital Transmission	12
NEE3208	Signal Processing	12
NEF3201	Engineering Management	12

Year 4

Semester 1

NEF4102	Capstone Project 1	12
NEF4105	Professional Engineering Practice	12

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

Semester 2

NEF4202	Capstone Project 2	12
NEE4204	Computer and Fuzzy Logic Control Systems	12

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

Minors

NMIPWR	Power Systems
NMITEL	Telecommunications

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 AND at least 20 in any Mathematics.

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subject: Mathematics OR Completion of an Australian Diploma or Advanced Diploma (or equivalent). PLUS IELTS (or equivalent): Overall score of 6 with no band less than 6.0

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

Admission Requirements VET: Completion of a cognate (similar discipline) Australian Diploma or Advanced Diploma (or equivalent) (such as Advanced Diploma of Engineering Technology), will be granted advanced standing of a maximum 96 credit points (Diploma) or 144 credit points (Advanced Diploma).

COURSE STRUCTURE

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

- 96 credit points of First Year Core studies;
- 240 credit points of Core Mechanical Engineering studies;
- 48 credit points of Minor studies.

Students are required to produce documented evidence of the completion of 12 weeks professional experience. Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours, students must achieve:

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

First Year Core Units

NEM1001	Algebra and Calculus	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12

Year 2

Semester 1:

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
NEM2201	Thermodynamics 1	12
NEM2202	Dynamics	12

12 credit points (equivalent to one unit) from the Minor

Year 3

Semester 1:

NEF3101	Project Management	12
NEM3103	Thermodynamics 2	12
NEM3203	Stress Analysis	12

12 credit points (equivalent to one unit) from the Minor

Semester 2:

NEF3201	Engineering Management	12
NEM3201	Manufacturing Materials	12
NEM3202	Fluid Mechanics 2	12
NEM3102	Design of Mechanical Systems	12

Year 4

Semester 1:

NEF4102	Capstone Project 1	12
NEF4105	Professional Engineering Practice	12
NEM4101	Mechanical Vibrations	12

12 credit points (equivalent to one unit) from the Minor

Semester 2:

NEF4202	Capstone Project 2	12
NEM4201	Structural Dynamics	12
NEM4420	Mechanical Design Project	12

12 credit points (equivalent to one unit) from the Minor

Compulsory Minors

NMIMSM	Modelling and Simulation

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

Course Code: NHES
Campus: Footscray Park.

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

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

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

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

This degree program encourages students to strongly engage with our industry network of local and international academic institutions (US, UK, France, Germany and China), local sports associations (Australian Institute of Sports, Victorian Institute of Sports) and local sports businesses e.g. Racesafe Australia, Ventou Sports, and

Autocoach Pty Ltd. Engagement will be in the form of projects embedded throughout the course, final year capstone projects and work experience/internships. International study tours are frequently undertaken for local students to go overseas and participate in a 2-3 week workshop focused on specific engineering problems. All students complete a minimum of 12 weeks professional experience to meet the requirements of Engineers Australia.

Course Objectives: On successful completion of this course, students will be able to: 1. Integrate conceptual understanding of mathematics, numerical analysis, statistics, and computer and information sciences with core bodies of knowledge within the electrical and electronic engineering and sports engineering discipline; 2. Exhibit expertise and professional judgement in engineering design practice which acknowledges contextual factors impacting the electrical and electronic engineering and sports engineering discipline; 3. Adapt theoretical knowledge applicable to the discipline and propose creative, innovative and sustainable engineering practices; 4. Critically evaluate both sources and validity of information and use established processes for information management; 5. Plan and execute a research project, professional project or piece of scholarship which demonstrates intellectual independence and contributes to the evidence base within the engineering discipline; 6. Discriminate and defend the application of established engineering methods and processes to promote systems which resolve existing and emerging complex engineering problems (including those that require cross-disciplinary knowledge and skills); 7. Present clear and coherent expositions of knowledge and ideas to a variety of audiences; 8. Exemplify the requisite characteristics for team leadership and membership appropriate to specific purposes, projects and contexts; 9. Apply professional ethics and accountabilities in their engineering practice and a commitment to ongoing professional development.

- Electrical and Electronics Engineer;
- Sports Engineer;
- Telecommunications Engineer;
- Embedded Systems Engineer;
- Power Engineer;
- Control Engineer;
- Mechatronics Engineer;
- Data Analyst;
- Biomechanics.

Careers:

Course Duration: 4 years

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

Admission Requirements International: Completion of an Australian Senior Secondary Certificate (VCE or equivalent) including at least one of the following subjects: Mathematics OR Completion of an Australian Diploma or Advanced Diploma (or equivalent) PLUS IELTS (or equivalent): Overall score of 6.0 (with no band less than 6.0 in Listening, Reading, Writing and Speaking).

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

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

COURSE STRUCTURE

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

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

Students are required to produce documented evidence of the completion of 12 weeks professional experience. Accreditation: This program is accredited by Engineers Australia and graduates are eligible to apply for graduate membership. First Class Honours: To be eligible for completion with First Class Honours, students must achieve:

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

First Year Core Units

NEM1001	Algebra and Calculus	12
NEF1102	Engineering Physics 1	12
NEF1103	Engineering and the Community	12
NEF1104	Problem Solving for Engineers	12
NEF1201	Engineering Mathematics 2	12
NEF1202	Engineering Physics 2	12
NEF1204	Introduction to Engineering Design	12
NEF1205	Engineering Fundamentals	12

Year 2

Semester 1

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

Semester 2

NEE2201	Linear Systems with Matlab Applications	12
NEE2204	Power System Supply Chain Management	12

NEE2205	Analogue Electronics	12
NEE2210	Engineering Design and Practice 2B	12
Year 3		
Semester 1		
AHE2102	Sports Biomechanics	12
NEF3101	Project Management	12
NEE3104	Digital Systems	12
NEE3201	Introduction to Control Systems	12
Semester 2		
NEE3203	Embedded Systems	12
NEE3207	Analogue and Digital Transmission	12
NEE3208	Signal Processing	12
NEF3201	Engineering Management	12
Year 4		
Semester 1		
AHE3101	Advanced Biomechanics	12
NEE4110	Electrical Power Systems, Analysis and Operation	12
NEF4102	Capstone Project 1	12
NEF4105	Professional Engineering Practice	12
Semester 2		
AHE3126	Motor Control	12
NEE4204	Computer and Fuzzy Logic Control Systems	12
NEE4212	Electric Energy Systems Protection and Communication	12
NEF4202	Capstone Project 2	12

Bachelor of Science (Honours)

Course Code: NHSC
Campus: Werribee, Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Exhibit advanced theoretical and technical knowledge in the discipline area by critically reviewing and evaluating relevant scientific literature; 2. Design, implement, troubleshoot and manage a research project to successful completion; 3. Analyse, evaluate and interpret data within the context of key literature; 4. Communicate professionally with a range of people including direct supervisor, peers, researchers, and industry representatives; 5. Produce a scholarly honours thesis based on their research project which complies with requisite academic conventions; 6. Critically reflect on own learning and progress of professional goals.

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

Course Duration: 1 year

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

COURSE STRUCTURE

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

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

OR

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

FULL-TIME:

NHE5100	Honours Research Project	48

PART-TIME:

NHE5101	Honours Research Project	24

Master of Engineering

Course Code: NMEN
Campus: Footscray Park.

About this course: The Master of Engineering is comprised of coursework, project work and research, designed to enable students to acquire specialised skills and expertise

in their chosen engineering discipline. The course will enable students to acquire advanced theoretical knowledge and critical analysis skills and apply these to research and complex technological problem solving scenarios. Additionally it provides pathways to higher research degrees. The Master of Engineering currently offers specialisations in two sub-disciplines: Telecommunications and Electrical Power. The course provides opportunities for students and also for suitably qualified persons to acquire the skills and expertise necessary to gain employment in the fast growing fields of Telecommunications, and Power industries. Emphasis is placed on topics which are required to support international trends in mobile broadband, fibre optic communications, growing applications such as sensor networks and machine to machine communications, power generation and distribution. The material taught in the course units enables students to acquire expertise and enhance their communication skills to elucidate complex technical problems and solutions in given scenarios.

Course Objectives: On successful completion of this course, students will be able to: 1. Conceptually map the most recent theoretical developments in their Engineering specialisation and justify their application in various contemporary and emerging professional contexts. 2. Contribute to the discourse and practice around 'engineering sustainability' and elaborate the links between Engineering and innovation. 3. Critically apply knowledge and skills relevant to both their chosen specialisation and the broader discipline of Engineering to new and uncertain professional practice scenarios, exhibiting a high level of personal autonomy and accountability. 4. Design, implement and evaluate Engineering projects or research which address complex issues and transmit subsequent findings to specialist and non-specialist audiences. 5. Formulate and strategise project management plans which accurately meet stakeholder needs and expectations.

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

Course Duration: 2 years

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

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

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

COURSE STRUCTURE

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

- 48 credit points of Common Interdisciplinary components;
- 48 credit points of Research Component units. Research topics must be aligned with the chosen specialisation;
- 96 credit points of Core Specialisation units for Telecommunications or Electrical Power.

Common Interdisciplinary Units:

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

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

Research Units:

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

NNR6001	Research Project A	24
NNR6002	Research Project B	24
OR		
NNR6500	Research Project	48

Specialisations

NSPTEL	Telecommunication
NSPELE	Electrical Power

Master of Applied Information Technology

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

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

Course Objectives: On successful completion of this course, students will be able to: 1. Conceptually map the most recent developments in IT theory and IT applications and justify their utility in various contexts. 2. Critically apply information technology knowledge and skills to new and uncertain situations in professional practice exhibiting a high level of personal autonomy and accountability. 3. Design, implement and evaluate applied IT research and transmit this knowledge to specialist and non-specialist audiences. 4. Formulate and strategise IT project management plans which accurately meet stakeholder needs and expectations.

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

Course Duration: 2 years

Admission Requirements: Completion of a cognate (similar discipline) Bachelor/Honours Degree; OR Completion of a non-cognate (any discipline) Bachelor/Honours Degree and a Graduate Certificate in a cognate (similar discipline) field.

Admission Requirements International: Entry into the program is open to applicants with a postgraduate qualification (AQF8 or higher), a first degree (AQF7) in the following quantitative disciplines: Information Technology, Computer Science, Computing, Information Systems, Engineering, Business, Science, or equivalent. In addition to satisfying the Bachelor/Honours Degree or Mature Age admission requirements, International Students must provide evidence of proficiency in the English language as demonstrated by: International English Language Testing System or its equivalent- overall score of 6.5 and no individual band score less than 6. Applicants with any of the following qualifications may apply for up to 48 credits points against specific coursework units (as detailed below): (a) A degree in computer science or IT. (b) A four year Honours degree in computer science or IT. (c) A degree or a Graduate Certificate with IT or Project Management units. (d) A postgraduate qualification with IT or Project Management units. (e) A combination of qualifications and experience equivalent to (a), (b), (c) or (d) above.

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

Selection Processes:, OtherSpecific Coursework units: NIT5110 Networking Systems; NIT5120 Software Engineering; NIT5130 Database Analysis and Design and EPM5600 Principles of Project Management.

COURSE STRUCTURE

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

- Information Technology studies;
- Project Management studies, and;
- Research-based studies.

Students may select ONE of the following options to complete their Research-based studies (thesis units): Option 1:

- 24 credit points of Thesis studies (Thesis 1 and 2);
- 48 credit points of Elective studies.

Option 2:

- 48 credit points of Thesis studies (Thesis 3 and 4);
- 24 credit points of Elective studies.

Year 1:

NIT5110	Networking Systems	12
NIT5120	Software Engineering	12
NIT5130	Database Analysis and Design	12
EPM5600	Principles of Project Management	12
NIT5140	Information Security	12
NIT5150	Advanced Object Oriented Programming	12
NIT5160	Cloud Computing	12
EPM5700	Project Management and Information Technology	12

Year 2:

NIT6130	Introduction to Research	12
NIT6150	Advanced Project	12

Select ONE of the following options:

Option 1:

NIT6041	Thesis 1	12
NIT6042	Thesis 2	12

Select four (4) Elective units:

OR

Option 2:

NIT6043	Thesis 3	24
NIT6044	Thesis 4	24

Select two (2) Elective units:

Elective Units:

EPM5610	Project Planning and Control	12
EPM5500	Fundamentals of Project Management	12
EPM5730	Project Stakeholder Management	12
EPM5740	Project Risk Management	12
NIT5081	Fundamentals of Cyber Security	12
NIT5082	Cloud Security	12
NIT5083	Enterprise Security Management	12
NIT5084	Cyber Security Law, Regulation and Policy	12
NIT6110	Advanced Wireless Networking	12
NIT6120	Mobile Applications	12
NIT6140	Sensor Networks	12
NIT6160	Data Warehousing and Mining	12

Master of Project Management

Course Code: NMPM
Campus: Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Conceptually map key theoretical project management frameworks and apply them to a range of project management scenarios, taking into consideration social, cultural, environmental and economic factors; 2. Select and defend research methods to investigate complex project management problems in order to generate solutions; 3. Design, develop and implement comprehensive project management plans which meet or exceed stakeholder expectations; 4. Critically analyse organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation; 5. Communicate effectively to specialist and non-specialist stakeholders utilising a variety of professional oral and written forms in order to justify and interpret theories, methodologies, recommendations and professional decisions; 6. Integrate professional standards into their practice and incorporate continuing professional development in accordance with Australian Institute of Project Management (AIPM) and Project Management Institute (PMI) USA protocols and standards.

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

Course Duration: 2 years

Admission Requirements: Successful completion of a cognate (similar discipline) Bachelor/Honours Degree; OR Successful completion of a non-cognate (any discipline) Bachelor/Honours Degree.

Admission Requirements International: In addition to satisfying the Bachelor/Honours Degree or Mature Age admission requirements, International Students must provide evidence of proficiency in the English language as demonstrated by: International English Language Testing System or its equivalent - overall score of 6.5 and no individual band score less than 6. Applicants with a recognised degree in a cognate discipline (an area of management eg. Construction Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) may apply for Advanced Standing for the Non-Cognate units.

Admission Requirements Mature Age: Successful completion of a cognate (similar discipline) Bachelor/Honours Degree; OR Successful completion of a non-cognate (any discipline) Bachelor/Honours Degree. Applicants with a recognised degree in a cognate discipline (an area of management eg. Construction Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) may apply for Advanced Standing for the Non-Cognate units. Applicants with a vocational education qualification (similar discipline) and at least 2 years work experience, in the project management area, may enter the course upon the completion of the Graduate Certificate in Project Management.

COURSE STRUCTURE

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

- 60 credit points of Core studies;
- 48 credit points of Non-Cognate studies;
- 24 credit points of Research studies;
- 60 credit points of Project Management elective studies.

Core Units:

EPM5600	Principles of Project Management	12
EPM5610	Project Planning and Control	12
EPM5620	Project Governance	12
EPM5630	Project Management and People	12
EPM5640	Research Methods	12
Non-Cognate Units:		
EPM5500	Fundamentals of Project Management	12
EPM5510	Project Program and Portfolio Management	12
EPM5520	Sustainable Project Management	12
EPM5530	Project Management Practice	12
Research Units		
EPM5651	Project Management Research Project A (Part-Time)	12
EPM5652	Project Management Research Project B (Part-Time)	12
OR		
EPM5660	Project Management Research Project	24
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
EPM5700	Project Management and Information Technology	12
EPM5710	Project Procurement Management	12
EPM5720	Facility Life Cycle Costing	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: 0.5 years

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

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

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

COURSE STRUCTURE

To successfully attain the Graduate Certificate in Cyber Security, students will be required to complete 48 credit points of Core Studies.

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

Graduate Certificate in Project Management

Course Code: NTPM
Campus: Footscray Park.

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

Course Objectives: On successful completion of this course, students will be able to: 1. Explain key theoretical project management frameworks and apply them to a range of project management scenarios, taking into consideration social, cultural, environmental and economic factors. 2. Differentiate research methods to investigate complex project management problems in order to generate solutions. 3. Design, develop and implement comprehensive project management plans which meet stakeholder expectations. 4. Evaluate the impact of organisational contexts, governance, ethical, legal and regulatory requirements and risk management when applying fundamental project management principles in a real life situation. 5. Communicate effectively to specialist and non-specialist stakeholders utilising a variety of professional oral and written forms to demonstrate an understanding of theoretical concepts, methodologies, recommendations and professional decisions.

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

Course Duration: 0.5 years

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

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

COURSE STRUCTURE

To successfully attain the Graduate Certificate in Project Management, students will be required to complete 48 credit points of Core Studies. Students without a degree in a cognate discipline (an area of management e.g. Consultation Management, Business Management, Information Systems, Logistics and Supply Chain Management or a similar field of management) will be required to complete EPM5500 Fundamentals of Project Management and EPM5530 Project Management Practice.

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

Core Units

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

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

Semester 1 Units:

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

Semester 2 Units:

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

Units are offered subject to availability.

Majors/Minors

NMABCH Biological Chemistry

Locations: Footscray Park

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

NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12
NPU3103	Techniques in Pharmaceutical Synthesis	12
NPU3104	Drug Testing and Analysis	12
RBF2390	Molecular Genetics	12
RBF2520	Biochemistry 1	12
NSC3010	Biotechnology Applications	12
NSC3030	Molecular & Systems Biology	12

NMABIT Biotechnology

Locations: Werribee, Footscray Park

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

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

NMACHE Chemistry

Locations: Werribee, Footscray Park

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

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

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.

NSC3010	Biotechnology Applications	12
NSC3030	Molecular & Systems Biology	12
RBF2390	Molecular Genetics	12
RBF2520	Biochemistry 1	12
RBF2620	Australian Plants	12
RBF2640	Australian Animals	12
RBF3110	Marine & Freshwater Ecology	12
RBF3210	Environmental Rehabilitation	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
NPU3103	Techniques in Pharmaceutical Synthesis	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: Werribee, Footscray Park

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

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

RBF3210	Environmental Rehabilitation	12
RBF3620	Conservation and Sustainability	12

NMANSC Network and System Computing

Locations: Footscray Park, 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
NIT2222	Networking Technologies	12
NIT2223	Mobile & Wireless Networks	12
NIT3104	Computer Architecture	12
NIT3122	Enterprise Network Management	12
NIT3123	Advanced Networking Technologies	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
NIT2212	Database 2	12
NIT2213	Software Engineering	12
NIT3112	Advance Web Application Development	12
NIT3113	Advanced Programming	12
NIT3114	Online Business System Development	12
NIT3213	Mobile Application Development	12

NMIACH Analytical Chemistry

Locations: Werribee, Footscray Park

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

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

NMIANM Network Management

Locations: Footscray Park, VU Sydney

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

NIT2122	Server Administration and Management	12
NIT2222	Networking Technologies	12
NIT3122	Enterprise Network Management	12
NIT3222	Virtualisation in Computing	12

NMIASC Services and Compliance

Locations: Footscray Park

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

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

NBC4001	Procurement Management	12

NMIASD Software Development

Locations: Footscray Park, VU Sydney

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

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

NMIAST Structure and Services

Locations: Footscray Park

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

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

NMIBCP Building Compliance

Locations: Footscray Park

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

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

NMIBIA Bioanalytics

Locations: Footscray Park

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

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

NMIBIM Biomechanics

Locations: Footscray Park

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

AHE2102	Sports Biomechanics	12
AHE2127	Motor Learning	12
AHE3101	Advanced Biomechanics	12
AHE3126	Motor Control	12

NMIBIO Biology

Locations: Werribee

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

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

RBF2330	Cell Biology	12

NMICBM Cell Biology/Microbiology

Locations: Werribee, Footscray Park

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

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

NMICHE Chemistry

Locations: Footscray Park

This minor in Chemistry will introduce you to the principles and practices of modern chemistry. Building upon the fundamental principles of chemistry which are introduced in the first year units, Analytical Methods 1 and Organic Synthesis introduce students to instrumental analytical chemistry and the theoretical and practical aspects of synthetic organic chemistry. These units provide basic training in the preparation, purification and characterisation of organic compounds and their complimentary modern spectroscopic, chromatographic and spectrometric methods of analysis. For students interested in teaching chemistry, taking the four (4) units in this minor adequately prepares students to deliver units 1, 2, 3 and 4 of the VCE chemistry curriculum.

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

NMIEAA Ecology and Environmental Management

Locations: Werribee, Footscray Park

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

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

NMIENV Environmental Science

Locations: Werribee

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

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

NMIESC Environmental Science

Locations: Werribee, Footscray Park

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

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

NMIEWE Environmental and Water Engineering

Locations: Footscray Park

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

NEA4203	Commercial Sustainable Design	12
NEC4082	Environmental Engineering 2	12
NEC4172	Urban Development and Transportation	12
NEC4201	Civil Engineering Design 2	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.

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

NMIMBI Molecular Biology

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year this group of units allows you to pursue a breadth minor in Molecular Biology. This biotechnology minor concentrates on the chemical basis of life with a particular focus on the relationship between genes, the proteins they encode and the impact these have on organisms. This minor provides knowledge of biochemistry and genetics that can be utilised across a broad range of industries, from DNA-based technologies in forensic science and conservation biology, to the diagnosis of disease using biochemical and genetic analyses, to the genetic engineering of cells and organisms. This minor includes practical training in the techniques used in biochemical analysis, investigation of gene and protein function and genetic engineering. This minor also investigates the ethical implications of these technologies and their broader impact on society. This minor is appropriate for students undertaking major studies in a range of science discipline areas who wish to complement their studies with an understanding of the molecular basis of life and how that knowledge can be utilised in a broad range of settings, including medical, forensic, conservation, pharmaceutical and agricultural industries.

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

NMIMSM Modelling and Simulation

Locations: Footscray Park

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

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

NMIMST Mathematics/Statistics

Locations: Werribee, Footscray Park

After developing a solid grounding in science and mathematics from the core units in first year, this specific group of units allows you to pursue a breadth minor in mathematics and statistics. These disciplines are at the heart of all modern science:

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

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

NMIPCH Pharmaceutical Chemistry

Locations: Werribee, Footscray Park

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

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

NMIPHY Physics

Locations: Werribee, Footscray Park

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

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

NMIPWR Power Systems

Locations: Footscray Park

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

NEE4105	Alternative Energy Systems and Power Electronics	12
NEE4110	Electrical Power Systems, Analysis and Operation	12
NEE4212	Electric Energy Systems Protection and Communication	12
NEE4214	Overhead and Underground Power Line Design	12

NMISPT Sports Technology

Locations: Footscray Park

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

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

NMISTE Structural Engineering

Locations: Footscray Park

There is a growing demand for effective planning, analysis, design, construction and

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

NEC4102	Structural Engineering Design 2	12
NEC4201	Civil Engineering Design 2	12
NEC4202	Structural Engineering Design 3	12
NEC4203	Advanced Structural Analysis	12

NMITEL Telecommunications

Locations: Footscray Park

This minor will allow for specialisation within the telecommunication discipline by taking wireless broadband communication, RF Engineering, Satellite and broadband link design and Mobile Networks and communications. This is a niche market for upcoming engineering graduates and gives a student an advantage in future job prospects in the fields taught in this minor. The system infrastructure and connect ability supported by the material taught is so ubiquitous in many contexts that students are encouraged cross-disciplinary and innovative approaches to learning, reflecting contemporary and emergent needs in the engineering discipline. Learning will be contextualised, relevant and provide the foundational skills that are highly desired in the industry. Students will access, evaluate, synthesise and analyse information to assist in knowledge development and in completing assessment tasks.

NEE4103	RF Engineering	12
NEE4208	Satellite and Broadband Link Design	12
NEE4211	Mobile Networks and Communications	12
NEE4220	Wireless and Broadband Communications	12

NMNBIO Biology

Locations: Werribee, Footscray Park, St Albans

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

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

NMNCHE Chemistry

Locations: Werribee, Footscray Park

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

NPU2101	Analytical Methods 1	12
NPU2103	Organic Synthesis	12
NPU3103	Techniques in Pharmaceutical Synthesis	12
NPU3104	Drug Testing and Analysis	12

NMNENV Environment

Locations: Werribee, Footscray Park

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

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

NSPELE Electrical Power

Locations: Footscray Park

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

Core Units:

NNM7001	Power Generation	12
NNM7002	Transient Analysis, Stability and Surge Protection	12
NNM7003	Overhead Design and Construction	12

NNM7004	Underground Design and Construction	12
NNM7005	Power Quality and Harmonics	12
NNM7006	Insulation Co-Ordination and Sub-Station Design Principles	12
NNM7007	National Electricity Market and Regulation Principles	12
NNM7008	Environmental Issues and Sustainability	12

NSPPRE Process Engineering

Locations: Footscray Park

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

Core Units:

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

NSPTEL Telecommunication

Locations: Footscray Park

The Master of Engineering Telecommunications specialisation is supported by coursework, design exercises and research projects designed to enable the development of specialised skills and expertise in the telecommunications field, specifically wireless and network engineering. Graduates will meet employment demand in the telecommunications industry within Australia and overseas. Particular emphasis on wireless and networking within the course will provide job opportunities in the areas of mobile broadband and fibre to the premises - the current growth drivers of the global telecommunications industry. Students in this specialisation will benefit from the College's strong research capabilities and facilities in wireless systems and optical technology which were major contributors to the 2010 (Excellence in Research Australia) ERA=4 ranking in electrical engineering.

Core Units:

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

NSPWTR Water Management

Locations: Footscray Park

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

Core Units:

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

UNITS

ENE3100 Engineering Design and Practice 3A

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 24

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

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

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

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

ENE3102 Systems & Applications

Locations: Footscray Park.

Prerequisites: Nil.

Description: Synchronous system design; Moore and Mealy models. Description in VHDL. An introduction to Algorithmic State Machine Design through VHDL description and PLD implementation. Controller and data-processor partitioning. Mechanical and Electromagnetic Fundamentals: Magnetic field, Faraday's Law and Lenz's Law. DC shunt motors Frequency response of amplifiers; an introduction to wide-band and high frequency amplifier design. Differential amplifiers, models of operation, gain, CMMR; design for performance characteristic. Feedback: Classification and the effect on driving point impedance and transfer functions. Series and Shunt feedback, Stability and gain and phase margins and compensation. Introduction to Switch mode power supply.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Implement optimal state machines for a range of electronic engineering applications; 2. Apply a system level approach to digital design using the algorithmic state-machine design paradigm; 3. Synthesize ASM controllers using: the traditional method, ROM based method and one-hot method; 4. Describe the fundamental principles of mechanical and electromagnetic energy conversion; 5. Analyse simple power systems containing DC machines and transformers; 6. Analyse a range of analogue circuit types and assess the circuit performance; 7. Apply the negative feedback on electronic circuits to achieve specific performance and stability; and 8. Design analogue circuits to meet performance criteria and select suitable components for circuit realisation.

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

Required Reading: Roth, C.H., (2004) 5th ed. Fundamentals of Logic Design Thomson Learning Sedra, A. and Smith, K., (2004) 5th ed. Microelectronic Circuits Oxford University Press Chapman, S. J., (2002) Electric Machinery and Power System Fundamentals McGraw Hill

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

EPM5500 Fundamentals of Project Management

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

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

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

(2013) 1st ed. Project Management Ashgate Publishing Ltd.
Assessment: One assessment record is needed to satisfy mandatory requirements of system, please check with your College for internal procedures. Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral Presentation (3000 words), 30%. Examination, Final Examination, 50%.

EPM5510 Project Program and Portfolio Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: Project, Program and Portfolio Management (PPPM) will introduce students to senior management decision-making models. Portfolio management involves prioritisation, risk assessment and deployment of resources across an entire organisation to achieve benefits to the whole-of-business. In contrast, program management identifies benefits and realises outcomes across programs and projects. PPPM concentrates on the development of a realistic picture of an organisation's business and future strategy and how to best use company resources to achieve beneficial results. These resources include adopting standards across an enterprise, developing staff competency through education and training, and implementing reporting regimes to provide senior management with information for sound decision making. Program Management feeds into portfolio decision making by providing accurate and real-time data, quality assurance across programs and projects and ensuring consistent processes are maintained.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate the concepts of project, program and portfolio management and articulate the key features of each; 2. Deconstruct the role and responsibilities of a Program Management Office and extrapolate these to a known or unknown organisational context; 3. Critically analyse the role and responsibilities of a Portfolio Services Organisation and exemplify how it relates to the strategic direction of organisations; 4. Conceptually map reporting chains and systems within an organisation and relate them to theoretical models of decision-making; and 5. Systematically evaluate the return on investment in program and portfolio project management in various contexts.
Class Contact: Lecture3.0 hrs
Required Reading: Formal class notes will be provided to students for each module within this unit of study. These notes are reviewed and updated regularly.Project Management Institute (PMI) (2013) 3rd ed. The Standard for Program and Portfolio Management Project Management Institute (PMI)
Assessment: Case Study, Project 1 (2000 - 2500 words), 25%. Case Study, Group Project 2 (2000 - 2500 words per group), 25%. Examination, Final Examination (3 hours), 50%.

EPM5520 Sustainable Project Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: Participants will complete the PRiSM (Projects integrating Sustainable Methods) program, whereby they can gain benefits from integrating sustainable based project delivery processes and practices into their existing work and obtain access to a globally recognised certification program - "Sustainable Project Manager". Theoretical models are proposed which integrate sustainable methods into the fabric of projects and align project outcomes with organisational strategic goals. Potential impacts on the five (5) bottom lines that define the health of an organisation (planet, people, profit, process, and product) are investigated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Deconstruct and apply as appropriate the PRiSM Model for guiding sustainably based processes and practices in various contemporary and emerging organisational settings; 2. Critically review and apply Sustainable Project Management frameworks in accordance with government and industry standards; 3. Propose sustainability processes and practices which align with organisational goals; 4. Formulate performance indicators which measure social, economic, & environmental sustainability as bottom line activities; and 5. Develop an advanced risk mitigation strategy in regard to elements of the Sustainability Management Plan.
Class Contact: Lecture3.0 hrs
Required Reading: Students will provide their own laptop or similar, with all course reference material supplied in downloadable electronic book format. Additional resource material would be available as handouts where necessary.PMI (2013) 5th ed. The Guide to the Project Management Body of Knowledge Project Management Institute Carboni J., Gonzalez M., Hodgkinsons J., (2013) PRiSM - Projects Integrating Sustainable Methods: The GPM Reference Guide to Sustainability in Project Management Green Project Management GPM Global (2014) The GPM Global P5 Standard for Sustainable Project Management: Planet, People, Profit, Process and Products Green Project Management
Assessment: Assessment will be a combination of two case study projects plus a two class tests. Case Study, Group Case Study Project 1 (Approx. 1,000 words per group member), 30%. Case Study, Group Case Study Project 2 (Approx. 1,000 words per group member), 30%. Test, Two (2) Class Tests (2 x 20% each), 40%.

EPM5530 Project Management Practice

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit is designed to provide an understanding of the principles of project management practice and the roles and responsibilities of stakeholders and others in a project team. Utilising the PMBOK© (Project Management Body of Knowledge) Guide as a reference, the unit explores 10 Knowledge Areas in project management and instigates the process of applying these to contemporary and emerging project environments. The unit delivers a comprehensive understanding of how due diligence manifests in a project life cycle. It addresses what is to be delivered in a project (scope), how it is to be delivered (plan), the delivery and implementation (execution) and finally reporting and review. As projects are situated within organisations, relevant concepts of organisational management and human resource management are also analysed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply knowledge, skills, tools and techniques to project activities through the lens of an established project management process (PMBOK©); 2. Define, differentiate and critique the 10 Knowledge Areas of project management; 3. Exhibit the use of Project Communications tools and techniques in the areas of planning, assessing, quantifying, qualifying, control, monitoring and disposition of project information relevant to all stakeholders and at all levels of the organisation; 4. Appraise the dynamics of working collaboratively within a project environment and developing distributed leadership skills; and 5. Predict the impact of risk in various project management scenarios.
Class Contact: Lecture3.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.(PMBOK© GUIDE) (2013), 5th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Gido, J & Clements (2015) 7 th ed Successful Project

Management Cengage Learning Australia Kloppenborg, TJ 2015 3rd ed Contemporary project management Cengage Learning Australia
Assessment: Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral Presentation, 30%. Examination, Final Examination, 50%.

EPM5600 Principles of Project Management

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: The unit of study will introduce and define project management as it applies to the conceptualisation, design, development, documentation, procurement and maintenance of any project or facilities (including buildings and infrastructure). Various models of project management and related principles and methodologies will be appraised. Frameworks for working in a project team environment will also be proposed and evaluated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interrogate and apply project management and lifecycle principles to assess project scope and complexity and strategise accordingly; 2. Critically evaluate the relevance of selected project management theoretical frameworks to a variety of project scenarios; 3. Determine and interpret contemporary and future trends and modelling in project management to ensure quality outcomes, including evidence of due diligence; 4. Elucidate and critique the potential roles and responsibilities of Project Manager and Project Team Member to inform professional practice; 5. Deconstruct and apply theories of stakeholder management as appropriate to projects in emerging and dynamic contexts; and 6. Participate effectively as a member of a multi-disciplinary project team.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Workshop 1.0 hr
Required Reading: Pinto, J.K., (2012) 3rd ed. Project Management: Achieving Competitive Advantage Pearson Education Limited, Essex, UK Bender, M.B., (2010) 1st ed. A Manager's Guide to Project Management - Learn How to Apply Best Practices Pearson Education Inc, New Jersey
Assessment: Assignment, Individual assignment, 20%. Project, Group project, 40%. Examination, Final Examination (2 hours), 40%. Total word equivalence of the above assessment tasks is 8,000 words.

EPM5610 Project Planning and Control

Locations: Footscray Park.
Prerequisites: Nil.
Description: The Project Planning and Control unit will review the development process of a project from its inception through to feasibility and commencement. Design documentation, procurement commissioning and life cycle planning will all be addressed. Theoretical frameworks for planning and managing the project management process will be critiqued. Project control and cost planning, financial control, time management and other scheduling techniques will be applied to practical scenarios.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elaborate and apply advanced project management principles and techniques to enable them to plan, organise, execute, control and complete a project; 2. Develop a project management plan for the successful delivery of a complex project in various contexts; 3. Critically apply resource scheduling and allocation techniques to facilitate effective project control; 4. Investigate and appraise key project evaluation monitoring and control techniques and justify their importance in bringing projects to successful completion; 5. Review various contemporary and IT based project management tools and hypothesise their application in diverse, dynamic and emerging contexts; and 6. Evaluate different quality systems and make recommendations regarding their role in minimising waste and providing value to the client.
Class Contact: Lecture 3.0 hrs Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).
Required Reading: Formal class notes will be provided to students for each unit of study. These notes are reviewed and updated regularly. Project Management Institute (2013) 5th ed. A Guide to the Project Management Body of Knowledge Project Management Institute Larson, E.W. & Gray, G.E., (2011) 5th ed. Project Management: the managerial process McGraw Hill-Irwin Series
Assessment: Project, Group Project, 60%. Examination, Final Examination (2 hours), 40%. Total word equivalence of the above assessment tasks is 8,000 words.

EPM5620 Project Governance

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

EPM5630 Project Management and People

Locations: Footscray Park.
Prerequisites: Nil.
Description: Successful projects comprise several key features. One is the 'people' factor. Good project outcomes rely on both strong leadership and management skills which include the explicit specification and understanding of requisite roles, responsibilities, skills and effort of project participants. Project Management and People identifies and critically assesses the qualities of people working on projects and extrapolates how they can contribute to project success in a diversity of known

and uncertain contexts. The subject also explores how human behaviour in project-focused organisations differs from that in more traditional organisational forms. The evidence base of theoretical and translational approaches to people management is reviewed and critiqued.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate between audiences internal and external to a project and their impact on project management; 2. Conceptually map how project teams can be established and roles allocated; 3. Critically evaluate different structures that can be created to ensure both intra and inter-team communication; 4. Devise tools and techniques for motivating staff and ensuring high levels of morale in project teams; and 5. Manage grievances and conflict in a team setting, provide space for team members with special skills and abilities, and introduce incentives and rewards to ensure ongoing efficiency.

Class Contact: Lecture 3.0 hrs

Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. McShane, S, Olekalns, M. & Travaglione, T (2014) 4th ed. Organisational Behaviour: Emerging Knowledge, Global Insights. McGraw Hill Brown, D & Harvey, D (2006) 7th ed. An experiential approach to organisational development Pearson Education

Assessment: Assignment, Individual Research Project, 20%. Project, Group Research Project, 40%. Examination, Final Examination (2 hours), 40%.

EPM5640 Research Methods

Locations: Footscray Park.

Prerequisites: EPM5600 - Principles of Project ManagementEPM5610 - Project Planning and Control

Description: Effective management of successful projects is founded on a broad evidence-base. While evidence can be extracted from the disciplinary literature, existing databases or previous project experience, original research may also be undertaken to meet the requirements of a specific project. Research is a process of enquiry and investigation, and takes a systematic and methodical approach to the creation of knowledge-as-evidence. Ineffective decision making can occur when a lack of knowledge leads to project delay and failure. Research Methods guides participants through the logical steps required for the establishment of a research proposal for a professional project or further scholarship. Starting with an overview of the purpose of research, it develops a set of principles designed to build a research proposal based on conceptual issues and different approaches to research design. The collection and review of primary and secondary data, the application of qualitative and/or quantitative methodologies, the collection and interrogation of data, reporting of results and conclusion are all considered.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate sequentially and elaborate the principles involved in planning and executing a research project; 2. Theorise a conceptual framework for a research problem and assess it in the context of project management principles; 3. Operationalise concepts to formulate a research question(s) or a hypothesis; 4. Select and develop the appropriate methodology and measurement instruments for data collection; 5. Critique relevant sources of information and justify the selection and application of methods for data collection and analysis; and

Class Contact: Lecture 3.0 hrs

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

Assessment: Project, Individual Research Project: selection and literature review (2000 words), 20%. Report, Research Proposal: submission in report format (4000 words), 40%. Presentation, Research Proposal project presentations and discussions (ongoing), 20%. Presentation, Final Formal Research Proposal Presentation (30 minutes), 20%.

EPM5651 Project Management Research Project A (Part-Time)

Locations: Footscray Park.

Prerequisites: EPM5640 - Research Methods

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

Credit Points: 12

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

Class Contact: Lecture 3.0 hrs

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

Assessment: Project Management Research Project A (Part-Time) is the first of a two unit project. On the completion of the second unit Project Management Research Project B (Part-Time), students receive the final grade which includes work and assessment conducted during this unit. Total weighting for the assessment conducted over two units is as follows: Presentation, Project Presentation, 20%. Report, Preliminary Research Report (approx. 4,000 words), 30%. Report, Final Research Report (approx. 8,000 words), 50%.

EPM5652 Project Management Research Project B (Part-Time)

Locations: Footscray Park.

Prerequisites: EPM5640 - Research MethodsEPM5651 - Project Management Research Project A (Part-Time)

Description: Effective project management is based on evidence. Such evidence can be extracted from the existing literature and/or previous project experience but often it needs to be created to meet the requirements of a specific project. Project Management Research Project provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in the Master of Project Management. Students will

apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. Following their investigation students will submit and present their findings and results based on statistical and analytical techniques and make recommendations for future research.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Select an appropriate research methodology based on the content of the research; 2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 3. Articulate and apply literature review strategies to survey and critically analyse the existing literature; 4. Conduct data collection and analysis of primary and secondary data using qualitative or quantitative methodologies; 5. Interpret results and findings, draw conclusions and make recommendations to a variety of audiences - specialised and non-specialised; and
Class Contact: Sessions with supervisor.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Veal A. J., (2005) 2nd ed. Business Research Methods: a Managerial Approach Pearson NSW Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London
Assessment: Presentation, Project Presentation, 20%. Report, Preliminary Research Report (approx 4,000 words), 30%. Report, Final Research Report (approx. 8,000 words), 50%.

EPM5660 Project Management Research Project

Locations: Footscray Park.
Prerequisites: EPM5640 - Research Methods
Description: Effective project management is based on evidence. Such evidence can be extracted from the existing literature and/or previous project experience but often it needs to be created to meet the requirements of a specific project. Project Management Research Project provides an opportunity for students to undertake research in a specialised area relevant to their own area of work or interest and/or related to theories explored in the Master of Project Management. Students will apply and synthesise knowledge and skills to develop an in-depth understanding of managing projects in contemporary and emergent settings. Following their investigation students will submit and present their findings and results based on statistical and analytical techniques and make recommendations for future research.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Select an appropriate research methodology based on the content of the research; 2. Demonstrate an understanding of the research process and a systematic approach to the investigation of their specialised area; 3. Articulate and apply literature review strategies to survey and critically analyse the existing literature; 4. Conduct data collection and analysis of primary and secondary data using qualitative or quantitative methodologies; 5. Interpret results and findings, draw conclusions and make recommendations to a variety of audiences - specialised and non-specialised; and
Class Contact: Lecture 3.0 hrs Tutorial 3.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Veal A.J., (2005) 2nd ed. Business Research Methods: A Managerial Approach Pearson NSW Collins J. & Hussey R., (2014) 4th ed. Business Research: A practical guide for undergraduate and postgraduate students Palgrave London
Assessment: Presentation, Project Presentation, 20%. Report, Preliminary Research Report (approx 4,000 words), 30%. Report, Final Research Report (approx 14,000 words), 50%.

EPM5700 Project Management and Information Technology

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit addresses the ways in which information technology (IT) can facilitate the project management process in relation to feasibility and sensitivity analysis, planning and monitoring, information processing and decision support functions. It focuses on the application of software packages in the areas of both General Project Management Information Systems and Specialised Project Management Information Systems. The subject content includes computerised procurement considerations, identification of available computer hardware and software and analysis of current IT trends. IT based Project Management analytical systems (spreadsheets/financial models, planning and resource control, Data Base Management Systems (DBMS), and Quantitative and Qualitative Risk Analysis) are critically reviewed. Problem solving in relation to change and risk management and issues of quality control are also addressed. Learning scenarios which highlight the emergent and dynamic nature of IT and project management will be used to contextualise course content.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and appraise hardware and software applications and defend their application in specific project environments; 2. Critically evaluate the relevance of selected project management theoretical frameworks to a variety of project scenarios; 3. Justify the selection of appropriate software to capture complex financial transactions and resolve resource conflicts across the life of projects; 4. Formulate a strategy for the implementation of project management software which addresses project risk identification and response; and 5. Exemplify the skills required for the effective functioning of a multi-disciplinary project planning control group.
Class Contact: Lab 3.0 hrs Lecture 3.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Kathy Schwalbe (2013) 7th ed. Information technology project management Cengage Learning, Boston MA. MS Project Training Manuals 2012 Students will be provided with class notes and additional resources online, in-line with the topics.
Assessment: Assignment, Individual Research Project (2000 – 2500 words), 20%. Assignment, Group Case Study Project (4000 – 5000 words), 40%. Examination, Final Examination, 40%.

EPM5710 Project Procurement Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit develops students' understanding of the interplay between aspects of the Australian legal system by examining the role of the Victorian and Commonwealth Parliament; the process and effect of passing legislation; and the impact on business and procurement contracting through the judicial interpretation of those laws in the hierarchy of Australian Courts. It addresses the responsibilities of various stakeholders as well as their liabilities by comparing different types of standard contract documents. The law relating to principles and practice of project procurement management and the formation of a contract (including formation and terms of a contract; avoidance; discharge of a contract; quantum merit; and dispute resolution and remedies) are also considered. Practical assessments will equip

students to both develop skills in analysing contractual issues and facilitate relationships between various stakeholders in a project. The roles and responsibilities of each stakeholder, risk apportionment between various stakeholders and determination of risks to be covered by insurances, bonds or other risk allocation instruments are all investigated.

Credit Points: 12

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

Class Contact: Lecture 3.0 hrs

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

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

EPM5720 Facility Life Cycle Costing

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture 3.0 hrs

Required Reading: Various texts are currently being reviewed - it is anticipated that there may be one required text and up to two recommended texts. Current texts being reviewed include: - Carter, J. W., "Contract law in Australia", (2013) (6th Ed) - Pentony, B et Al., "Understanding business law", (2013) (6th Ed) - Seddon, N, "Government contracts: federal, state and local", (2013) (5th Ed) Students will also be directed to journal articles for supplementary reading as they become relevant and available. Blank L. & Tarquin A., (2012) 7th ed. Engineering Economy McGraw Hill Kirk S. J. and Dell'Isolla A. J., (1995) 2nd ed. Life Cycle Costing for Design Professionals McGraw Hill Standard Australia (1999) 1999 AS/NZS 4536:1999: Life Cycle Costing - An application guide Standard Australia

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

EPM5730 Project Stakeholder Management

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture 3.0 hrs Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).

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

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

EPM5740 Project Risk Management

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture 3.0 hrs Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom).

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

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

EPM5750 Project Investment Analysis

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture 3.0 hrs

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

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

EPM5760 Project Construction Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: The focus of this unit is contemporary and emerging construction systems and technology with respect to available procurement options. Issues around build-ability and use-ability are considered and lessons for future application extrapolated. Appropriate forms of traditional and non-traditional project delivery options such as D&B, GMP, BOO/BOT are considered, along with the use of modern frameworks to improve construction efficiency. Additional topics include alternative means of protection of structures (including fire and external environmental conditions); safety factors and cost implications of materials handling on construction sites; effective resource planning; and cost, time and quality optimisation techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Plan, construct and manage the delivery of efficient, and effective strategies and inputs over the course of the construction process to achieve value for money on diverse and complex projects in alignment with Construction Extension to the PMBOK Guide. 2. Evaluate the success of construction solutions by measuring their results against theory-based criteria and standards of performance taking into consideration construction techniques, methods and processes for commercial and government organisations. 3. Articulate and apply the ethical and legal requirements for different types of delivery methods, supplier selection processes, contract negotiations, contract administration requirements and overall contract management. 4. Critically review the efficacy of contract delivery systems in the construction industry in relation to occupational health and safety (OH&S) requirements, activity management, plant and machinery resource management and procurement requirements particular to the construction industry. 5. Conceptually map construction management processes relevant to resource utilisation on a complex project.

Class Contact: Lecture 3.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics Richard Lambeck, John Eschemuller (2009) 1st ed. Urban construction project management McGraw-Hill Richard H. Clough, Glenn A. Sears, S. Keoki Sears (2008) 1st ed. Construction project management New York : Wiley PMI (2007) 3rd ed. Construction Extension to the PMBOK Guide PMI PMI (2013) 5th ed. Guide to Project Management Body of Knowledge PMI

Assessment: Project, Individual Research Project (2000 – 3000 words), 20%. Project, Group Research Project (8000 – 9000 words), 40%. Examination, Final Examination, 40%.

NBC1100 Building Planning Process 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: Private and municipal building surveyors carry out the statutory role of ensuring that proposed residential building projects meet relevant compliance requirements prior to issuing planning permits. Building Planning Process 1 unit is concerned with the fundamental planning considerations for residential buildings in classes 1 and 10 as defined in the National Construction Code (NCC) and up to three storeys and not more than 2000 square metres in floor area. The main focus is on gathering and assessing documentation that supports the planning application

process required to obtain planning permission.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret and apply relevant clauses of the National Construction Code (NCC) for Class1 and Class 10 buildings; 2. Summarise construction methods and materials suitable for buildings in classes 1 and 10; 3. Interpret drawing symbols, notations, acronyms and construction terminology used in the National Construction Code (NCC), Australian standards, working drawings, and building design specifications; 4. Explain legislative and local planning and building requirements governing the issuing of planning approval permits in the jurisdictions relevant to each building specified in the performance evidence; and 5. Exemplify effective communication with a range of skilled professionals, including architects and engineers.

Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hr

Required Reading: National Construction Code Series (2015) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code (2014) Volume 1 Energy efficiency provisions ABCB Publications, Canberra National Construction Code (2015) Volume 2 Energy efficiency provisions ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (each 500 word equivalent), 30%. Test, Three (3) quizzes, 30%. Assignment, Team design project and oral presentation (1500 word equivalent), 40%.

NBC1102 Building and Construction Structures

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to structural concepts, construction materials and construction methodologies applied to simple buildings. The structural considerations include the analysis of loads, load paths, lateral stability, principles governing selection of structural systems and their compliance with Australian Standard Codes, building components including scaffolding, understanding design of temporary structures, and general beam behaviour and statics analysis. Materials topics include selection of suitable materials for differing situations encountered in construction and OH and S and sustainability issues in regards to materials. Construction topics include: site operations, sub-structure, super-structure and enclosure methodologies for simple residential buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic structural analysis and design concepts to contemporary construction practice; 2. Synthesise and communicate resolutions to construction problems by means of sketches and drawings; 3. Propose and evaluate alternative construction systems in a range of situations; 4. Propose and evaluate alternative construction materials in a range of situations; 5. Assess OH and S and sustainability related issues for various construction materials; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only.Barry R., (2014) Barry's advanced construction of buildings Wiley & Sons Inc Wyatt .K., (2013) Principles of Structures Taylor & Francis Ltd. Wilkie. G., (2003) Building Your Own Home New Holland

Assessment: Test, Class test (500 words), 30%. Test, Class test (500 words), 20%. Assignment, One Team Project report and oral presentation (500 words), 20%. Examination, End of Semester Examination (2 hours), 30%.

NBC1105 Building and Construction Studies 1

Locations: Footscray Park.

Prerequisites: Nil

Description: This unit introduces students to the procedures, principles and methods of construction with particular focus on typical residential buildings. The unit forms the foundation for NBC2104 Building and Construction Studies 2 unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss the types and functions of domestic buildings, and regulations that apply to them; 2. Develop the procurement of minor works and dwellings, the roles and the activities of building clients, designers and contractors, with descriptions of the design and construction processes; 3. Draw simple domestic buildings, as required in the building procurement process; 4. Distinguish between the functions, materials, configuration(s) and details of the major components in domestic buildings; 5. Classify the sources of waste in the construction industry, particularly in housing and the development of strategies and management practices to minimise its effects; 6. Explain the protocols and the aims, objectives and points to be observed when undertaking inspections of domestic buildings; and 7. Discuss the importance of temporary works, particularly scaffolding, formwork and falsework, the regulations governing their use, their design principles and the operational requirements that govern their use.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only.R. Barry (2014) 3rd ed. Barry's advanced construction of buildings Wiley-Sons K. Wyatt (2013) Principles of Structures Taylor & Francis G. Wilkie (2003) Building Your Own Home New Holland Mehta, Scarborough, Armpriest (2008) Building Construction: Principles, Materials and Systems Prentice Hall

Assessment: Test, Class Test (500 words), 30%. Test, Class Test (500 words), 20%. Assignment, One (1) Team Project (500 words), 20%. Examination, End of Semester Examination (2 hours), 30%. The total combined assessment word equivalence is approximately 3000 words.

NBC1106 Measurement and Estimating 1

Locations: Footscray Park.

Prerequisites: Nil

Description: In this unit students are introduced to the techniques required to measure, quantify and cost construction work. Students will read and interpret plans and specifications applicable to medium rise residential and commercial projects in order to inform estimation, planning and supervisory activities. The estimated costs associated with the acquisition of materials and labour on building and construction sites will be established, together with the application of relevant overhead costs and margins. Monitoring techniques for building or construction costing systems will be introduced. The unit forms the foundation for NBC2103 Measurement and Estimating 2 unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exemplify the roles of quantity surveyors/cost engineers in the construction industry; 2. Interpret and apply the principles and logic of the Australian Standard Method of Measurement (ASMM) to inform estimation; 3. Apply cost planning

principles to a wide range of medium rise residential and commercial projects; 4. Prepare a simple Bill of Quantities (BoQ); 5. Develop builder's estimates for projects in various contexts; and 6. Apply bidding and tendering principles to medium rise residential and commercial projects.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics.Smith, J. and Jaggar, D. (2007) 2nd Edition Building Cost Planning for the Design Team Elsevier, Oxford Australian Institute of Quantity Surveyors (2000) Volume 1 Australian cost Management Manual Australian Institute of Quantity Surveyors, Canberra Flanagan, R. and Tate, B. (1997) Cost Control in Building Design Blackwell, Oxford

Assessment: Assignment, Two (2) Individual Projects (750 words each), 60%. Examination, End of Semester Examination (2 hours), 40%. Students are required to achieve a mark of at least 50% in the exam in order to pass the subject. The total word equivalent for the assessments is no more than 3000 words.

NBC1108 Building Assessment Process 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students examine and apply the National Construction Code (NCC) and associated legislation to Building Class 1 and 10 projects (residential, up to 3 storeys). They will learn about statutory controls and assessment; enforcement proceedings; how occupational health and safety, environmental and heritage legislation interact with the NCC; and the application of the principles of performance-based legislations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and apply the National Construction Code (NCC) for Building Class 1 and 10 projects; 2. Assess when and how to use performance-based provisions; 3. Explain the hierarchy of legislation and the courts; 4. Discuss how Australian Standards and Codes are used in building legislation; 5. Apply occupational health and safety, environmental and heritage legislation provisions to projects; and 6. Adapt and apply the enforcement provisions under current building legislation.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: National Construction Code Series (2015) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (500 word equivalent, 15% each), 30%. Case Study, Team design project and oral presentation (1000 word equivalent), 40%. Test, Three (3) Quizzes (10% each), 30%. The overall grade for this unit will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. .

NBC2001 Building Planning Process

Locations: Footscray Park.

Prerequisites: Nil.

Description: Private and municipal building surveyors carry out the statutory role of ensuring that proposed residential and commercial building projects meet relevant compliance requirements prior to issuing planning permits. This unit is concerned with the fundamental planning considerations for residential buildings in classes 1 and 10 and commercial buildings in classes 2 to 9 as defined in the National Construction Code (NCC) and up to three storeys and not more than 2000 square metres in floor area. It introduces students to planning and preparation required to assess planning application, assessment of planning application documentation, assessment of revised design plans and finalisation of planning permits.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse relevant approving authority requirements for assessing and issuing planning permissions and ensure adherence to relevant administrative processes; 2. Investigate relevant planning application documentation, including drawings, for each building project and assess each application for compliance with relevant legislation, codes, regulations and local planning authority requirements; 3. Analyse documentation supplied by at least one external consultant for each planning application, to ensure information is accurate and complete and to determine compliance of the planning application; 4. Assess all non-compliance and produce a range of alternative solutions for client consideration; 5. Document final planning permission for each building project, noting specific conditions and validity of each permit; 6. Propose a final planning approval ready for relevant authorities and notification to the client; and 7. Exemplify effective communication with a range of skilled professionals, including architects, engineers and builders.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2016) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code Series (2016) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code (2016) Volume 2 Energy efficiency provisions ABCB Publications, Canberra National Construction Code (2016) Volume 1 Energy efficiency provisions ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Test, Quizzes (1000 words, 15% each), 30%. Assignment, Two (2) Team design projects and oral presentations (2000 word equivalent, 35% each), 70%.

NBC2002 Building Regulations

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to provide students with understanding of the National Construction Code (NCC) and associated legislation when applied to buildings up to three storeys and not more than 2000 square meters. Students will learn about statutory controls and assessment; enforcement proceedings; how occupational health and safety, environmental and heritage legislation interact with the NCC; and the application of the principles of performance-based legislations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret and apply the National Construction Code (NCC) for buildings upto three storeys; 2. Judge design documentation for compliance with building legislation including Workplace Health and Safety, and Disability Discrimination laws, and Australian Standards; 3. Interpret and apply the enforcement provisions under current building legislation; 4. Exemplify effective communication with a range of skilled professionals, including architects, builders and engineers; and 5. Employ sound and safe practices in relation to permits and inspections on site.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: National Construction Code Series (2016) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Two (2) Individual tutorial assignments (500 word

equivalent, 15% each), 30%. Assignment, Team design project and oral presentation (1000 word equivalent), 40%. Test, Three (3) Quizzes (10% each), 30%.

NBC2003 Building Systems and Services

Locations: Footscray Park.
Prerequisites: Nil.
Description: Both domestic and commercial buildings are built systems comprised of numerous sub-systems. One of the major components of such built systems is building services. Sustainability is an important element in all facets of construction including building services. This unit will introduce building services systems associated with residential, commercial and industrial building projects. Using industry regulations, standards and codes of practice, students will examine the principles of building services requirements, installation, operation and maintenance relating to: HVAC; electrical supply; gas supply; natural and artificial lighting; security and communications, ; hydraulic service supply and disposal systems; fire protection; vertical transportation; and acoustics. Comfort conditions, indoor air quality and total building performance will also be included in the unit.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret regulatory and technical requirements relevant to reticulated (electrical, water, gas, sewerage and drainage, telecommunications) and designed building services (HVAC, fire, internal transportation) installations; 2. Interpret building acoustic requirements using industry regulations, standards and codes; 3. Develop energy efficient and sustainable design with respect to building services, including lighting, power, heating, cooling, mechanical services, hot water, and water usage; 4. Analyse design documentation and carry out on-site inspections of services installations and assess their compliance with relevant statutes, codes and standards. 5. Conceptualise factors affecting human thermal comfort and indoor air quality; and 6. Effectively collaborate with others to conduct total building performance evaluations in all building types.
Class Contact: Lecture1.0 hrTutorial2.0 hrs
Required Reading: National Construction Code Series (2016) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2016) Volume 1 Energy Efficiency Provisions ABCB Publications, Canberra National Construction Code (2016) Volume 2 Energy Efficiency Provisions ABCB Publications, Canberra Handbook (2016) Using on-site renewable and reclaimed energy sources ABCB Publications, Canberra
Assessment: Assignment, Individual tutorial assignment (1000 word equivalent), 30%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%. Test, Three (3) Online Quizzes (10% each), 30%.

NBC2004 Building and Construction Studies

Locations: Footscray Park.
Prerequisites: NBC1111 - Fundamentals of Building ConstructionNil
Description: This unit extends on the content of two units: Fundamentals of Building Construction and Building Science. This unit introduces students to construction principles and methods for commercial and industrial buildings, concentrating on low-rise construction and buildings with load-bearing walls up to three stories in height. The unit provides a background to the following for the construction of these classes of buildings: principles of fire safety, inspection procedures, temporary structures, waste and water management planning, relationship between design and construction methods and the integration of building services into the building structure.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate between and present in detail construction principles and processes including building components, systems and services for low rise buildings covered by NCC; 2. Critically assess construction documentation for constructability and compliance with codes and standards; 3. Work individually and collaboratively to develop the procurement process for a project including objectives, strategies, inspections, temporary works and waste management; 4. Advise the construction requirements for acoustic insulation and fire safety to prospective clients; 5. Resolve routine and unfamiliar problems in regards to construction principles and methods for commercial and industrial buildings using information, technology, logic and ethical decision making; and 6. Apply a range of personal and interpersonal skills to communicate effectively to a variety of specialist and non-specialist audiences within the building construction field.
Class Contact: Lecture1.0 hrTutorial2.0 hrs
Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only.R. Barry (2014) Barry's advanced construction of buildings Wiley-Sons K. Wyatt (2013) Principles of Structures Taylor & Francis Ltd Mehta, Scarborough, Armpriest (2008) Building Construction: Principles, Materials and Systems Prentice Hall
Assessment: Assignment, One (1) Team Project report and oral presentation (1000 words), 30%. Test, Two (2) Class Tests (500 words each), 40%. Examination, End of Semester Examination (2 hours), 30%.

NBC2005 Building Materials

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit introduces the students to the behaviour, properties, performance and limitations of the most widely used construction materials. The important link between ecologically sustainable design and construction material choice is explored.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the types, properties and applicability of materials; most commonly used in building construction work 2. Demonstrate an appropriate knowledge of other construction and building materials such as masonry, aluminium, glass, polymers and composites 3. Identify the application and installation requirements of construction materials and components to avoid component failure 4. Distinguish those factors based on materials structure and performance which influence the choice and selection of sustainable materials for adequate performance 5. Describe the importance of the OH&S and environmental requirements for working in a construction site with specific materials
Class Contact: Lab1.0 hrLecture1.0 hrTutorial2.0 hrs
Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. There are no required texts for this unit.
Assessment: Report, Team Report and Presentation (1000 words equivalent)., 30%. Report, Team Report and Presentation (750 words equivalent), 20%. Examination, End of Semester Exam (2 hours), 50%.

NBC2006 Professional Estimating

Locations: Footscray Park.
Prerequisites: NBC1113 - Measurement and EstimatingNil
Description: This unit extends on Measurement and Estimating, as in this unit students are introduced in more depth to measurement styles and techniques, such as description composition, measurement of different defined building areas, computer

measurement software, and Australian Standard Method of Measurement of Building Work (ASMM). Other shortened/simple form methods, core estimating principles, estimating, pricing builder's preliminaries, overheads and supervision are also included. The aim of this unit is to give students a hands-on experience of the tendering process for construction professionals. Students undertake a team research project to determine the optimum parameters for a civil/building infrastructure estimation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret accepted drawing conventions and formats and building documentation in order to apply shortened/simple form methods; 2. Apply building principles and methods to a civil/building infrastructure; 3. Interpret architectural, structural and services drawings of moderately complex projects in order to apply shortened/simple form methods; 4. Measure moderately complex architectural and engineering structures using basic measurement techniques and effectively communicate items that have been measured to a range of specialist and non-specialist stakeholders; 5. Prepare estimating documentation for a building project in collaboration with team members; and 6. Develop and assess tender documentation demonstrating professional judgment.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics.Smith, J. and Jaggar, D. (2007) 2nd ed. Building Cost Planning for the Design Team Elsevier, Oxford Australian Institute of Quantity Surveyors (2000) Volume 1 Australian Cost Management Manual Australian Institute of Quantity Surveyors, Canberra Flanagan, R. and Tate, B. (1997) Cost Control in Building Design Blackwell, Oxford

Assessment: Assignment, Two (2) Team Research Projects (1000 words each), 70%. Examination, End of Semester Examination (2 hours), 30%.

NBC2101 Building and Construction Surveying

Locations: Footscray Park.

Prerequisites: NBC1101 - Maths for BuildersNBC1103 - Basic Structural Mechanics

Description: This unit introduces students to the establishment and management of construction site operations through a systematic approach. The related components of construction site operations operate as subsystems which include site information, surveying and preparation, establishment, amenities, protection, safety, management and construction sequence. Students will work individually and collaboratively to assess, propose and present solutions to various construction site set-ups.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the principles of effective site planning (to accommodate site clearance, construction/demolition work, materials storage, access, temporary works and services, dewatering, plant and amenities, and the efficient organisation of site activities) in a range of challenging situations. Demonstrate how geotechnical investigations are conducted on site; 2. Demonstrate the survey techniques used to set out and monitor construction work: (a) Set out a building on a selected site with minimal profiles, (b) Prepare, test and operate levelling devices, (c) Identify specialised levelling and surveying equipment available on large building projects for various set-out and checking procedures, (d) Compute coordinates and bearings, distances related to grids and general set-out work on large building sites; 3. Analyse and assess environmental protection requirements and waste minimisation measures relevant to construction site operations; 4. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice; 5. Identify the impact of development on traditional owners or custodians and propose solutions which comply with international standards on human rights, sustainable development and the environment for the purpose of ensuring that traditional owners and custodians are able to practice their traditional laws and customs and exercise the full range of connection to Country; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

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

Required Reading: The textbooks listed below are recommended texts only.Banniser, R. and Baker (1998) 7th ed. Surveying Pearson Prentice Hall Kavanagh, B. (2009) 8th ed. Surveying, Principles and Applications Pearson Prentice Hall, Columbus Paul, R. and Whyte W. (2015) 4th ed. Basic Surveying Taylor & Francis Ltd, Architecture Press Almost any surveying text will be an adequate reference. English texts use language and procedures which are more closely related to Australian practice than USA texts.

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

NBC2103 Measurement and Estimating 2

Locations: Footscray Park.

Prerequisites: NBC1106 - Measurement and Estimating 1Nil

Description: This unit extends on the NBC1106 Measurement and Estimating 1 unit. In this unit students are introduced in more depth to measurement styles and techniques, such as description composition, measurement of different defined building areas, computer measurement software, and Australian Standard Method of Measurement of Building Work (ASMM). Other shortened/simple form methods, core estimating principles, estimating, pricing builder's preliminaries, overheads and supervision are also included. The aim of this unit is to give students a hands-on experience of the tendering process for construction professionals. Students undertake a team research project to determine the optimum parameters for a civil/building infrastructure estimation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret accepted drawing conventions and formats and building documentation in order to apply shortened/simple form methods; 2. Apply building principles and methods to a civil/building infrastructure; 3. Interpret architectural, structural and services drawings of moderately complex projects in order to apply shortened/simple form methods; 4. Measure moderately complex architectural and engineering structures using basic measurement techniques and effectively communicate items that have been measured to a range of specialist and non-specialist stakeholders; 5. Prepare estimating documentation for a building project in collaboration with team members; and 6. Develop and assess tender documentation demonstrating professional judgment.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics.Smith, J. and Jaggar, D. (2007) 2nd ed. Building Cost Planning for the Design Team Elsevier, Oxford Australian Institute of Quantity Surveyors (2000) Volume 1 Australian Cost Management Manual Australian Institute of Quantity Surveyors, Canberra Flanagan, R. and Tate, B. (1997) Cost Control in Building Design Blackwell, Oxford

Assessment: Assignment, Two (2) Team Research Projects (1000 words each), 70%.

Examination, End of Semester Examination (2 hours), 30%. Students are required to achieve a mark of at least 50% in the exam in order to pass the subject. The total work equivalent for the assessments is no more than 4000 words.

NBC2104 Building and Construction Studies 2

Locations: Footscray Park.
Prerequisites: NBC1105 - Building and Construction Studies 1Nil
Description: This unit extends on the content of NBC1105 Building and Construction Studies 1. This unit introduces students to construction principles and methods for commercial and industrial buildings, concentrating on low-rise construction and buildings with load-bearing walls up to three stories in height. The unit provides a background to the following for the construction of these classes of buildings: principles of fire safety, inspection procedures, temporary structures, waste and water management planning, relationship between design and construction methods and the integration of building services into the building structure.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Differentiate between and present in detail construction principles and processes including building components, systems and services for low rise buildings covered by Building Code of Australia Volume 1; 2. Critically assess construction documentation for constructability and compliance with codes and standards; 3. Work individually and collaboratively to develop the procurement process for a project including objectives, strategies, inspections, temporary works and waste management; 4. Advise the construction requirements for acoustic insulation and fire safety to prospective clients; 5. Resolve routine and unfamiliar problems in regards to construction principles and methods for commercial and industrial buildings using information, technology, logic and ethical decision making; and 6. Apply a range of personal and interpersonal skills to communicate effectively to a variety of specialist and non-specialist audiences within the building construction field.
Class Contact: Lecture1.0 hrTutorial2.0 hrs
Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. The textbooks listed below are recommended texts only.R. Barry (2014) Barry's advanced construction of buildings Wiley-Sons K. Wyatt (2013) Principles of Structures Taylor & Francis Ltd Mehta, Scarborough, Armpriest (2008) Building Construction: Principles, Materials and Systems Prentice Hall
Assessment: Assignment, One (1) Team Project report and oral presentation (1000 words), 30%. Test, Two (2) Class Tests (500 words each), 40%. Examination, End of Semester Examination (2 hours), 30%. The total combined assessment word equivalence is approximately 4000 words.

NBC2109 Performance Based Solutions for Building

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit is concerned with implementation of the performance-based codes, risk assessment and risk management principles to commercial and residential buildings including all classes and all types of construction. This unit deals with the objectives, functional statements and performance requirements of the Building Code of Australia and reviews the impact of the introduction of performance based solutions and private building certifiers/surveyors.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate the differences between established deemed-to-satisfy protocols and professional judgement relating to performance based solutions; 2. Evaluate documentation for performance based solutions; 3. Justify and document performance based solution decisions and prepare appropriate assessment reports; 4. Judge performance based solutions in relation to the impact on building maintenance and refurbishment; 5. Evaluate and justify the potential benefits in using performance based solutions in place of deemed-to-satisfy provisions; 6. Analyse ethical and professional behaviour in practice; and 7. Exemplify effective communication with a range of skilled professionals, including architects, builders and engineers.
Class Contact: Lecture1.0 hrTutorial2.0 hrs
Required Reading: National Construction Code (2016) Performance Requirements extracted from the National Construction Code 2016 ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.
Assessment: Test, Three (3) Quizzes (10% each), 30%. Assignment, Individual tutorial assignments (1000 word equivalent, 15% each), 30%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%.

NBC3001 High Rise Development and Compliance

Locations: Footscray Park.
Prerequisites: NEA2201 - Building Development and Compliance
Description: This unit extends on the content in the unit NEA2201 Building Development and Compliance and will provide students with knowledge of the specialist forms of construction and complex statutory controls and their relevance to multi-unit residential development and high-rise commercial buildings.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse the fundamentals of conventional and innovative forms of construction for multi-unit residential and high-rise commercial buildings; 2. Contextualise the nature of building construction in heavily-developed urban environments; 3. Appraise the common structural features and services installations specific to tall buildings; 4. Assess the involvement of principal consultants and contractors; 5. Critically review knowledge of urban development and building regulatory procedures, codes and standards to present graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios; 6. Exemplify a leadership role in space and amenity planning; and 7. Justify maipr plant and equipment, techniques and practices typically employed in high-rise construction work.
Class Contact: Lecture1.0 hrTutorial3.0 hrs
Required Reading: Ching, FDK, Onoye, BS, Zuberbuhler, D, (2013) Building structures illustrated: patterns, systems, and design John Wiley & Sons, Inc, Hoboken, New Jersey National Construction Code (2016) Volume One Building Code of Australia (BCA) ABCB Publications, Canberra National Construction Code (2016) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra
Assessment: Assignment, Individual tutorial work (500 word equivalent), 20%. Case Study, Team design project and oral presentation (1500 word equivalent), 50%. Portfolio, Individual Portfolio (2000 words equivalent), 30%. The portfolio is to feature work done in the tutorials and at home, including graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios, a reflective journal, and a self and peer assessment.

NBC3002 Advanced Building Surveying

Locations: Footscray Park.
Prerequisites: NBC2002 - Building RegulationsNBC2001 - Building Planning Process
Description: The National Construction Code (NCC) and associated legislation relevant

to High Rise Construction (buildings taller than 3 storeys) will be examined and applied in this unit. Students will learn about statutory controls and assessment; enforcement proceedings; how occupational health and safety, environmental and heritage legislation interact with the NCC; and the application of the principles of performance-based legislations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret Codes and Standards of Class 2 to 9 buildings beyond 3 stories including Type A construction; 2. Interrogate and advise on compliance of design documentation for Class 2 to 9 buildings taller than 3 storeys; 3. Negotiate initial, advanced and final construction inspections of Class 2 to 9 buildings taller than 3 storeys; 4. Exemplify effective communication with a range of skilled professionals, including architects, builders and engineers; and 5. Formulate sound and safe practices in relation to permits and inspections on site.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.National Construction Code Series (2016 Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra

Assessment: Test, Three (3) Online Quizzes (10% each), 30%. Assignment, Two (2) Individual tutorial assignments (500 word equivalent, 15% each), 30%. Case Study, Two (2) Team design project and oral presentation (2000 word equivalent, 20% each), 40%. The overall grade for this unit will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. An overall mark of at least 50%, or an overall grade of 'pass' is required in order to pass the course.

NBC3003 Building Services Management

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elucidate the concept of Energy Management, the associated economic assessment and the importance of Building Energy Management Systems (BEMS); 2. Articulate the importance of building services maintenance and management in terms of function, procedures and operations; 3. Develop customised solutions to strategic and operational building services management goals; 4. Critically review the implications of energy efficient design principles upon architectural and services designs and apply appropriate energy budgets for building fabric and services; and 5. Assess building energy efficiency via industry-standard computer software.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

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

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

NBC3004 Construction Economics

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture1.0 hrTutorial2.0 hrs

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

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

NBC3005 Construction Law

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture1.0 hrTutorial2.0 hrs

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

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

NBC3006 Construction Site Operations

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit provides students with the necessary skills and knowledge to set up and manage all resources and services necessary for the efficient and safe operation of a construction site.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Present and conceptualise a practical understanding of the Site establishment, preparation and protection 2. Design for site organisation and management (personnel, workforce management, site accommodation and amenities, materials coordination, managing plant and equipment, storage and circulation, attendance to trades) 3. Adapt the legislative and regulatory requirements including work health and safety legislation, codes of practice for safe working in the construction industry; safety inductions and safe work method statements (SWMS) 4. Critically reflect and evaluate the hazard and risk identification; review and control measures; and personnel protection
Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs
Required Reading: No required text. The recommended readings for this unit are as below Rapp, R. R., & Benhart, B. L. (2015) Construction Site Planning and Logistical Operations: Site-Focused Management for Builders Purdue University Press Griffith, Alan & Watson, Paul 2004 Construction management : principles and practice Palgrave Macmillan, Basingstoke
Assessment: Test, In-class test (500 words equivalent), 20%. Assignment, Group assignment report (2000 words equivalent), 40%. Examination, Final exam (2hrs exam), 40%.

NBC3007 Research Methods

Locations: Footscray Park.
Prerequisites: Nil.
Description: Effective management of successful construction projects is founded on a broad evidence-base. While evidence can be extracted from the disciplinary literature, existing databases or previous project experience, original research may also be undertaken to meet the requirements of a specific project. Research is a process of enquiry and investigation, and takes a systematic and methodical approach to the creation of knowledge-as-evidence. Ineffective decision making can occur when a lack of knowledge leads to project delay and failure. Research Methods guides participants through the logical steps required for the establishment of a research proposal for a professional project or further scholarship. Starting with an overview of the purpose of research, it develops a set of principles designed to build a research proposal based on conceptual issues and different approaches to research design. The collection and review of primary and secondary data, the application of qualitative and/or quantitative methodologies, the collection and interrogation of data, reporting of results and conclusion are all considered.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate sequentially and elaborate the principles involved in planning and executing a research project; 2. Theorise a conceptual framework for a research problem and assess it in the context of construction management; 3. Operationalise concepts to formulate a research question(s) or a hypothesis; 4. Select and develop the appropriate methodology and measurement instruments for data collection; and 5. Critique relevant sources of information and justify the selection and application of methods for data collection and analysis.
Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. O'Leary, Z 2014 2nd Edition The essential guide to doing your research project London, Sage
Assessment: Project, Individual Research Project: selection and literature review (500 words equivalent), 20%. Report, Research Proposal: submission in report format (2000 words equivalent), 40%. Presentation, Research Proposal project presentations and discussions (500 words equivalent), 20%. Presentation, Final Formal Research Proposal Presentation (15 minutes) (500 words equivalent), 20%.

NBC3101 Project Management Practice

Locations: Footscray Park.
Prerequisites: Nil
Description: This unit is designed to provide an understanding of the principles of project management practice and the roles and responsibilities of stakeholders and others in a project team. Utilising the PMBOK© (Project Management Body of Knowledge) Guide as a reference, the unit explores 10 Knowledge Areas in project management and instigates the process of applying these to contemporary and emerging project environments. The unit delivers a comprehensive understanding of how due diligence manifests in a project life cycle. It addresses what is to be delivered in a project (scope), how it is to be delivered (plan), the delivery and implementation (execution) and finally reporting and review. As projects are situated within organisations, relevant concepts of organisational management and human resource management are also analysed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply knowledge, skills, tools and techniques to project activities through the lens of an established project management process (PMBOK©); 2. Analyse and critique the 10 Knowledge Areas of project management; 3. Assess the use of Project Communications tools and techniques in the areas of planning, assessing, quantifying, qualifying, control, monitoring and disposition of project information relevant to all stakeholders and at all levels of the organisation; 4. Appraise the dynamics of working collaboratively within a project environment and developing distributed leadership skills; and 5. Predict the impact of risk in various project management scenarios.
Class Contact: Lecture 3.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. (PMBOK© GUIDE) (2013), A Guide to the Project Management Body of Knowledge 5 Project Management Institute Larson E W, Gray G W (2011) Project Management: the managerial process 5 McGraw Hill - Irwin Series Lock Dennis (2013) Project Management 1 Ashgate Publishing Ltd Hartley, Stephen (2008) Project Management: Principles, processes and practice 2 Pearson Education Australia
Assessment: Assignment, Assignment 1 - Individual (1000 words), 20%. Assignment, Assignment 2 - Group & Oral Presentation (1000 words), 30%. Examination, Final Examination (2 hours), 50%.

NBC3102 Building Development and Compliance 2

Locations: Footscray Park.
Prerequisites: NEA2201 - Building Development and Compliance

Description: This unit extends on the content in the unit NEA2201 Building Development and Compliance and will provide students with knowledge of the specialist forms of construction and complex statutory controls and their relevance to multi-unit residential development and high-rise commercial buildings.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse the fundamentals of conventional and innovative forms of construction for multi-unit residential and high-rise commercial buildings; 2. Contextualise the nature of building construction in heavily-developed urban environments; 3. Appraise the common structural features and services installations specific to tall buildings; 4. Assess the involvement of principal consultants and contractors; 5. Critically review knowledge of urban development and building regulatory procedures, codes and standards to present graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios; 6. Exemplify a leadership role in space and amenity planning; and 7. Justify major plant and equipment, techniques and practices typically employed in high-rise construction work.
Class Contact: Lecture1.0 hrTutorial3.0 hrs
Required Reading: State of Victoria Department of Sustainability and Environment, (2004) Guidelines for higher density residential development Victorian Government Department of Sustainability and Environment, East Melbourne. Ching, FDK, Onoye, BS, Zuberbuhler, D, (2009) Building structures illustrated: patterns, systems, and design John Wiley & Sons, Inc, Hoboken, New Jersey Australian Building Codes Board (ABCB), (2010) Volume One Building Code of Australia (BCA) ABCB Publications, Canberra Australian Building Codes Board (ABCB), (2010) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra
Assessment: Assignment, Individual tutorial work (100 word equivalent), 20%. Case Study, Team design project and oral presentation (1000 word equivalent), 50%. Portfolio, Individual Portfolio (2000 words equivalent), 30%. The portfolio is to feature work done in the tutorials and at home, including graphical and written designs and specifications detailing creative solutions appropriate to building types and/or property development scenarios, a reflective journal, and a self and peer assessment.

NBC3107 Procurement Management

Locations: Footscray Park.
Prerequisites: Nil
Description: This unit develops students' understanding of the interplay between aspects of the Australian legal system. It addresses the responsibilities of various stakeholders as well as their liabilities by comparing different types of standard contract documents. The law relating to principles and practice of project procurement management and the formation of a contract are also considered. Practical assessments will equip students to both develop skills in analysing contractual issues and facilitate relationships between various stakeholders in a project. The roles and responsibilities of each stakeholder, risk apportionment between various stakeholders and determination of risks to be covered by insurances, bonds or other risk allocation instruments are all investigated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate relevant aspects of the Australian legal system with respect to the role of Commonwealth and Victorian Parliaments, the process of passing legislation and the impact on organisational tenders & projects; 2. Conceptually map the operations of Victorian and Commonwealth court systems, in particular, the hierarchy and authority of the courts; 3. Critically review the general principles and application of contract law, including the law relating to tenders, as applied to projects; 4. Interpret the AS4000 form of contract in relation to the principles of project management and explore its interaction with other standard forms of contract and project procurement management; and 5. Critically analyse authentic project agreements and extrapolate principles to the design and administration of a contract.
Class Contact: Lecture3.0 hrs
Required Reading: Various texts are currently being reviewed - it is anticipated that there may be one required text and up to two recommended texts. Current texts being reviewed include: Carter, J.W., (2013) 6th ed Contract Law in Australia LexisNexis Australia Pentony, B et Al., (2013) 6th ed Understanding Business Law LexisNexis Australia Seddon, N., (2013) 5th ed Government contracts: federal, state and local Annandale, N.S.W. : Federation Press
Assessment: Project, Individual Project (1000 words), 20%. Project, Group Project (2000 words), 30%. Examination, Final Examination (3 hours), 50%. The combined equivalence of assessments is 5-6000 words.

NBC3110 Building Surveying Project 1

Locations: Footscray Park.
Prerequisites: Completion of at least 144 credit points.
Description: Building Surveying Project 1 is the culmination of student experience in the Bachelor of Building Surveying program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial construction management project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Surveying Project 1 focuses on the scoping, designing and planning of the project. Project proposals will be presented as both a written report and as an end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Building Surveying Project 2 where their project outcomes will be created, delivered and evaluated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the likely components and deliverables of their negotiated project; 2. Effectively plan the negotiated project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Evaluate the feasibility of a range of solutions to anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Synthesise, prototype, critically analyse and/or test project designs ensuring that design outcomes meet client specifications; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.
Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.
Required Reading: None required. Notes from lecturers will be provided to students.

Assessment: Project, Preliminary Project Proposal (See detail below), 20%. Project, Project Management Plan (See detail below), 30%. Presentation, Oral Presentation (10 minutes), 10%. Project, Final Project Proposal (See detail below), 40%. The student is required to satisfactorily complete and pass the preliminary project proposal before attempting the project management plan.

NBC3201 Research Methods

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

NBC3204 Complex Construction

Locations: Footscray Park.
Prerequisites: Nil.
Description: NBC3204 Complex Construction is concerned with the procedures, principles and methods of construction used for complex projects including tall buildings (over 300m in height) and designated by the National Construction Code (NCC) as being within Building Class 2 to 9.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the temporary works, particularly scaffolding, formwork and falsework and plant selection processes used for complex or high-rise construction; 2. Justify the use of foundations systems, major excavation, stabilisation and dewatering techniques in the construction of basement levels of tall buildings; 3. Verify the functions, materials and details of the major components, the waste management strategies used and the regulatory inspections made when constructing a complex or high-rise project; 4. Diagnose and plan the rectification of common building faults; 5. Assess and report on the issues encountered by complex or high-rise buildings including funding, ownership, design, construction and social and environmental issues; and 6. Advocate the development and implementation of innovative building practices.
Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs
Required Reading: National Construction Code Series (2016) Volume 1 Building Code of Australia Class 2 to Class 9 Buildings ABCB Publications, Canberra National Construction Code Series (2016) Volume 2 Building Code of Australia Class 1 and Class 10 Buildings ABCB Publications, Canberra National Construction Code Series (2016) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2016) Volume 1 Energy efficiency provisions ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.
Assessment: Assignment, Two (2) Individual tutorial assignments (1000 word equivalent, 20% each), 40%. Test, Two (2) Online Quizzes (10% each), 20%. Case Study, Team design project and oral presentation (2000 word equivalent), 40%.

NBC3205 Building Systems and Services 2

Locations: Footscray Park.
Prerequisites: NBC2204 - Building Systems and Services 1
Description: This unit builds on the theory and practice introduced in NBC2204 Building Systems and Services 1, and is designed to provide students with further knowledge of Building Energy Management Systems (BEMS) and strategies for non-residential buildings under the Building Code of Australia. The unit is concerned with air-conditioning, ventilation, communications and security systems, fire safety services, transportation systems and building services maintenance and management strategies and procedures for commercial class buildings.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elucidate the concept of Energy Management, the associated economic assessment and the importance of Building Energy Management Systems (BEMS); 2. Interpret the principles of air conditioning and ventilation systems, flow analysis for natural ventilation and the plant and ducting requirements for air conditioning installations; 3. Assess fire detection and alarm systems and fire suppression systems with respect to the relevant codes and standards; 4. Articulate the basic elements of a communication system and the basic elements of a security system; 5. Interpret the types, functions and regulations concerning lifts, escalators, and moving walkways; and 6. Articulate the importance of maintenance in terms of function, procedures and operations.
Class Contact: Lecture 1.0 hr Tutorial 2.0 hrs
Required Reading: National Construction Code Series (2015) Volume 3 Plumbing Code of Australia ABCB Publications, Canberra National Construction Code (2014) Volume 2 Energy Efficiency Provisions ABCB Publications, Canberra National Construction Code Handbook (2013) Lifts used during evacuation ABCB Publications, Canberra National Construction Code Handbook (2006) Digital building telecommunications access ABCB Publications, Canberra In addition, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.

Assessment: Assignment, Individual tutorial assignment (1000 word equivalent), 30%. Case Study, Two (2) Team design projects and oral presentations (3000 word equivalent, 35% each), 70%.

NBC3220 Building Surveying Project 2

Locations: Footscray Park.
Prerequisites: NBC3110 - Building Surveying Project 1
Description: Building Surveying Project 2 is the implementation of the negotiated project (NBC3110 Building Surveying Project 1) and represents the culmination of student experience in the Bachelor of Building Surveying program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. This is achieved in the context of a negotiated two-semester, substantial construction management project, related to their discipline area. Students will take responsibility for the design, planning, organisation, implementation and evaluation of, the various components required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. Building Surveying Project 2 focuses on the implementation, delivery and evaluation of project outcomes to the satisfaction of the client and the academic requirements of Victoria University. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise and deliver to the satisfaction of the client the negotiated project outcomes; 2. Analyse and deliver independently or as part of a team all requisite aspects of construction management practice including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 3. Propose and present a range of solutions to real and anticipated problems taking into account factors such as cost, technical requirements, business requirements, environmental and sustainability issues; 4. Produce a range of high quality professional and technical documents including project reports; and PowerPoint presentations; and 5. Communicate effectively with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.
Class Contact: One (1) hour per week and (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.
Required Reading: None required. Notes from lecturers will be provided to students.
Assessment: Project, Assessment of the project outcomes against the agreed proposal (1000 words equivalent), 30%. Report, Project Report (4000 words equivalent), 60%. Presentation, Oral Presentation (15 minutes), 10%.

NBC4001 Procurement Management

Locations: Footscray Park.
Prerequisites: Nil
Description: This unit develops students' understanding of the interplay between aspects of the Australian legal system. It addresses the responsibilities of various stakeholders as well as their liabilities by comparing different types of standard contract documents. The law relating to principles and practice of project procurement management and the formation of a contract are also considered. Practical assessments will equip students to both develop skills in analysing contractual issues and facilitate relationships between various stakeholders in a project. The roles and responsibilities of each stakeholder, risk apportionment between various stakeholders and determination of risks to be covered by insurances, bonds or other risk allocation instruments are all investigated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate relevant aspects of the Australian legal system with respect to the role of Commonwealth and Victorian Parliaments, the process of passing legislation and the impact on organisational tenders & projects; 2. Conceptually map the operations of Victorian and Commonwealth court systems, in particular, the hierarchy and authority of the courts; 3. Critically review the general principles and application of contract law, including the law relating to tenders, as applied to projects; 4. Interpret the AS4000 form of contract in relation to the principles of project management and explore its interaction with other standard forms of contract and project procurement management; and 5. Critically analyse authentic project agreements and extrapolate principles to the design and administration of a contract.
Class Contact: Lecture3.0 hrs
Required Reading: Various texts are currently being reviewed - it is anticipated that there may be one required text and up to two recommended texts. Current texts being reviewed include: Carter, J.W., (2013) 6th ed Contract Law in Australia LexisNexis Australia Pentony, B et AL, (2013) 6th ed Understanding Business Law LexisNexis Australia Seddon, N., (2013) 5th ed Government contracts: federal, state and local Annandale, N.S.W. : Federation Press
Assessment: Project, Individual Project (1000 words), 20%. Project, Group Project (2000 words), 30%. Examination, Final Examination (3 hours), 50%.

NBC4002 Advanced Construction

Locations: Footscray Park.
Prerequisites: Nil
Description: This unit extend and consolidate the student's technical knowledge and skills of modern construction and project management techniques to complex construction projects. The unit covers the current practices and approaches used in the construction industry including sustainable construction, lean construction and prefabrication.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate techniques used in construction project management and administration, including complex projects in terms of constructability and construction methods; 2. Evaluate the principles and exemplify approaches for the implementation of sustainable construction; 3. Design for efficient management of resources and present familiarity with the use of software in the application of project management planning techniques and tools; 4. Cross-examine the theoretical knowledge of the lean construction, prefabrication and simulation in construction.
Class Contact: Lecture1.0 hrTutorial2.0 hrs
Required Reading: There is no required text for this unit. The recommended readings are as below Harris, F & McCaffer, R 2006 6th ed. Modern Construction Management Blackwell Science, Oxford. Wilkinson, S, Kelly, J & Morledge, R 2002 Best value in construction Blackwell Science, Oxford Langston, C & Ding, G, (eds.) 2001 2nd ed. Sustainable Practices in the Built Environment Butterworth- Heineman: Oxford
Assessment: Test, In-class test (1000 words equivalent), 20%. Assignment, Group assignment (1000 words equivalent), 20%. Report, Individual report (2000 words equivalent), 30%. Examination, Final exam (2hrs exam), 30%.

NBC4003 Cost Planning and Control

Locations: Footscray Park.

Prerequisites: Nil

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

Credit Points: 12

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

Class Contact: Lecture3.0 hrs

Required Reading: There are a number of other textbooks that can be used in conjunction with the required texts below. Some of these texts are available online by subscription. Students please check with the Main Library. Lecture Materials and Associated Notes. Leland Blank and Anthony Tarquin, (2012) 2nd ed. Engineering Economy McGraw Hill Kirk, S. J. and Dell'Isolla, A. J., (1995) 2nd ed. Life Cycle Costing for Design Professionals McGraw Hill Standards Australia (1999) AS/NZS 4536:1999 Life Cycle Costing - An application guide Standards Australia & Standards New Zealand Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Assignment, Individual Case Study Project (1000 words), 20%. Project, Two (2) Group Case Study Projects (1500 words each), 40%. Examination, Final Examination (2 hours), 40%.

NBC4101 Construction Management

Locations: Footscray Park.

Prerequisites: Nil

Description: The focus of this unit is contemporary and emerging construction systems and technology with respect to available procurement options. Issues around build-ability and use-ability are considered and lessons for future application extrapolated. Appropriate forms of traditional and non-traditional project delivery options are considered, along with the use of modern frameworks to improve construction efficiency. Additional topics include alternative means of protection of structures (including fire and external environmental conditions); safety factors and cost implications of materials handling on construction sites; effective resource planning; and cost, time and quality optimisation techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Plan, design and manage the delivery of efficient, and effective strategies and inputs over the course of the construction process to achieve value for money on diverse and complex projects; 2. Evaluate the success of construction solutions by measuring their results against theory-based criteria and standards of performance, taking into consideration construction techniques, methods and processes for commercial and government organisations; 3. Critically analyse and apply the ethical and legal requirements for different types of delivery methods, supplier selection processes, contract negotiations, contract administration requirements and overall contract management; 4. Critically review the efficacy of contract delivery systems in the construction industry in relation to occupational health and safety (OH&S) requirements, activity management, plant and machinery resource management and procurement requirements particular to the construction industry; and 5. Conceptually map construction management processes relevant to resource utilisation on a complex project.

Class Contact: Lecture1.0 hrTutorial2.0 hrs

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics.Richard Lambeck, John Eschemuller (2009) 1st ed. Urban construction project management (McGraw-Hill Construction Series) McGraw-Hill S. Keoki Sears, Glenn A. Sears, Richard H. Clough, Jerald L. Rounds, Robert O. Segner (2015) 6th ed. Construction project management New York : Wiley

Assessment: Project, Individual Case Study Project (1000 - 1500 words), 20%. Project, Group Case Study Project (2000 - 2500 words), 40%. Examination, Final Examination - (2 hours), 40%.

NBC4107 Major Project 1

Locations: Footscray Park.

Prerequisites: NBC3007 - Research MethodsCompletion of at least 240 credit points

Description: This unit builds on the NBC3007 Research Methods unit. The Major Project is the culminating experience of the student's construction management program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial engineering project or research project, related to the student's discipline area. Students will take the responsibility to organise, plan and carry-out the various tasks required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. This unit focuses on the research, scoping, designing and planning of the project. Project proposals will be presented as a report as well as end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Major Project 2 where the project outcomes will be created and delivered.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse the problem; 2. Use construction management research methods to evaluate the feasibility of a range of solutions taking into account such factors as cost, technical requirements, business requirements, environmental and sustainability issues; 3. Synthesise, prototype, critically analyse and/or test project designs or research hypotheses ensuring that design outcomes meet client specifications; 4. Effectively plan a project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: Seminar2.0 hrs

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

Assessment: Presentation, Oral Presentation, 10%. Report, Project Proposal (See

detail below), 60%. Project, Project Management Plan (See detail below), 30%. In the project proposal, students will apply their skills and knowledge to critically analyse a complex construction management problem or research question, conduct a detailed literature review and investigation and propose a detailed solution or hypothesis to be tested. In the Project Management Plan students will document the complete design of their engineering solution or research investigation as well as a detailed plan on how the engineering solution will be created or how the research investigation will be conducted. This will include a detailed work break-down structure, identification and allocation of resources, risk analysis and records of meetings and communications with the supervisor and other parties involved with the project. In the oral presentation, students will present their proposal in a clear, effective and professional manner. The student is required to satisfactorily complete and pass the project proposal before attempting the project management plan.

NBC4108 Major Project 2

Locations: Footscray Park.

Prerequisites: NBC4107 - Major Project 1

Description: The Major Project is the culminating experience of the student's construction management program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial construction management project. Students will take the responsibility to organise, plan and carry-out the various tasks required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. This unit continues the work done by students in the prerequisite unit Major Project 1. In this unit, the project outcomes will be created and delivered to the satisfaction of the client. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply construction management knowledge to create, test and validate project designs or research activities to deliver on outcomes that meet client specifications; 2. Effectively manage a complex design or research project; 3. Produce a range of high quality professional and technical documents including project reports; and PowerPoint presentations; and 4. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.

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

Assessment: Project, Project Assessment, 50%. Report, Project Report (See details below), 40%. Presentation, Oral Presentation, 10%. The project outcome is assessed against the project proposal and required deliverables from semester 1. Project assessment is required to be completed with a minimum satisfactory pass to complete the unit. The project report documents the creation of project deliverable or research outcomes with detailed analysis and evaluation of the project. The outcomes of the project are also presented orally in the final oral presentation. One assessment record is needed to satisfy mandatory requirements for this unit, please check with your College for internal procedures.

NBD2001 Architectural History and Analysis

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture 2.0 hrs Workshop 1.0 hr

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.

Assessment: Individual portfolios and reports which provide evidence demonstrating that the learning outcomes for the subject have been achieved. The assessment material will include three major section as listed below that illustrate the importance of architecture in history, skills in abstract thinking and visual communication and skills in three-dimensional 'spatial' problem solving and model making. Case Study, One (1) Case study, 25%. Portfolio, Architectural Analysis, 25%. Presentation, One (1) Individual Oral presentation (15 minutes), 10%. Report, One (1) Team Report on History of Architecture, 40%.

NBD2002 Building Contract Documentation

Locations: Footscray Park.

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

Description: This unit introduces students to the roles and responsibilities associated with the preparation of contract documents. The administration of construction contracts and contract management will also be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare the different types of building contract arrangements and prepare working drawings from a design sketch; 2. Apply systems and management procedures for the control of contract documentation and cost control; 3. Formulate a tendering process for collecting and analysing tenders; 4. Identify and prepare the documentation required to obtain a building approval and formulate and implement quality management policies for documentation; and 5. Communicate effectively with a range of skilled professionals, including government officials, architects, builders and engineers.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr

Required Reading: The textbooks listed below are recommended texts only. Charles W. Cook (2014) 1st ed. Successful Contract Administration: For Constructors and Design Professionals Taylor & Francis Group CSI (2011) 1st ed. The CSI Construction Contract Administration Practice Guide John Wiley and Sons Ltd A very comprehensive set of notes will be available for most topics. These notes will contain

further references and reading material.
Assessment: Project, Individual project (1000 words equivalent), 20%. Project, Team Project and Presentation (1000 words equivalent), 40%. Examination, Final Examination (2 hrs) (2000 words equivalent), 40%.

NBD2100 Built Environment 1

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design DocumentationNBD1100 - Built Environment Communication and SkillsNBC1112 - Building Science
Description: This unit will introduce you to a range of key concepts in physical and social sustainability principles; Environmental Perception, Environmental Psychology and Environment Behaviour, that you can apply within buildings and communities through a design-based project. The unit uses precedent studies to generate diversity in students' design approach to architecture. Spatial design and designing for effective circulation, disabled access and emergency egress is also covered.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Propose methods for improving the physical and social sustainability of the built environment using information, technology, logic and ethical decision making; 2. Integrate concepts of environmental perception, environmental psychology and Environment Behaviour Studies (EBS) in design; 3. Evaluate circulation patterns within proposed spatial designs including disabled access and emergency egress; 4. Communicate effectively with a range of skilled professionals, including architects, builders and engineers; 5. Develop responsibility to effectively contribute to group outcomes while maintaining accountability for own learning and work.
Class Contact: Lecture 2.0 hrsPC Lab 2.0 hrs
Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One (1) Team Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Team Presentation (fifteen (15) minutes), 10%.

NBD2200 Building Contract Documentation and Administration

Locations: Footscray Park.
Prerequisites: NBD1101 - Building Design DocumentationNBD1100 - Built Environment Communication and Skills
Description: This unit introduces students to the roles and responsibilities associated with the preparation of contract documents. The administration of construction contracts and contract management will also be introduced.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare the different types of building contract arrangements and prepare working drawings from a design sketch; 2. Apply systems and management procedures for the control of contract documentation and cost control; 3. Formulate a tendering process for collecting and analysing tenders; 4. Identify and prepare the documentation required to obtain a building approval and formulate and implement quality management policies for documentation; and 5. Communicate effectively with a range of skilled professionals, including government officials, architects, builders and engineers.
Class Contact: Lecture 2.0 hrsPC Lab 1.0 hrWorkshop 1.0 hr
Required Reading: The textbooks listed below are recommended texts only.Charles W. Cook (2014) 1st ed. Successful Contract Administration: For Constructors and Design Professionals Taylor & Francis Group CSI (2011) 1st ed. The CSI Construction Contract Administration Practice Guide John Wiley and Sons Ltd A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Project, Individual project (1000 words equivalent), 20%. Project, Team Project and Presentation (1000 words equivalent), 40%. Examination, Final Examination (2 hrs) (2000 words equivalent), 40%.

NBD3001 Risk and Safety Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: In this unit, students will develop the requisite knowledge and skills to identify and classify complex aspects of risk management within a project. Project teams will learn how to plan, control and review risks associated with a project and develop appropriate risk mitigation strategies. The project risk planning process and its position within the overall management function is considered. The unit addresses the conduct of control activities in accordance with the ISO 31000: 2009 Standard and other relevant industry-based Risk Management Standards.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptualise what risk management is and make risk identification an integral component of decision-making in projects; 2. Discern threats and opportunities and conceptually map their relative importance in the project; 3. Critically apply tools and techniques to assess, quantify, qualify, prioritise and document risks; 4. Analyse risks as a part of risk assessment activities and construct a risk management plan; and 5. Critically examine and evaluate the responsibilities of personnel assigned to manage, monitor and control project risks.
Class Contact: Lecture 1.0 hrWorkshop 2.0 hrs
Required Reading: The textbooks listed below are recommended texts only.Crouhy M. & Galai D., (2006) 1st ed. Essentials of risk management McgGraw-Hill Publishing Company Hopkin P., (2010) 1st ed. Risk Management Dewey Publications Rafferty J, Reilly C. & Higgin D., (2012) 1st ed. Risk Management in Projects Loosemore AS/NZS ISO 31000: 2009 Risk management - Principles and guidelines Standards Australia A comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.
Assessment: Assignment, Project Risk Assignment & Presentation (1500 words equivalent), 30%. Assignment, Project Risk Assignment & Presentation (1500 words equivalent), 30%. Examination, Final Examination (2 hours), 40%.

NBD3002 Residential Sustainable Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: As a result of climate change, there is a definite need for more sustainable approaches to design of buildings. This unit introduces principles of designing residential buildings; provides examples and ideas for buildings of tomorrow, which may include naturally ventilated buildings, the use of thermal storage, advanced façade design for daylighting and solar energy transmission, design for indoor environmental quality (IEQ) improvement; active measures of renewable energy usage and waste minimisation, and use of rainwater and organic matter.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop a case for the design of sustainable buildings justifying recommendations based on the need to address climate change in 21st century; 2. Critically assess interactions between buildings and their surroundings and evaluate the impact of

alternative design approaches; 3. Appraise government policies at federal, state and local levels and explain the role of government bodies and other organisations in promoting sustainable development; 4. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks; and 5. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture 1.0 hr PC Lab 3.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One (1) Team Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Team Presentation (15 minutes), 10%.

NBD3003 Commercial Sustainable Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: Global warming has reinforced the importance of designing green buildings with lowering the energy consumption of existing buildings. This unit of study focuses on both aspects. In the first stage of the unit, students will become familiar with principles of environmentally sustainable design. Students will design green commercial buildings. The second stage of the unit covers an introduction to building performance analysis tools (software as used by architects and engineers in compliance with energy efficiency provisions of the Building Code of Australia), computer simulation modelling of buildings including thermal and solar performance, natural ventilation, natural and artificial lighting. At the end of the second stage students will analyse alternative design scenarios to optimise the thermal and lighting performance of buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate deep insights into a wide range of engineering and technological approaches to the design of green buildings; 2. Adopt a critical approach to designing buildings that are energy efficient and in harmony with their surroundings; 3. Model and simulate complex integrated building designs in the area of thermal performance, natural ventilation, air conditioning, solar penetration, thermal comfort, and natural/artificial lighting; and 4. Devise professional graphical illustration skills with which students can communicate their designs to a wide audience. 5. Work and communicate individually and with others effectively on a range of built environment-related topics;

Class Contact: Lecture 1.0 hr PC Lab 3.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One Team portfolios, poster and physical model., 40%. Presentation, One (1) Team Oral Presentation (15 minutes), 10%.

NBD3100 Built Environment 2

Locations: Footscray Park.

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

Description: This unit will introduce you to a range of key concepts in environmental sustainability principles. This unit acknowledges regional, national and international environmental responsibilities by introducing students to principles of environmental design. It explores relationships between climate and design using passive techniques that influence the environmental performance of small scale buildings in the local context. In this unit students will be introduced to the roles and responsibilities of building design professionals in relation to the design and planning of the built environment. The impact of how current trends can reduce the environmental footprint associated with the development of the built environment will also be explored.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design a project proposal compliant with a local authority's development plan; 2. Assess human comfort needs and apply relevant design solutions for climatic condition for particular Australian climate zones; 3. Critically review building materials and evaluate the environmental performance of the buildings; 4. Demonstrate high level graphical illustration skills to communicate finalised designs to a wide audience; and 5. Communicate effectively with a range of skilled professionals, including government officials, architects, builders and engineers.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: A very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Case Study, One (1) Case Study (500 words), 25%. Portfolio, One (1) Portfolio, 25%. Portfolio, One (1) Team Portfolios, Poster and Physical Model, 40%. Presentation, One (1) Team Presentation (fifteen (15) minutes), 10%.

NBD3101 Environmentally Sustainable Design 2

Locations: Footscray Park.

Prerequisites: NEA3202 - Environmentally Sustainable Design 1

Description: Global warming has reinforced the importance of designing green buildings with lowering the energy consumption of existing buildings. This unit of study focuses on both aspects. In the first stage of the unit, students will become familiar with principles of environmentally sustainable design as well as principles of heat transfer in buildings. Students will design green buildings. The second stage of the unit covers an introduction to building performance analysis tools (software as used by architects and engineers in compliance with energy efficiency provisions of the Building Code of Australia), computer simulation modelling of buildings including thermal and solar performance, natural ventilation, natural and artificial lighting and computational fluid dynamics (CFD). At the end of the second stage students will analyse alternative design scenarios to optimise the thermal and lighting performance of buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate deep insights into a wide range of engineering and technological approaches to the design of green buildings; 2. Adopt a critical approach to designing buildings that are energy efficient and in harmony with their surroundings; 3. Model and simulate complex integrated building designs in the area of thermal performance, natural ventilation, air conditioning, solar penetration, thermal comfort, and natural/artificial lighting; and 4. Devise professional graphical illustration skills with which students can communicate their designs to a wide audience.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also

be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Portfolio, Individual Portfolio, 15%. Portfolio, Individual Portfolio, 15%. Portfolio, Two team portfolios, poster and physical model., 50%. Examination, End of semester examination., 20%.

NBD3102 Building Design Project 1

Locations: Footscray Park.

Prerequisites: Completion of at least 144 credit points.

Description: Building Design Project 1 is the culmination of student experience in the Bachelor of Building Design program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. Students will design low-rise (1 to three storey) buildings. 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. 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 and as an end-of-semester 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 in 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 & its representation, the aims & claims that are made for the building design; and 5. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks in an ethical and professional manner.

Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.

Required Reading: A very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Project, Project Proposal and Project Management Plan (3000 words), 30%. Presentation, Oral Presentation (10 minutes), 10%. Project, Portfolio, Poster, Physical model, 60%. Students will be required to attend and participate in the organized Site visits and field measurements, as this relates to all components in the assessments.

NBD3200 Urban Design and Development

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit, students are introduced to study of urban design issues that are essential in professional practice, thus necessary content in the Bachelor of Building Design program. Students will engage in independent and collaborative analysis to inform their ideas and proposals and will develop their understanding of the fundamentals of the project briefing and design process through a design-based project. Topics review and deepen the student's existing knowledge of sustainable communities, environmental issues and the movement of pedestrians and traffic in urban renewal. Specialist focus on heritage, diverse cultures, urban poverty, human behaviour and emergency management in urban locations will be introduced. Students will develop urban design plans and city models which will be presented and critiqued.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate deep insight into a wide range of urban design and development approaches to the design of sustainable environments; 2. Analyse heritage and environmental issues in urban renewal; 3. Propose creative strategies to accommodate the diversity of human behaviour in the design of public urban spaces and communicate effectively with a range of skilled professionals, including architects, builders and engineers. 4. Compare and modify movement of pedestrians and traffic within urban design; 5. Adapt knowledge and skills to include diverse cultural needs and sustainable communities in urban design. 6. Design and develop the urban design plans which demonstrates the understanding on the sustainable neighbourhood design; and 7. Work and communicate individually and with others effectively on a range of built environment-related topics;

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

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

NBD3201 Project Risk Management

Locations: Footscray Park.

Prerequisites: NEF3101 - Project Management

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

Credit Points: 12

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

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: The textbooks listed below are recommended texts only.Crouhy M. & Galai D., (2006) 1st ed. Essentials of risk management McgGraw-Hill Publishing Company Hopkin P., (2010) 1st ed. Risk Management Dewey Publications Rafferty

J, Reilly C. & Higgin D., (2012) 1st ed. Risk Management in Projects Loosemore AS/NZS ISO 31000: 2009 Risk management - Principles and guidelines Standards Australia A comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.
Assessment: Assignment, Project Risk Assignment & Presentation, 30%. Assignment, Project Risk Assignment & Presentation, 30%. Examination, Final Examination (2 hours), 40%.

NBD3202 Building Design Project 2

Locations: Footscray Park.
Prerequisites: Completion of at least 144 credit points.
Description: Building Design Project 2 is the culmination of student experience in the Bachelor of Building Design program. It provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years and to develop strategies for their transition to professional life. Students will design high-rise buildings; 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. Projects may be undertaken by individual students or in small teams.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply design knowledge to an architectural problem in an advanced level; 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 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 & its representation, the aims and claims that are made for the building design; and 5. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks in an ethical and professional manner.
Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors and to commit at least 6-8 hours per week of private study.
Required Reading: A very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.
Assessment: Project, Project Proposal and Project Management Plan., 30%. Presentation, Oral Presentation (10 minutes), 10%. Project, Portfolio, poster, physical model, 60%. Students will be required to attend and participate in the organized Site visits and field measurements, as this relates to all components in the assessments.

NEA2101 Architectural History and Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: Architects are recognised as the primary design professionals in the building industry. This subject acquaints students with insight into the architectural process by discovering the historical evolution of buildings technically and aesthetically and how they relate to the culture and time in which they were built. A selection of design skills is explored to promote conceptual thinking and visual communication. Group workshops are used to promote research and problem solving techniques as well as basic three-dimensional visualisation through model making.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify critical shifts in the historical evolution of Architecture and Building; 2. Demonstrate requisite skills in visual communication through freehand drawing techniques; 3. Elaborate the features of basic architectural design skills, both technical and conceptual; 4. Discriminate the impact of various environmental conditions on the design process; and 5. Conceptually map the Architectural design process and utilise specialised a vocabulary to communicate with other professionals.
Class Contact: Lecture 2.0 hrs Workshop 2.0 hrs
Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material.
Assessment: Individual portfolios and reports which provide evidence demonstrating that the learning outcomes for the subject have been achieved. The assessment material will include three major section as listed below that illustrate the importance of architecture in history, skills in abstract thinking and visual communication and skills in three-dimensional 'spatial' problem solving and model making. Report, History of Architecture, 30%. Portfolio, Architecture Design Theory, 30%. Portfolio, Architectural Workshop, 40%.

NEA2102 Architectural Design and Theory

Locations: Footscray Park.
Prerequisites: Nil.
Description: Architectural design and theory includes two components: Component A (Theory) and Component B (Design). Component A: Theory, Students must undertake study in areas of architectural theory including the language of Architecture (form and order, hierarchy, scale composition and proportion); the human body and anthropometrics; and drawing upon historical precedents evident in contemporary Architecture. Component B: Design, introduces students to Architectural Design by exploring the complex process of thinking, where experience, meaning and philosophy are positioned as essential to the aesthetic, spatial and physical resolution of design. This subject immerse students into the architectural design process, including its theoretical, aesthetical, technical, professional and contextual basis. Students will develop a wide range of visual literacy, theory, and communication skills through the conceptual design process.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review and Synthesise a body of practical and theoretical knowledge to apply to the design process; 2. Apply design knowledge to an architectural problem at an introductory level and demonstrate design skills through an iterative and considered design process, to resolve ideas from concept formation through to simple design development; 3. Communicate design ideas at an introductory level, demonstrating through the building design & its representation; 4. Produce two and three-dimensional drawings as determined by the project brief; 5. Articulate the design rational, process and purpose coherently and through a medium that is universally recognised by other professionals as well as relevant stakeholders; and 6. Work individually and with others, and communicate effectively with others orally and in writing on a range of built environment-related topics using appropriate language.
Class Contact: Lecture 1.0 hr Tutorial 3.0 hrs
Required Reading: A comprehensive set of notes will be available for most topics.

These notes will contain further references and reading material.

Assessment: Individual portfolios and reports which provide evidence demonstrating that the learning outcomes for the subject have been achieved. The assessment material will include four major section as listed below that illustrate the importance of architectural design, theory, skills in abstract thinking and visual communication and skills in three-dimensional 'spatial' problem solving and model making. Report, Report (1500 words), 25%. Portfolio, Individual Portfolio , 25%. Portfolio, Team portfolio, poster and physical model (three members in a team) , 40%. Presentation, Team Oral Presentation (fifteen (15) minutes), 10%.

NEA2201 Building Development and Compliance

Locations: Footscray Park.

Prerequisites: Nil.

Description: NEA2201 Building Development and Compliance aims to give students an understanding of the various forms of building development that can be encountered in suburban settings, ranging from domestic building projects (the housing industry) through to non-residential building projects (the commercial building industry), and an understanding of the codes and standards relevant to building compliance applicable to those two sectors of the building industry in Australia.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and interpret the fundamentals of conventional and innovative forms of construction for both domestic housing and small commercial/industrial buildings; 2. Assess the causes of common building problems, and devise effective treatments; 3. Formulate building schemes and details appropriate to specific forms of construction for both domestic housing and small commercial/industrial buildings; 4. Assess the involvement of various building trades, professions and authorities; 5. Interpret and apply evolving building standards and statutory requirements; 6. Identify the impact of development on traditional owners or custodians and propose solutions which comply with international standards on human rights, sustainable development and the environment for the purpose of ensuring that traditional owners and custodians are able to practice their traditional laws and customs and exercise the full range of connection to their Country; and 7. Communicate with other professionals in the building process using appropriate building terminology.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Wilkie, G., (2003) (Revised edition) Building your own home: a comprehensive guide for owner-builders New Holland Publishers (Australia) Pty Ltd, Sydney Ching, F.D.K., (2008) 4th ed. Building construction illustrated John Wiley & Sons, Inc, Hoboken, New Jersey Australian Building Codes Board (ABCB), (2014) Volume One Code of Australia (BCA) ABCB Publications, Canberra Australian Building Codes Board (ABCB), (2014) Volume Two Building Code of Australia (BCA) ABCB Publications, Canberra

Assessment: Other, Continuous assessment (500 words equivalent), 10%. Assignment, Team work report (1000 words equivalent), 20%. Assignment, Team work report (1000 words equivalent), 20%. Portfolio, Individual portfolio (2000 words equivalent), 50%. The portfolio is to feature work done in tutorials and team work assignments, including graphical and written designs and specifications detailing creative building solutions appropriate to various property development scenarios, a reflective journal, and self and peer assessment.

NEA2202 Hydraulic Service Systems

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to acquire a basic understanding of the theoretical principles in the areas of building water supply, sanitary plumbing and stormwater management. This unit will enable students to acquire theoretical knowledge and critical thinking skills and apply these to problems. This unit also provide students an opportunity to enhance their oral and written communication skills as well as other Engineers Australia Professional Capabilities. Topics include; Types and components of building water supply systems. Design Criteria in demands and flows. Design of hot and cold pipework systems. The general requirements for fully vented and modified, single stack and modified sewage plumbing systems, Introduction to wastewater treatment processes and building water harvesting/recycling systems. Design of roof drainage and storm water systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct qualitative and quantitative design analysis of various water, wastewater systems in buildings; 2. Analyse a range of numerical problems to propose justified solutions across a range of in stormwater systems; 3. Manage, locate and effectively use information / data relevant to design works; 4. Initiate, coordinate and manage team projects in water related investigation projects and to recommend and present the optimum solutions professionally.

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

Required Reading: Australian Standards 3500 (2015) National Plumbing and Drainage Code Parts 0-4 Australian Standards

Assessment: Assignment, Design Project/Research Case Study Investigation (2500 words), 20%. Presentation, Oral Presentation of assignment findings (5 minutes), 15%. Test, Mid-Semester Test (1.5 hours), 25%. Examination, End-of-Semester exam (2 hours), 40%.

NEA3101 HVAC Systems 1

Locations: Footscray Park.

Prerequisites: NEM2201 - Thermodynamics 1 NEF2101 - Fluid Mechanics 1 NEM2201 OR VAM2112 & NEF2101 OR VAM3131

Description: This unit is designed to provide students with knowledge of how engineers apply thermodynamics to design air conditioning systems in buildings. Students will develop skills needed in the selection and design of various elements of these systems, such as applied psychrometry for cooling coil sizing or estimating building heating and cooling loads used for duct sizing and selection of thermal plant in buildings. Students will work either individually or collaboratively. The unit builds on the prerequisite knowledge developed in NEM2201 THERMODYNAMICS 1. The knowledge of refrigeration, psychrometry and cooling and heating load estimation can be used in designing air conditioning systems for a wide range of facilities, from high-tech data centres to modern aircraft. Theoretical and practical concepts introduced in this unit will be further expanded in NEA3201 HVAC Systems 2.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply principles of thermodynamics to explain how refrigeration and air conditioning systems perform in a range of external conditions; 2. Explain and critically evaluate basic psychrometric processes and demonstrate how they apply in various types of air conditioning systems; 3. Apply theoretical concepts to compare different approaches used in the design of air conditioning systems to achieve human thermal comfort and adopted for non-occupied spaces; 4. Categorise the components of cooling and heating loads in buildings, examine methods used for their estimation, and carry out cooling and heating load estimation to analyse designs and evaluate alternatives; 5. Explain and assess the impact of air conditioning systems on the environment and suggest ways of minimising it; and

6. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs

Required Reading: Paks, M 1997 Design of Building Air Conditioning Systems, Park 1: Psychrometry AS&TP ASHRAE 2013 Handbook - Fundamentals ASHRAE Jones, WP 2012 2nd Air Conditioning Application and Design Taylor and Francis AIRAH 1997 Air Conditioning: Lead Estimation AIRAH Murray, M, Hamilton, T and Kingstone, T2002 User Guide for the Computer Program ACADS-BSG

Assessment: Assignment, Two assignments (each worth 25%), 50%. Other, Portfolio, class participation/personal reflection and oral presentation, 15%. Examination, End-of-semester examination, 35%. For each assessment component, 50% of available marks must be achieved in order to pass the subject. Teams will consist of 3-4 students. .

NEA3102 Building Electrical Systems

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical Circuits OR NEF2251 - Fundamentals of Electrical and Electronic Engineering

Description: This unit critically examines electrical systems in buildings and reviews the role of the specialist electrical services engineer in designing and overseeing the installation of electrical distribution systems. Relevant regulations, standards and codes of practice are examined and high, medium and low voltage distribution practices are investigated. An overview of the transformers used in power distribution systems is given and their specifications are analysed. The importance of power system distribution protection is highlighted, and the use and configuration of high voltage switchgear and protection devices in this process is evaluated. The calculation of system 'fault' capacity and fault levels is explored. The unit further examines cable properties and cable selection/sizing within buildings based on current, temperature, voltage drop and fault levels. An introduction to switchboard design and construction is given. Important concepts such as earthing of buildings, power factor correction are critiqued. Electric motors are discussed and their use within buildings is examined with special emphasis on the control, starting, and protection of electric motors. The unit discusses energy management in electrical power systems and methods of achieving reliability in building electrical power supply. Standby power generation systems, uninterruptible power supplies (UPS) and the sizing of central battery systems is investigated. The unit concludes with a discussion of harmonics within power distribution systems, electronic security systems and their use within buildings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate and plan for the electrical power supply needs of residential, commercial and light industrial buildings; 2. Select and determine the size of all electrical power cables, their circuit protection and distribution control devices for a range of residential, commercial and light industrial buildings; 3. Examine the process of electrical power supply to buildings and the interaction(s) applicable with power supply authorities to ensure a safe and secure supply to buildings; 4. Plan for the emergency supply of electrical power to buildings and decide on appropriate system(s) for buildings and their interface systems with the supply authority provided power to a building; 5. Assess the electrical power needs of building vertical and horizontal transportation systems, and design power supply systems for these systems; 6. Appraise a range of potential problems and maintenance requirements (and their solutions) of a modern building electrical power distribution system; 7. Construct the general 'architecture' of modern building electrical power distribution systems; and 8. Evaluate regulations, standards and codes of practice used in the building industry for electrical installations.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: J.R.Cogdell, 2003 Foundations of Electric Circuits Prentice Hall J.R.Cogdell, 2003 Foundations of Electric Power Prentice Hall Australian Standards AS3000, AS30088 and AS3439.

Assessment: Presentation, Based on Six (6) Projects (1500 words each), 20%. Report, Six (6) Group Project Reports (1500 words each), 60%. Exercise, Tutorial Exercises (1500 words), 20%.

NEA3201 HVAC Systems 2

Locations: Footscray Park.

Prerequisites: NEA3101 - HVAC Systems 1 NEA3101 OR VAA3071

Description: This unit builds on the theory and practice introduced in NEA3101 HVAC Systems 1, and is designed to provide students with further knowledge of air and water systems in buildings, their components, as well as an overview of complex HVAC systems employed in today's buildings. Students will develop further skills needed in the selection of components to make them suited for energy-efficient full-load and part-load operation. Controls requirements of various systems will also be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Consolidate their knowledge of engineering principles in operation of air and water systems in buildings; 2. Analyse how alternative configurations applicable to ducted and piped systems design could be used in order to minimise pressure losses; 3. Justify design criteria and carry out a design of ducted and piped systems, including pressure losses estimation; 4. Assess options available to HVAC designers in selecting main types of plant and formulate a suitable proposal for equipment selection; 5. Explain an impact of design decisions on equipment performance under full-load and part-load operation, and on system energy efficiency; and 6. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Paks, M 1997 Design of Building Air Conditioning Systems, Part 1: Psychrometry AS&TP ASHRAE 2010-2013 Handbooks ASHRAE Jones, WP 2001 Air Conditioning Engineering Butterworth Heinemann AIRAH Design Aids AIRAH Notes provided by the lecturer Class notes on WebCT/Blackboard

Assessment: Assignment, Two assignments (25% for each), 50%. Other, Portfolio, reflection, participation, and oral presentation, 15%. Examination, End-of-semester examination, 35%. For each assessment component, 50% of available marks must be achieved in order to pass the subject. Teams will consist of 3-4 students.

NEA3202 Environmentally Sustainable Design 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: As a result of climate change, there is a definite need for more sustainable approaches to design of buildings. This unit introduces principles of designing ecological buildings; provides examples and ideas for buildings of tomorrow, which may include naturally ventilated buildings, the use of thermal storage, advanced façade design for daylighting and solar energy transmission, design for indoor environmental quality (IEQ) improvement; active measures of renewable energy usage and waste minimisation, and use of rainwater and organic matter. Concepts developed in this unit of study will be further explored in NBD3101 Environmentally Sustainable Design 2.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop a case for the design of sustainable buildings based on the need to address climate change in 21st century; 2. Critically assess interactions between buildings and their surroundings; 3. Appraise government policies at federal, state and local levels and explain the role of government bodies and other organisations in promoting sustainable development; 4. Identify the common tools designers use to evaluate alternative approaches, as well as their capabilities, and assess the impact of alternative design approaches; 5. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks; and 6. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Notes provided by the lecturer and Class notes on University LMS (VU Collaborate). The textbooks listed below are recommended texts only. Attmann, O., (2010) Green Architecture: Advanced Technologies and Materials McGraw Hill Liedl, P., Hausladen, G. and de Saldanha, M., (2011) Building to Suit the Climate: A Handbook Birkhauser

Assessment: Assignment, Two (2) Assignments (3500-5000 words each - teams of 3-4 students) (30% each), 60%. Other, Two (2) portfolios, personal reflections and oral presentations (10% each), 20%. Examination, Final Examination, 20%. For each assessment component, 50% of available marks must be achieved in order to pass the subject and have adequate skills and knowledge as required by the sequel unit NBD3101. Teams will consist of 3-4 students.

NEA4102 Residential Sustainable Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: As a result of climate change, there is a definite need for more sustainable approaches to design of buildings. This unit introduces principles of designing environmental residential buildings; provides examples and ideas for buildings of tomorrow, which may include naturally ventilated buildings, the use of thermal storage, advanced façade design for daylighting and solar energy transmission, design for indoor environmental quality (IEQ) improvement and active measures of renewable energy usage.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate deep insights into a wide range of engineering and design approaches to the design of green residential buildings in response to climate change issues in 21st century; 2. Develop and critically assess alternative approaches for designing environmentally sustainable residential buildings based on environmental, structural, cultural and legal constraints 3. Appraise international and Australian federal, state and local building regulations and integrate governments and accredited Non-Profit Organizations (NGOs) policies in building environmentally sustainable design process; 4. Work collaboratively and effectively as a member and/or leader of a team; and 5. Effective collaborative and individual communication using range of oral ad paper-based methods.

Class Contact: Lecture 1.0 hr Tutorial 3.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Report, Team Report, (1000 words per team member and three members per team), 20%. Portfolio, Individual Portfolio, 30%. Presentation, Team Presentation (7 minutes per team member, and three members per team), 10%. Project, Team Poster and a Physical Model, 40%.

NEA4201 Building Systems Design & Costing

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study integrates the knowledge gained by students in previous studies of individual building services and building construction. The main emphasis is on understanding and following construction-relevant processes, to ensure coordination of services, integration with building structure, buildability and adequate space provision for both installation and future servicing. The role of Building Information Modelling in achieving these objectives is explained. In addition, the unit introduces methods of measurement and estimating for cost control, as well for life cycle cost estimates.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. From information provided in classes and through interviews with industry practitioners, identify problems involved with coordination and buildability of individual building services and propose procedures resulting in innovative solutions; 2. After a critical review of existing practices, develop a strategy for successful integration of all building services into building structure during the design and construction stages; 3. Create an optimised design of structural and services (primarily HVAC) elements for a typical floor in a multi-storey building and provide full costing for alternatives considered; 4. Assess the use of bills of quantities and unit rates in the tendering process for cost forecasting and control the design and construction phases of capital works projects; 5. Report on and present the principles and methodology for life cycle economic evaluation and management of building-related assets; 6. Demonstrate an ability to work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 7. Demonstrate an ability to present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture 3.0 hrs

Required Reading: Marsden, PK 2002 2nd Basic Building Measurement New South Wales University Press, Sydney, Australia Kirk, SJ and Dell'Isolla AJ 1995 2nd Life Cycle Costing for Design Professionals xx Notes provided by the lecturer. Class notes on University LMS.

Assessment: For each assessment component, 50% of available marks must be achieved in order to pass the subject. Assignment, Integrated building design and costing., 55%. Portfolio, Class participation/personal reflection., 15%. Examination, End of semester examination., 30%.

NEA4202 Building Fire Safety Systems

Locations: Footscray Park.

Prerequisites: NEA3103 - Hydraulic Services Systems NEA3103 OR VAA3042

Description: This unit of study aims to give students an introduction to building fire safety engineering. Includes fire safety and protection provisions in building regulations and building codes, deemed-to-satisfy design, design to standards and performance-based design. The following topics are covered in two parts: Part A - Introduction to Building Fire Safety Engineering: Fire engineering design strategy. Fire behaviour. Pre-flashover fires. Post-flashover fires. Fire modelling with computers. Fire spread. Means of egress. Detection and suppression systems. Mechanical smoke movement. Fire safety system interfaces. Provision for fire service operations. Fire control water supplies. Building fire safety systems and relevant Australian Standards. Fire hydrant systems. Fire hose reels. Automatic fire sprinkler

systems. Portable fire extinguishers. Fire safety during construction. Emergency lighting and exit signs. Part B - Fire Safety Systems Design: Hydraulic design of fire hydrant systems, fire hose reels and automatic fire sprinkler systems. Computer-aided design using HYENA software.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appreciate the fundamentals of fire safety engineering in building design; 2. Specify fire safety features and installations appropriate to various sizes/uses of a range of residential, light industrial and commercial buildings; 3. Formulate fire safety schemes and details, and develop plans for systems maintenance; 4. Assess the involvement of fire safety authorities and the need for specialist fire safety consultants and contractors; 5. Interpret and apply existing fire safety standards and related statutory requirements in an evolving area of the building industry, and appraise the applicability of research and fire safety standards (from overseas) to Australian conditions; and 6. Participate in the fire safety design process using correct fire safety terminology.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, tutorial classes and laboratory work. Includes a mix of individual and small group work.

Required Reading: Buchanan, AH Fire Engineering Design Guide, Centre for Advanced Engineering University of Canterbury Australian Building Codes Board (ABCB), 2014 Volume One NCC 2014 Building Code of Australia ABCB Publications, Canberra Standards Australia, 2005 AS2419 Fire Hydrant Installations Standards Australia Standards Australia, 2005 AS2441 Installation of Fire Hose Reels Standards Australia Standards Australia, 1999 AS2118 Automatic Fire Sprinkler Systems Standards Australia Standards Australia, 2001 AS2444 Portable Fire Extinguishers and Fire Blankets - Selection and Location Standards Australia

Assessment: Report, Team work report (2000 words per team member), 25%. Assignment, Individual test/design, 25%. Portfolio, Individual portfolio, 50%. The portfolio is to feature work done in tutorials and team work assignments, including graphical and written designs and specifications detailing creative fire safety solutions appropriate to various property development scenarios, a reflective journal, and self and peer assessment.

NEA4203 Commercial Sustainable Design

Locations: Footscray Park.

Prerequisites: Nil.

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

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop a case for the design of sustainable commercial buildings justifying recommendations based on the need to address climate change issues in 21st century; 2. Adopt a critical approach to designing commercial buildings that are energy efficient and in harmony with their surroundings; 3. Model and simulate complex integrated building designs in the area of thermal performance, natural ventilation, and natural lighting using Australian and international analysis tools; 4. Work effectively and collaboratively as a member and/or leader of a team, and to time-manage multiple tasks; and 5. Demonstrate adequate level of individual and collaborative communication skills through face to face workshops, oral presentations and printed posters.

Class Contact: Lecture 1.0 hr Tutorial 3.0 hrs

Required Reading: A very comprehensive set of notes will be available for most topics. These notes will contain further references and reading material. Students will also be directed to journal articles for supplementary reading as they become relevant and available.

Assessment: Report, Team Report (1000 words per team member and three members per team), 20%. Portfolio, Individual Portfolio, 30%. Presentation, Team Presentation (7 minutes per team member and three members per team), 10%. Project, Team Poster and a Physical Model, 40%.

NEA4204 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 The theory and fundamentals of sound wave description and propagation, the hearing mechanism, noise criteria, noise control, acoustic instrumentation, acoustic barriers, psychoacoustics, sound source types and radiated sound fields, sound in enclosed spaces and outdoor, mechanical noise, reverberation and intelligibility. In addition, Green Building acoustic requirements and Australian standard acoustic requirements for fire safety will be covered in this unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate the artificial lighting needs of residential, commercial and industrial buildings in accordance with Australian standards, current 'best practice'' and the minimisation of electrical energy usage; 2. Select and determine the size of luminaries, lamps, their control devices for a range of residential, commercial and industrial buildings. Predict illumination levels at relevant positions from installed lighting systems, using manual and computer calculation methods; 3. Recommend suitable maintenance programs for artificial lighting systems to achieve required illumination levels throughout the life of the lamps employed in the system; 4. Estimate the contribution that natural daylight can provide to the interior illumination of buildings, through the architecture of the building fabric and façade; 5. Evaluate the range of solutions and equipment for designing building acoustic systems, and be able to distinguish the applicability of alternate systems for a given building; 6. Select appropriate forms of specification (for tendering) for the installation of building acoustic systems; 7. Develop a deeper insight and ability to solve problems and write technical reports.

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

recommence at weeks 11 and 12.

Required Reading: Helms R. and Belcher M. Clay. (2005) Lighting for Energy Efficient Luminous Environments Prentice-Hall Australian Standards AS 3080; AS 4428; AS60849; AS2201 Australian Standards BCA (2008) Building Code of Australia Australian Standards AS 1680 (2002) Code for Interior Lighting Australian Standards

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

NEC2102 Solid Mechanics

Locations: Footscray Park.

Prerequisites: NEF1102 - Engineering Physics 1NEF1205 - Engineering FundamentalsNEM1001 - Algebra and CalculusNEF1101 - Engineering Mathematics 1NEF1101 or NEM1001

Description: Solid Mechanics is a fundamental subject in engineering and its principles and concepts provide a foundation for further learning in both broad and specialised engineering contexts. Engineers are required to design or analyse a variety of elements, components or structures that are often exposed to different loading conditions. An abstract and practical understanding of the mechanics of materials is therefore required. The abstract concepts of equilibrium and the compatibility of external and internal deformation in particular must be understood by every engineer.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify internal actions in a member including axial force, bending moment and shearing force diagrams; 2. Evaluate centroids, centre of gravity, moment of inertia of simple and composite cross-sections; 3. Determine elastic normal stresses, shearing stresses and shear flow distribution, and calculate torsion and angle of twist in simple structures; 4. List and elaborate on the mechanical properties of engineering materials; 5. Evaluate stresses and strains in two dimensions utilsing the concepts of principle stress and Mohr's circle. 6. Analyse the deflection of simple beams and failure modes of simple compression members; 7. Identify statically indeterminate structures and internal/external forces in simple two dimensional rigid frames; and 8. Formulate and solve problems by undertaking basic engineering analysis and write technical reports.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Hibbeler, R.C. (2013) 4th ed. in SI units Statics and mechanics of Materials Pearson/Prentice Hall, Singapore. Hibbeler, R.C. (2015) 14th ed. in SI units Engineering mechanics: statics Pearson/Prentice Hall, Singapore. Recommended Reading - Texts Hibbeler, R.C. (2016) Mechanics of materials, 10th ed. in SI Units, Pearson/Prentice, Singapore

Assessment: Assignment, Homework Problems (fortnightly), 15%. Project, Project Report (10 pages,1500 words plus figures/tables), 15%. Test, Mid Semester Test (1.5 hours), 20%. Examination, End of Semester Examination (3 hours), 50%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.1, 1.2, 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 6) which are not assessed within the assignments and project. As the test and examination are the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC2103 Engineering Materials & Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit covers the behaviour, properties, performance and limitations of the most widely used construction materials such as concrete, steel, timber as well as other construction materials such as polymers and composites. In addition, the unit gives an introduction to construction equipment, techniques and OH&S requirements used by the Civil or Building Engineering industry.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the types, properties and applicability of materials; most commonly used in civil and building engineering construction work (i.e. concrete, steel and timber); 2. Demonstrate an appropriate knowledge of other construction and building materials masonry, aluminium, glass, polymers and composites; 3. Select the types and applications of plants, equipment and construction processes for variety of civil and building engineering construction processes; 4. Investigate materials, equipment and construction techniques for a specific project; and 5. Describe the importance of the OH&S and environmental requirements for working in a construction site with specific material, plant or project.

Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial2.0 hrsForty Eight (48) hours for one semester comprising a mixture of lectures, tutorials and group based practical laboratory experiments. Weekly contact is four hours comprising of a lecture and either a tutorial or a lab.

Required Reading: Students will be provided with class notes and additional resources online, in line with the topics. There are no required texts for this unit.

Assessment: Report, Group Numerical Type Report (2000 words approx), 25%. Report, Group Technical Report (each 1500 words approx), 25%. Examination, End of Semester Exam (3 hours), 50%.

NEC2104 Engineering Surveying

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2ENF1201 OR NEF1201

Description: Engineering Surveying is a key facet of all civil engineering practice. This unit of study promotes students' knowledge and skills in the sub-discipline of surveying - including the ability to select and operate basic and specialised surveying equipment appropriate to specific engineering tasks. Students learn to perform an engineering survey and critically analyse survey data results to inform subsequent design and construction considerations. The development of survey practices from their origins to contemporary contexts is also addressed. Students work in small teams to carry out (typically) eight fieldwork projects drawn predominantly from the areas of building and road engineering. Each survey project involves project analysis, calculations, practical use of surveying equipment and project evaluation. Topics include: Surveying reference and basic computations; Mapping, Vertical measurement and note keeping; Angular measurement and note keeping; Circular curves, Contours and Contouring; Area computations for polygons; Rectangular co-ordinates; Computations for earth works; Digital terrain models; Geographic positioning systems; and the Victorian land title system.

Credit Points: 12

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

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

Class Contact: Lab 3.0 hrs Lecture 1.0 hr Tutorial 3.0 hrs Forty-eight (48) hours per semester, consisting of nine (9) weeks of labs for 3 hours per week and three (3) weeks of tutorials for 3 hours per week, including twelve (12) hours of lectures for 1 hour per week.

Required Reading: Class Notes and additional resources on University LMS (VU Collaborate) site. Ghilani, C D & Wolf, P R. (2011) 13th ed. Elementary Surveying: An Introduction to Geomatics New York: Pearson Education

Assessment: Practicum, Fieldwork (six (6) practicals at max two pages each), 30%. Assignment, One Assignment (1000 words), 20%. Examination, End of semester exam (2 hour), 50%.

NEC2201 Introduction to Structural Engineering Design

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics

Description: This unit of study aims to provide a basic introduction into the design principles of structural elements. The following topics would be covered: Steel: Load calculation, dead and live loads, design loads rationale, calculation of specific loads. Design of simple structural members in tension, compression, bending and shear. Design of bolted and welded connections in simple shear or tension. Timber: Design of timber beams, columns. Nailed and bolted connections in simple shear. Other materials: Review of fundamental concepts based on Solid Mechanics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design steel elements in tension, compression, bending and shear; 2. Design steel connections consistent with the above outcome; 3. Design timber beams and columns and appropriate connection details; 4. Demonstrate a basic understanding of design fundamentals; and 5. Formulate and solve specific problems, and work both autonomously and as a member of a team.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Class Notes and additional resources on VU Collaborate.

Assessment: Test, Two (2) Class Tests (500 words each), 20%. Assignment, Four (4) Team (PBL) Project reports and oral presentations (500 words each), 50%. Examination, End of Semester Examination (2 hours), 30%. The portfolio provides documented evidence demonstrating that the learning outcomes for the subject have been achieved. The portfolio may include skills audits, laboratory activities, project reports, reflective journals, self and peer assessment.

NEC2202 Geomechanics

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics

Description: All engineering structures are founded on or within the earth, so it is important that civil engineering students acquire a good understanding of soil and rock behaviour and their impact on such structures. This unit is designed to provide students with knowledge of basic geology, and the engineering properties and behaviour of different types of soil and rock when subjected to various degrees of weathering, moisture conditions, topographic /stratigraphic conditions, loading patterns and improvement techniques. Students will also be introduced to a range of field investigation and laboratory practices aimed at determining types and properties of soil and rock which might be present on any particular site. Key topics include: Importance of geology in engineering. Earth history, rock formation and basic structural geology. Geological maps and their interpretation.
Erosion/transportation/deposition processes and soil formation. Geology and soils of Melbourne and related case studies. Classification, description and engineering properties of soil and rock, soil phase relationships, clay behaviour. In-ground stress due to gravity loads, principle of effective stress. Permeability, seepage of water through soil, flow nets and applications. Shear strength, friction angle and cohesion in various soil types under differing moisture conditions, Mohr-Coulomb strength criterion. Slope failure mechanisms and related stability analyses, methods of slope stabilisation. Earthworks and compaction of soils and crushed rock including methods, specification and field evaluation. Geotechnical site investigation including desk studies, boring/sampling/testing methods, soil/rock profile logging and reporting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Locate, evaluate and analyse basic soil / rock information from sources including websites and texts, geological maps, and laboratory and field investigations; 2. Plan a basic staged and iterative investigation for soil and rock conditions at a particular site, specifying appropriate drilling and sampling equipment, and associated laboratory tests; 3. Classify a limited number of major soil and rock types, and explain their typical applications for engineering uses including structural foundations, roads and dams; 4. Identify a number of key soil parameters, and explain how they are used to qualitatively predict the behaviour of various soil types when subject to a range of specific topographic, stratigraphic, moisture and loading conditions; 5. Solve a range of numerical problems involving the key parameters in (4) above to quantitatively determine soil behaviour when subject to conditions as above; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Smith, I. (2014) 9th ed. Elements of Soil Mechanics Wiley Blackwell A significant number of other texts, supplementary notes and tutorial materials, websites and other resources are recommended for this unit in addition to the text above. These will be indicated in the unit guide provided to students on the VU Collaborate system.

Assessment: Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based field assignment and report, 15%. Assignment, Assignment 2: Team-based problem solving exercise and report, 15%. Examination, End-of-semester exam (3 hours), 60%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.1, 1.3 and 2.2 for the Examination. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment) in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC2203 Hydraulics

Locations: Footscray Park.

Prerequisites: NEF2101 - Fluid Mechanics 1

Description: This unit builds on Fluids Mechanics that was covered in Semester 1. Fluid mechanics provides the theoretical foundation for hydraulics, which focuses more on the engineering applications of water and other liquids. Hydraulic topics covered in this unit include practical applications in open channel flow, such as hydraulics structures, flow measurement, river channel behaviour, erosion and sedimentation. These topics would be taught using practical hand-on lab experiments, lab demonstrations and a computer based assignment. The site visit is designed to improve the student's ability to link theory (learnt in the classes) with practical real-world situations. Topics include: Pipe flow, boundary layer theory, water hammer; Open channel flow, discharge equations for uniform flow, Specific energy and critical depth, flow transitions and hydraulic jump; Gradually varied flow, classification, water surface profile evaluation; Dimensional analysis, dimensional homogeneity, Rayleigh and Buckingham pi methods, hydraulic model studies; Hydraulic structures, culverts, broad crested and crump weirs; Flow measurements, venturi meter, orifices, sharp crested weir; River hydraulics, river sediment transport and movable bed forms, estimation of sediment loads, reservoir saltation and loss of capacity, river training and control, bank stabilisation and channel maintenance.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply concepts of hydraulics, complemented with practical laboratory based experiments, site visit and computer labs; 2. Apply concepts of open channel flow to practical engineering related problems; 3. Use dimensional analysis to develop relationships and also for hydraulic model similitude studies; 4. Design hydraulic structures like culverts and weirs; 5. Estimate sediment loads carried by rivers.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Tutorial 1.0 hr Workshop 1.0 hr

Required Reading: Class notes uploaded on University LMS. Hamill, L. (2001) 3rd ed. Understanding Hydraulics MacMillan Press

Assessment: Report, Site visit based report - based on self selected site visit in week 9 (Report, photographs, sketches, max word limit of 1500), 10%. Assignment, Computer lab based assignment, 15%. Practicum, One Lab experiment based test, 15%. Examination, End-of-semester examination, 60%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within the report, assignment or practicum. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC2204 Highway Engineering

Locations: Footscray Park.

Prerequisites: NEC2104 - Engineering Surveying

Description: The field of highway engineering is a vital part of national and international infrastructure development. This unit of study introduces students to the principles of road design and construction which can be applied in various urban and rural contexts. Students learn to perform geometric road design, including route location, super elevation, transition curves, grading and earthwork calculations. They work in small teams on real world projects which require consideration of the natural and existing built environment, OH&S compliance and established reporting protocols. Unit topics include: Earthworks including equipment, determination of quantities and costs; preparation and use of mass haul diagrams. Route location factors, route selection, horizontal alignment including circular curves and transition curves and superelevation, determination of sight distance; vertical alignment including grades and vertical curves. Pavement design methods for both flexible and rigid pavements, determination of number of equivalent standard axles, use of California Bearing Ratio. Road construction equipment capabilities. Introduction to road drainage methods, surface and subsurface drainage. Road maintenance issues and programs.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply appropriate geometric standards to the design of rural roads; 2. Demonstrate understanding of methods to determine efficient earthworks operations; 3. Conceptually map the process for designing road pavements; 4. Identify, formulate and solve emerging problems, and perform requisite design/redesign work; 5. Use a systematic approach to design and evaluate engineering solutions taking into account all relevant technical, environmental, economic and social considerations; 6. Work effectively as a member and/or leader of a team; 7. Demonstrate good communication skills, based on technical reports and team discussion and/or oral presentations.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Lecturer will provide reading materials as required.

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

NEC3101 Structural Analysis

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics

Description: Engineers are required to design or analyse a variety of structures that are often exposed to a variety of loading conditions. Therefore an understanding of key analysis methods for statically determinate and indeterminate trusses, beams and frames should be mastered. These include, the method of virtual work for determination of deflections and rotations, the 'stiffness' method of analysis (including the equations of slope deflection and numerical approximation by moment distribution) for beams and rigid frames, the matrix representation of the stiffness method for solution by digital computation and the flexibility method of analysis for statically indeterminate trusses, beams and rigid frames. Experience in approximate analysis of structures and in structural 'modelling' and analysis using commercial linear finite element analysis computer program(s). An introduction to stability analyses of rigid frames and frame buckling.

Credit Points: 12

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

1. Evaluate structural deflections and rotations for a range of structures (modelled as connected linear elements), which behave in a linear and elastic manner; 2. Evaluate internal axial forces, shearing forces and bending moments for a range of determinate and indeterminate structures (modelled as connected linear elements), which behave in a linear and elastic manner; 3. Create and analyse structure models using a commercial computer program, where structures are modelled as connected linear elements which behave in a linear and elastic manner; 4. Appraise a range of approximate solutions for common structures; and 5. Solve problems, undertake standard structural Engineering analyses and write technical reports.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Hibbler R.C., (2015) 9th ed. Structural Analysis Pearson International

Assessment: Assignment, Portfolio of computer analyses (1000 words), 20%. Assignment, Structural model project (1000 words), 15%. Examination, Mid-semester test (1000 words), 30%. Examination, Final Exam (2 hours), 35%.

NEC3102 Geotechnical Engineering

Locations: Footscray Park.

Prerequisites: NEC2202 - Geomechanics

Description: All engineering structures are founded on or within the earth, and such foundations must be structurally sound, stable (safe), serviceable and cost effective. They must not "break the earth", nor exceed reasonable settlement limits. It is important therefore that civil engineering students develop the key skills necessary to analyse and design different types of foundations and other earth-related structures in a range of different soil and rock types so as to satisfy these criteria. Such foundations and structures include both shallow and deep footings, slabs, embankments, and retaining walls of various types. Students should also understand a number of key construction issues such as dewatering, excavation stabilization, and soil improvement, and be able to design systems for same. On-going visits made over several weeks to sites where significant foundation construction work is being undertaken form a key part of this unit and are aimed at helping students acquire skills and understanding as indicated above. Key topics include: Introduction to foundation design. Bearing capacity of shallow pad and strip foundations on fine and coarse-grained soils. In-ground stress distribution due to applied loads. Foundations on reactive soils. Pile foundations including types and loading conditions. Load capacity of single driven and bored piles, and of pile groups. Immediate settlement. Consolidation theory and consolidation settlement of foundations on fine-grained soils. Settlement rates and allowable settlement. Lateral stresses in the ground. Active and passive stress states. Analysis and design of gravity and cantilever retaining walls. Introduction to construction issues including ground stabilisation and dewatering. Types and uses of geosynthetic materials.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain key requirements for safe, serviceable and cost effective foundations for several different types of structures in or on a range of soil and rock types; 2. Locate, evaluate and use specific site soil / rock information from websites, geological maps, laboratory / field investigations and reports for design purposes; 3. Analyse requirements and design shallow foundations (including pad and strip footings and slabs) and deeper pile foundations for a range of common structures in different earth / rock profiles; 4. Explain earth pressure theory and design retaining walls and related structures when subjected to a range of backfill soil types and moisture conditions; 5. Explain the principles and carry out basic design work related to dewatering, soil improvement systems and the use of geosynthetic materials; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Smith, I. (2014) 9th edn, Elements of Soil Mechanics, Wiley Blackwell A significant number of other texts, websites and other resources are recommended for this unit in addition to the text above. These will be indicated in the unit guide provided to students.

Assessment: Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based field site visits and report, 15%. Assignment, Assignment 2: Team-based problem solving / design and report (may be split into 2 parts), 15%. Examination, End-of-semester exam (3 hours), 60%. The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment) in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC3103 Hydrology and Water Resources

Locations: Footscray Park.

Prerequisites: NEC2203 - Hydraulics

Description: This unit is designed to enable students to acquire an understanding of the theoretical principles in engineering hydrology and water resources engineering. This unit will enable students to acquire theoretical knowledge and critical thinking skills and apply these to problems. This unit also provide students an opportunity to enhance their oral and written communication skills as well as other Engineers Australia professional capabilities. Topics include; Hydrologic cycle, rainfall and runoff routing, Urban Drainage design, Floodplain management, Water resources development, Computer software including RORB and SOURCE.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and synthesise a range of numerical problems in urban hydrology, rainfall/runoff routing, flood frequency, urban drainage, flood plain, and water resources management; 2. Conceptually map and design urban drainage networks and recommend and justify computations; 3. Recommend a design flow volume required in an urban subdivision design using computer software RORB 4. Simulate water supply system using computer software SOURCE; 5. Initiate, coordinate and manage team projects in water resources management and to recommend and present the optimum solutions professionally.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 2.0 hrs Forty-eight (48) hours for one semester comprising, lectures (2hrs X12 weeks), computer labs (2 hrs x 8 weeks), Tutorials (2 hrs x4 weeks), mid-semester test (1 hour during week 6/7 lecture period) and examination (2 hour).

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

Assessment: Assignment, SOURCE portfolio, 10%. Assignment, Drainage /detention system/RORB, 15%. Test, Mid-semester test, 25%. Examination, End of Semester Exam (2 hours duration), 50%. Word count requirements of the assignments and the duration of the test may vary from year to year, depending on the design presenters and level of complexity. .

NEC3201 Hydraulic Engineering

Locations: Footscray Park.

Prerequisites: NEC2203 - Hydraulics

Description: Provision of adequate, safe and appealing water supplies for urban and rural communities has long been a key role for civil engineers. Similarly the need for sustainable and increased food supplies to meet the needs of a growing global population is well established, and civil engineers again play a major role in achieving this by designing and constructing irrigation and land drainage systems. Accordingly, this unit of study aims to give students a basic understanding, problem solving and design skills in the areas of water supply and irrigation / drainage engineering. Students are required as part of the unit to undertake a site visit and inspection of relevant infrastructure, and write a report on same. Key topics include: Urban Water Supply Schemes: Demand assessment and management, supply sources, dam types/spillways/outlet works/construction and safety issues, groundwater development works, water quality requirements and various types of treatment to satisfy these, service storage, pumping stations, reticulation system arrangements/layout and manual/computer analysis, pipeline design and construction. Irrigation and drainage: Purpose and principles of irrigation, irrigation water quality, channel design and structures, flood, furrow, sprinkler and trickle irrigation layout and design principles, need for, principles and design of appropriate land drainage systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify typical levels of demand in terms of both quantity and quality for urban water supply and irrigation schemes, and the factors which influence them; 2. Identify, describe, locate information, solve relevant numerical problems, and carry out basic design of key elements for water source development schemes including dams, groundwater bores, pump stations, transfer conduits and service storages; 3. Identify and explain key water quality parameters and supply standards, and describe, solve relevant numerical problems, and carry out design of key elements for basic water treatment plants; 4. Determine appropriate elements and layouts of town water reticulation systems, and design basic systems using manual and computer methods; 5. Identify, describe, solve relevant numerical problems, determine layouts and carry out basic design of key elements in irrigation and drainage schemes including supply channels, flood, sprinkler and drip systems, and both surface and subsurface drainage systems; 6. Work effectively as a member and/or leader of a small team; and 7. Demonstrate good communication skills, based on technical reports and team discussion.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Lechte, P. (2017), NEC3201 Hydraulic Engineering - Course Notes and Tutorial Problems

Assessment: Test, In-class test (30 minutes), 10%. Assignment, Assignment 1: Team-based problem solving / design exercise and report (may be in 2 parts), 20%. Assignment, Assignment 2: Team-based site visit and report, 10%. Examination, End-of-semester exam (3 hours), 60%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment). In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC3202 Civil Engineering Design 1

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC2204 - Highway Engineering

Description: Along with planning, investigation, construction, and management, design work is a key element of civil engineering. This unit of study aims to give students design practice and skills in a number of areas of civil engineering, and to further develop a range of more generic skills including teamwork and communication. Students will work in small design teams (typically 3-4 students) to carry out two to four (2-4) designs of varying focus and complexity, but drawn mainly from the areas of water and road engineering. Each design will typically involve data gathering, analysis, calculations, preparation of engineering drawings, and a report. To increase student exposure to current real-world practice and requirements, at least one of these designs will often be offered and run by an external civil engineering organisation in collaboration with the unit coordinator. Students will also prepare and deliver an individual oral presentation on one of the designs performed during the semester.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify key issues in a typical civil engineering design problem, formulate the problem, and use a systems approach to solving it; 2. Locate, evaluate and use additional data and information from a variety of sources relevant to a particular design; 3. Carry out preliminary designs for projects in the broad fields of water and road engineering; 4. Evaluate design options against technical and other criteria; 5. Work effectively as a member and/or leader of a small design team; and 6. Demonstrate good communication skills, through team discussion, oral presentation, and design reports.

Class Contact: Lecture 1.0 hr Tutorial 3.0 hrs

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

Assessment: Presentation, Oral presentation (6-7 minutes) on aspects of a particular design, 10%. Assignment, Two to four team-based design reports, 60%. Examination, End-of-Semester Exam (1.5 hours), 30%. (1) The time allocated to individual designs may vary from year to year, depending on the design presenters and level of complexity. Hence 2 larger designs, 3 intermediate or 4 smaller designs may be offered in a particular year. (2) The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, a student must achieve a minimum mark of 40% in the examination and 50% in the overall unit assessment in order to pass the unit.

NEC3203 Structural Engineering Design 1

Locations: Footscray Park.

Prerequisites: NEC2201 - Introduction to Structural Engineering Design

Description: Structural Engineering is a key stream in most civil engineering courses. Engineers are required to design a variety of structures under various loading regimes using simplified codes methods or alternatively more accurate techniques. More specifically this unit of study aims to give students a fundamental understanding in the design of reinforced concrete structural elements. The following topics are covered: Design of reinforced concrete simply supported and continuous beams in bending, shear and torsion. Serviceability design of beams including deflection and

crack control. Design of one-way and two-way slabs using method of coefficients. Analysis of Flat slabs using simplified strip and equivalent frame methods, including punching shear. Reinforced concrete column and wall design. Introduction to strut and tie method, pre-stressed concrete and footing design.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and design reinforced concrete beams in both strength and serviceability states (for bending, shear, torsion, deflection and crack control); 2. Analyse and design reinforced concrete one-way and two-way slabs (including flat plates); 3. Analyse and design members in combined compression and bending (i.e. columns and walls); 4. Demonstrate an in-depth understanding of relevant Australian codes of practice in the design of concrete structures; 5. Exercise critical thinking and judgement in formulating and solving specific concrete design problems; and 6. Work both autonomously in solving problems and as a member of a team in undertaking design tasks.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: The prescribed text 1 is supplemented by resource material placed on the University website (VU Collaborate). Loo, Y.C. and Chowdhury, S.H. (2013) 2nd ed. Reinforced & Prestressed concrete: Analysis and design with emphasis on the application of AS3600-2009 Cambridge Press Standards Australia 2009 AS3600-2009 Concrete structures Standards Australia Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998) Concrete structures Longman, Melbourne Texts 2 and 3 are recommended reading materials.

Assessment: Test, Mid-semester skills audit (1.5 hours equivalent to 1000 words), 20%. Test, Homework Problems (weeks 2 - 8 only), 20%. Project, PBL project (10 pages, 1500 words plus figures/tables), 20%. Examination, End of Semester Examination (3 hours equivalent to 2000 words), 40%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.1, 1.2, 1.3, 2.1 and 2.3. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within the mid-semester test, homework problems or project. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEC4082 Environmental Engineering 2

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to (i) achieve sound knowledge and understanding of general environmental issues and the ability to develop and implement systems and procedures to ensure compliance with legal environmental requirements, and (ii) appreciate the importance of risk management and sustainable development. Specifically, this unit provides students with specialised skills and expertise in solid and hazardous waste management, air and noise pollution management, and coastal engineering. It also requires students to engage in critical evaluation and debate on broader sustainability and risk management issues. Assignments will help students to practice their skills, and communicate their ideas and results in a clear and concise manner. Students are required as part of the unit to undertake a site visit and inspection of coastal structures in order to develop understanding of complex real world issues in coastal engineering, and to demonstrate possible solutions for particular related problems. Topics include: Part A: Overview of a range of environmental problems and introduction to Basic Ecology. Solid and Hazardous Waste Management: sources, types/quantity of wastes, hierarchy of management options, collection methods and transfer stations, disposal by landfill and other methods. Air Pollution: types, causes and effects, clean up and control. Noise Pollution: sources and effects, solutions to noise problems. Also, Environmental Management including auditing, risk assessment and sustainable development issues. Part B: Coastal Engineering: coastal forms, wave generation and height prediction, wave phenomena, sediment transport and impact, beach erosion/rehabilitation, marinas and fixed or floating breakwaters, coastal management.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically assess and discuss key issues relating to ecology, energy and general environmental management, solid / hazardous waste management, air and noise pollution management, and coastal engineering; 2. Identify and solve problems related to the areas above based on scientific and engineering principles and taking account of the likely multi-faceted components of such problems 3. Develop and evaluate solutions to a range of such problems, using a systems approach and recognising the integrated nature of engineering responsibilities; 4. Produce high quality written and oral technical reports as part of a small team.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: No required text books, but several recommended in detailed unit guide. Lecture notes and other study materials will be available on VU Collaborate.

Assessment: Test, Class Test covering materials from weeks 1-4 (0.5 hour), 10%. Assignment, All students to participate as team members in a series of formal in-class debates on issues of environmental importance, 15%. Report, Coastal Engineering oral and site visit report - Maximum of eight A4 pages, 15%. Examination, End-of-Semester Examination (3 hours), 60%. The examination focuses upon the individual student's ability to demonstrate his or her ability to apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 4) which are not assessed within the assignment, report or test. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit.

NEC4101 Environmental Engineering 1

Locations: Footscray Park.

Prerequisites: NEC2203 - HydraulicsNEC3201 - Hydraulic EngineeringNEC2203, including prior completion of NEC3201 Hydraulic Engineering, is also strongly advised.

Description: Water treatment, wastewater collection, treatment and reuse, water pollution control, and the assessment of project environmental impacts are key elements in maintaining public health and protecting the environment. Civil engineers typically undertake and have responsibility for major projects in each of these areas. This unit of study aims to give students a basic understanding, problem solving and design skills in each of these facets of civil engineering. Students are required as part of the unit to undertake a site visit and inspection of relevant infrastructure, and write a report on same. Key topics include: Reaction kinetics and reactors. Wastewater management overview. Wastewater characteristics and estimation of wastewater flows. Types, design, maintenance and rehabilitation of collection systems. Basic microbiology. Wastewater treatment plant types and applications,

unit processes involved and design of components. Advanced wastewater treatment. Introduction to industrial wastewater treatment processes. Land treatment methods and wastewater reuse. On-site wastewater treatment. Water pollution and quality changes in rivers, estuaries and lakes. Point and non-point source water pollution and control. Urban runoff quality and its management. Water quality modelling, overview of available models, and use of SOURCE software. Environmental impact scoping and assessment, community consultation programmes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop basic design plans for key elements of different types of wastewater collection systems, treatment plants and reuse systems; 2. Explicate and solve, manually or via appropriate software packages, a range of water pollution and water sensitive urban design (WSUD) problems; 3. Analyse potential environmental impacts for typical civil engineering projects, and evaluate solution options against technical, environmental, economic and social criteria; and 4. Produce high quality written technical reports as part of a small team.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: No prescribed text books. The study materials will be available on VU Collaborate or as directed by the Lecturer.

Assessment: Test, In-class test (0.5 hours), 10%. Assignment, Assignment 1: Team-based problem solving/design exercise and report (may be in 2 parts), 20%. Assignment, Assignment 2: Team-based site visit and report (10 pages per group), 10%. Examination, End-of-semester exam (3 hours), 60%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 3) which are not assessed within the test or assignments 1 and 2. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit.

NEC4102 Structural Engineering Design 2

Locations: Footscray Park.

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

Description: This unit introduces the analysis and design of steel and steel-concrete composite structures. Topics include: wind loads, local buckling of thin steel plates, steel webs in shear and bearing, steel members under axial load and bending, steel connections, finite element analysis, plastic analysis of steel beams and frames, composite slabs, composite beams, and composite columns.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compute wind loads and provide professional recommendations for implementation in a variety of conditions; 2. Design steel members under combined actions and steel connections; 3. Analyse frames and trusses using finite element software; 4. Use the plastic method to analyse steel beams and simple steel frames; and 5. Design composite slabs, composite beams and composite columns.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Liang, Q. Q. (2014) Analysis and Design of Steel and Composite Structures, Boca Raton and London: CRC Press, Taylor and Francis Group. RECOMMENDED READING: Patel, V. I., Liang, Q. Q. and Hadi, M. N. S. (2015). Nonlinear Analysis of Concrete-Filled Steel Tubular Columns, Germany: Scholar's Press. AS/NZS 1170.2 (2011). Australian/New Zealand Standard for Structural Design Actions, Part 2: Wind Actions, Sydney, NSW, Australia: Standards Australia and Standards New Zealand. AS 4100 (1998). Australian Standard for Steel Structures, Sydney, NSW, Australia: Standards Australia. AS 2327.1 (2003). Australian Standard for Composite Structures, Part 1: Simply Supported Beams, Sydney, NSW, Australia: Standards Australia.

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

NEC4172 Urban Development and Transportation

Locations: Footscray Park.

Prerequisites: NEC2204 - Highway Engineering

Description: This unit covers areas of sustainable urban land development and transportation systems including biophysical and socio-economic data collection and inventories, land capability analysis, planning processes and issues including population density, city infill vs peripheral development, infrastructure and servicing requirements, open space/green city/urban forest concepts, energy and water conservation issues, residential subdivisions and appropriate street designs. It also focuses on demand for transport and the significance of transport and freight movement to the economy; road safety issues; transport planning techniques including trip generation, trip distribution, mode split and trip assignment models; traffic engineering aspects including flow theory, road capacity, headways, gaps and speed analysis; intersection analysis and use of SIDRA program to aid design and analysis of signalised intersections; traffic survey methods and analysis; local area traffic management studies; travel demand management.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Locate, evaluate and analyse a wide range of data relevant to the design and layout of both greenfield and infill urban developments; 2. Develop broad scale plans for greenfield and infill urban developments incorporating appropriate residential, commercial, industrial, open space / recreational areas and transport networks, as well as detailed layout plans for residential subdivision street schemes with service and traffic management arrangements; 3. Select and apply relevant transport planning techniques including traffic surveys and analysis, demand assessment and management, modal split and trip assignment modelling, freight needs assessment, and modelling of complex signalized intersection; 4. Evaluate plans and solutions to problems against technical, environmental, economic and social criteria; 5. Demonstrate professional capabilities to collaborate effectively in a small team with responsibilities and accountability for your own learning and development of appropriate technical reports.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

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

required.

Assessment: Assignment, Assignment 1: Individual Transport planning assignment (1500 words), 25%. Assignment, Assignment 2: Team-based design/modelling assignment (2000 words), 25%. Examination, End-of-semester exam (2 hours), 50%. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline, apply established engineering methods to complex engineering problems, and the fluent application of engineering techniques, tools and resources, as defined in Engineers Australia competencies 1.3, 2.1 and 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (2 to 4) which are not assessed within both assignments. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit.

NEC4201 Civil Engineering Design 2

Locations: Footscray Park.

Prerequisites: NEC3102 - Geotechnical EngineeringNEC3201 - Hydraulic EngineeringNEC3202 - Civil Engineering Design 1NEC4101 - Environmental Engineering 1NEC3102 OR VAC3062 & NEC3201 OR VAC3042 & NEC3202 OR VAC3031 & NEC4101 OR VAC4081

Description: Graduate Civil Engineers in industry are expected to undertake an increasing range of complex design tasks that require a comprehensive range of skills often with minimal training and assistance. To prepare students for this challenge this unit provides practical experience in design of two to four (2-4) civil engineering projects related to water/wastewater/stormwater treatment, pumping and gravity reticulation systems (hydraulics), hydrology & water resources, roads, geotechnical, and transportation engineering. External Civil Engineering Organisations and Consultants are invited to present authentic and contemporary engineering design project to enhance student learning and confidence. Students will apply engineering fundamentals and project management concepts learnt during the course to complete the design modules. The unit also covers the development of professional engineering skill-attributes such as communication and interpersonal skills, teamwork, Internet research skills, formulating databases and technical report writing. Depending on the project, students will get the opportunity to gain effective use of common engineering software such as AutoCAD, numerical modelling, project planning, budgeting/costing, and scheduling and resource allocating techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate the capacity to conduct real-world civil engineering design problems or projects; 2. Identify design problems, propose solutions and complete associated design work in a number of civil engineering disciplines; 3. Research and locate relevant design information and data to inform resolution of design problems; 4. Conceptually map and adopt a system approach to design and evaluate the feasibility of solutions taking into account technical, environmental, economic and social criteria; 5. Work effectively as a member and/or leader of a design team; 6. Demonstrate sound communication skills in preparing requisite technical reports, contributing to team discussions and making oral presentations.

Class Contact: Forty-eight (48) for one semester comprising design workshops / seminars and student team design work.

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

Assessment: Assignment, Two parallel design projects (contact time 12 hours each) – Reports with individual peer review reflective statements – (2000 words each), 25%. Assignment, Design project (contact time 24 hours each) – Reports with individual peer review reflective statements – (2000 words each), 25%. Presentation, Oral presentation/s – 6-8 minutes (based on design assignments 1, 2 or 3) – Individually assessed, 10%. Examination, Final Examination (two (2) hours), 40%. Students will work in teams of 3-4 students on four designs with a group project report worth10% each . Students will deliver one oral presentation (6 minutes) on one of the designs which is worth 10%. The portfolio will normally include skills audit results and design reports including technical calculations, but may also include a reflective journal, workbook(s), and self and peer assessment with a maximum of 4 pages. Further details on portfolio components will be issued to students during the first week of classes. Two hour final exam covering all four designs worth 40%. .

NEC4202 Structural Engineering Design 3

Locations: Footscray Park.

Prerequisites: NEC3203 - Structural Engineering Design 1NEC4102 - Structural Engineering Design 2

Description: This unit introduces the analysis and design of prestressed concrete structures. Topics include: introduction to prestressed concrete, deflections of prestressed concrete beams, loss of prestress, flexural strength, strength at transfer, design for shear, anchorage zones, continuous prestressed concrete beams, prestressed concrete slabs, strut-and-tie modelling of structural concrete, and reinforced concrete footings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design prestressed concrete beams for strength and serviceability; 2. Design prestressed concrete slabs for strength and serviceability; 3. Design non-flexural concrete members using the strut-and-tie model method; 4. Design reinforced concrete footings.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Gilbert, R. I., Mickleborough, N. C. and Ranzi, G.(2016) 2nd ed. Design of Prestressed Concrete to AS3600-2009 Boca Raton and London: CRC Press, Taylor and Francis Group RECOMMENDED READING: Liang, Q. Q. (2005). Performance-Based Optimization of Structures: Theory and Applications, London and New York: Spon Press, Taylor and Francis Group. Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998). Concrete Structures, Melbourne: Longman. AS 3600 (2009). Australian Standard for Concrete Structures, Sydney, NSW, Australia: Standards Australia.

Assessment: Test, Tutorial Problems (Weeks 1-8, 10-11; Maximum 4 A4 pages including design calculations and drawings for each test), 10%. Assignment, Assignment 1 (Report maximum 35 A4 pages including design calculations and drawings), 20%. Assignment, Assignment 2 (Report maximum 35 A4 pages including design calculations and drawings), 20%. Examination, Final Exam (2 hours, closed book exam), 50%. The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, a student must achieve a minimum mark of 40% in the final examination and 50% in the overall unit assessment in order to pass the unit.

NEC4203 Advanced Structural Analysis

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit of study aims to provide an advanced insight into the design and analysis of structures subject to dynamic loading. The following topics are covered: degrees of freedom; undamped and damped systems; response of systems to harmonic excitations;general forcing functions; Eigen values for a system; natural frequencies; and, mode shapes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the response behavior of systems subjected to harmonic excitation and general forcing functions; 2. Calculate natural frequencies of systems and draw or develop mode shapes; 3. Develop response spectra of single degree of freedom systems; 4. Use commercially available software in the analysis and/or design of structures subjected to dynamics loads; and 5. Interpret data collected from the instrumentation of structures under natural vibration and or forced excitation.
Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hr
Required Reading: Required TextsLu, Xinzheng, Guan, Hong 1 Earthquake Disaster Simulation of Civil Infrastructures Springer Singapore TJR Hughes 1 The Finite Element Method: Linear Static and Dynamic Finite Element Analysis Courier Corporation Required Texts
Assessment: Assignment, Assignment 1 (Report maximum 35 A4 pages including design calculations and drawings), 30%. Examination, Mid Semester Exam (2 hours closed book exam), 40%. Assignment, Assignment 2 (Report maximum 35 A4 pages including design calculations and drawings), 30%.

NEE2101 Electrical Circuits

Locations: Footscray Park.
Prerequisites: NEF1205 - Engineering FundamentalsNEF1205 OR ENF1205
Description: This unit focuses mainly on Alternating-Current (AC) circuit analysis. A revision on DC circuit analysis will be given in the beginning of the semester. Definitions of instantaneous power, the load convention, active electrical circuit elements (sources) and passive electrical circuit elements (sinks) will then be introduced. Time domain voltage-current relationships of ideal capacitors and ideal inductors are explored. These will lead to the calculation of energy storage in a capacitor and an inductor. Analysis of simple RC and RL circuits in time domain will then be covered. Steady-state sinusoidal analysis of series RL, RC, and RLC circuits will be performed with phasors and complex numbers. The concepts of impedances, admittance, average power, RMS values, and crest and form factors will also be covered. The Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, Norton's theorem, and equivalent circuits will be emphasised. For applications in the power engineering area, students will learn to calculate real power, reactive power, complex power, and power factor along with power factor correction for single phase and balanced three-phase circuits. For applications in the electronic engineering area, circuits involving Transformer Rectifier Units will be treated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Provide Comprehensive analysis of RC and RL circuits; 2. Demonstrate knowledge and competency in the analysis of simple AC circuits by Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, and Norton's theorem; 3. Differentiate the concepts of frequency, impedance and admittance as they relate to AC circuits; 4. Demonstrate knowledge and competency in the analysis of balanced three-phase AC circuits; 5. Distinguish a range of circuits with operational amplifiers such as inverting amplifiers, non-inverting amplifiers, comparators, buffer and summing amplifier circuits; and 6. Demonstrate knowledge and competency in the analysis of transformer rectifier units.
Class Contact: Lab2.0 hrsLecture2.0 hrsTutorial1.0 hrForty Eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Lab groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.
Required Reading: Alexander, C.K. and M.N.O. Sadiku. (2016). 6th ed. Fundamentals of Electric Circuits. McGraw-Hill.
Assessment: Test, Two (2) Semester Tests (1 hour each), 20%. Laboratory Work, Two (2) Team Reports (2000 words), 20%. Examination, End of Semester Exam (3 hours), 60%.

NEE2102 Computer Systems

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit introduces students to computer programming using a high level language (C). The unit describes the overview of a typical microcomputer system including the program creation process (for an embedded microcontroller). The unit focus is on creating computer programs that interact with the outside world using microcontroller PORTS and simple sensor/actuator interfacing.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the architecture and program creation process for a small embedded microcontroller; 2. Describe the relationship between a high level programming language (C), assembler language and low level machine code; 3. Convert numbers between bases (decimal, binary and hexadecimal forms), perform binary and hexadecimal arithmetic and determine the permissible range of a number (signed and unsigned) given a word length; 4. Write programs in the C language to solve problems that include use of selection and repetition structures, create arrays, store and manipulate data, employ library and user created function calls, create and manage pointers and simple data structures; 5. Write C programs for a microcontroller that respond to external and internal interrupts and maintain a simple "real-time" flow and interface to common actuator and display devices including 7-sement displays, LCDs, DC, stepper and servo motors and common sensors including:- temperature, pressure/force, light intensity and motion; and 6. Embedded C programs onto a small micro-controller and connect to external sensors and actuators.
Class Contact: Lab2.0 hrsLecture1.0 hrTutorial1.0 hr
Required Reading: Kochan, S.G. (2014) 4th ed. Programming in C Addison-Wesley
Assessment: Laboratory Work, Six (6) Laboratory Based Problem Solving Sessions, 20%. Test, Mid-semester Test, 20%. Examination, End of Semester Examination, 60%.

NEE2104 Sports Technology Design

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit uses a fun and exciting design problem to introduce students to systematic engineering design methods for solutions in sports technology. The first part of the unit will cover the fundamental phases of engineering design, human factor considerations and CAD software required for physical design of the solution. Design considerations from materials, cost, technology, ethics and culture will be covered with the design problem as an example. In the second part, students

will be introduced to fundamental aspects of electronics, sensors and embedded programming while working in groups to design the prototype solution. Examples of these concepts applied to other sports technology will be provided throughout the unit. Students will be required to deliver a working prototype as part of an engineering team.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Assess and articulate the ergonomics and human factors as applied to physical considerations in system design; 2. Apply basic knowledge in electronics, sensors and microcontrollers for measurement system design; 3. Systematically apply design methodology, incorporating engineering design phases and solution requirements; 4. Work individually and collaboratively, as both a team member and leader, to complete tasks and evaluate own and others' performance using prescribed methods; 5. Communicate effectively with others orally and in writing;

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: Pahl, Gerhard, and Wolfgang Beitz. (2013) 1st ed. Engineering design: a systematic approach Springer Science & Business Media

Assessment: Laboratory Work, Six (6) Labs (2 hours each), 30%. Presentation, Oral presentation (20 minutes per group) and demonstration of design project, 10%. Report, Three (3) group reports (3,000 words max. each), 60%.

NEE2105 Introduction to Data Analytics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to the fundamentals of data analytics, data collection and current analytics software used in industry. Application focus will be given to data obtained from sports such as game statistics, player stats, team stats and historical sports data. The unit will cover fundamental concepts on data analytics, big data, data discovery, data preparation, model planning and model building. The importance of ethical data collection and data privacy will be emphasized with respect to human subject data. Basic statistical analysis tools such as moments of a distribution, power, sample sizes and differences of means will be covered with respect to analysis of example data sets using popular software.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the fundamental concepts in data analytics including data preparation, model planning and model building; 2. Interpret basic statistical descriptions of data and cite the underlying assumptions; 3. Calculate statistical descriptors using data analytics software; 4. Articulate the importance of data privacy and the ethics behind human data collection.

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: Runkler, Thomas A., 2016 2nd Data Analytics: Models and Algorithms for Intelligent Data Analysis Springer-Verlag

Assessment: Laboratory Work, Six (6) Laboratory (Computer and Practical) (2 hours each), 30%. Test, Mid Semester (1 hour), 20%. Examination, Final Exam (3 hours), 50%.

NEE2106 Computer Programming for Electrical Engineers

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces students to basic fundamental programming concepts using a high level language (C++). Topics covered include data types, variables, operators, control structures, functions, arrays, and files. The unit equips students with practical skills that would enable them practice developing, compiling, running, testing and debugging program codes. Students will construct program codes to apply programming concepts to the solution of electrical engineering problems. Students will also develop skills in MATLAB script programming, including Graphical User Interface (GUI) development in MATLAB.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Experiment with the use of arrays, functions, object oriented structures, and control structures in computer programming; 2. Apply core principles and fundamentals of programming in writing simple computer programs; 3. Demonstrate practical abilities in coding, testing and debugging simple algorithms in a practical setting; 4. Write computer programs to solve simple engineering problems; 5. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

Class Contact: Lab2.0 hrsLecture1.0 hrTutorial2.0 hrsForty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Lab groups will be running on alternating weeks. Students will be working on their programming assignments as part of the laboratory work, assessed as per the assessment breakdown.

Required Reading: Liang, Y. D., (2014). 3rd ed, Introduction to Programming with C++. Pearson. Lent, C. S. (2013). 1st ed, Learning to Program with MATLAB: Building GUI Tools. Wiley.

Assessment: Laboratory Work, Six (6) Laboratory Based Problem Solving and Programming Sessions, 30%. Test, Mid-Semester Test (1 hour), 20%. Examination, End of Semester Examination (3 hours), 50%.

NEE2107 Telecommunications

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2

Description: This unit is designed to provide the theoretical basis for the understanding of the engineering aspects of analogue and digital transmission, which leads to the design, construction, and operation of existing and emerging communication systems. The unit will provide the support for students requiring basic knowledge of analogue and digital transmission in order to handle concurrently studied Engineering Design projects that involve various aspects of analogue and digital transmission in communication systems. Consequently, the syllabus is a collection of specialised lectures, the emphasis and sequence of which accommodates the demands of any concurrent PBL exercises. Optical systems as well as optical transmission infrastructure are covered here. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine signals and their characteristics as depicted in time and frequency domains; 2. Translate the information bearing nature of signals and the bandwidth considerations; 3. Implement the principles behind frequency translation and its depiction as various types of modulation; 4. Exploit the signal transition in linear and non-linear systems, and the recognition of such systems in terms of filters and other components; 5. Determine the types of noise present in telecommunication systems and the characterisation of thermal noise; 6. Perform the statistical analysis of random signals and the characterization of such signals in terms of correlation and power spectral density functions; 7. Employ the concept of signal to noise ratio and its influence in faithful reception of analogue and digital signals; and 8. Outline the assessment of performance in digital communication systems in terms of bit error probability.

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

Required Reading: There are a number of other textbooks that can be used in conjunction with the required text below. Some of these texts are available online by subscription. Students please check with the Main library. Wong, K.D., (2012). 1st ed. Fundamentals of communication engineering technologies. Wiley. Haykin, S. & Moher, M., (2009). 5th ed. Communication systems. Wiley. N.Benvenuto et al (2007). 1st ed. Communication systems: Fundamentals and Design Methods. Wiley. Many other sources of important information are available online.www.ieee.org/explore

Assessment: Laboratory Work, Two (2) Laboratory Team Reports (1500 words each), 10%. Test, Mid-Semester Test (1 hour), 15%. Examination, End-of-Semester Examination (3 hours), 50%. Project, Project Report (2000 words; Team of Two), 25%.

NEE2110 Engineering Design and Practice 2A

Locations: Footscray Park.

Prerequisites: NEF1204 - Introduction to Engineering Design

Description: This is a PBL unit in which students work in teams to formulate responses to given problems specifically designed to integrate the learning and content from the units Electrical Circuits and Computer Programming for Electrical Engineers. Student teams will be coached or mentored by an Electrical Engineering staff member whilst resolving these problems. Staff from these units will advise students with technical aspects of the problems. A language and communication staff member will assist with the development of communications and other generic skills in tutorial classes. This unit provides students with the opportunity to collaboratively apply the wide-ranging technical, creative and conceptual skills developed throughout the year with creativity, initiative and personal responsibility.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contextualise science and engineering fundamentals through problem solving and by utilising a systems approach; 2. Demonstrate specialised knowledge and technical competence in finding creative, sustainable and ethical solutions to allocated problems; 3. Collaborate effectively as an individual in diverse teams, with accountability for personal and team accomplishments; 4. Integrate Occupational Health and Safety (OHS) and professional responsibilities of engineers in problem solving; 5. Locate, evaluate, and use information effectively in the solution of allocated problems; and 6. Communicate solutions clearly (orally and in writing) to professional and non-professional audiences.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Students will be working on their project assignments as part of the laboratory work.

Required Reading: The following books are for recommended readings. A Guide to Writing as an Engineer, David F. Beer, David A. McMurrey, 4th Edition, May 2013, ©2014, Wiley. Timmis, Harold, 2011 Practical Arduino Engineering Berkeley, CA : Apress Yang, Yik, 2014 LabVIEW Graphical Programming Cookbook Birmingham, U.K. : Packt Publishing. Only one of the two technical readings is used depending on the requirements of the PBL projects.

Assessment: Presentation, Two Oral Presentations (20 min each), 20%. Project, Project Demonstration (1 hour), 10%. Report, Team Technical Report (3000 words), 20%. Examination, End of Semester Examination (3 hours), 50%.

NEE2201 Linear Systems with Matlab Applications

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2NEE2101 - Electrical CircuitsNEF1201 OR ENF1201 & NEE2101 OR ENE2103

Description: This unit treats both transient and steady-state analysis of linear time-invariant systems by using Fourier and Laplace transform methods. In addition to periodic signals, signals represented by singularity function will also be included as forcing functions. The application of system concepts, which include transfer functions, poles and zeros, frequency response functions, and state variables, will be emphasised.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adapt and apply Fourier series, Fourier transforms, and Laplace transforms to the analysis of signals and linear time-invariant systems; 2. Demonstrate the ability to apply the Fourier series and Fourier transforms to the frequency-domain analysis of linear time-invariant systems; 3. Competently apply the Laplace transforms to the time-domain analysis of linear time-invariant systems described by linear differential equations; 4. Competently utilise the Laplace transforms in the time-domain analysis of linear time-invariant systems described by state variables; and 5. Fluently employ MatLab commands and Simulink to analyse and evaluate linear time-invariant systems using Fourier series, Fourier transforms, and Laplace transforms.

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

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

Assessment: Test, 2 Semester Tests (1 hour each), 20%. Report, Two Laboratory Team Reports (2000 words each), 20%. Examination, End-of-Semester Examination (3 hours), 60%.

NEE2202 Electronic Systems

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical Circuits

Description: The digital electronics section of the unit includes an examination of simple logic gates and applications including the description of circuit operation in truth table form, the derivation and manipulation of Boolean equations along with the Karnaugh Map reduction technique. Circuit implementation techniques using simple logic gates and universal gate sets are examined along with simple asynchronous (ripple) counting circuits. Student designs are tested in logic simulation software and implemented on Field Programmable Logic Arrays (FPGA). The analog electronics section of the unit involves the study of PN and Zener diodes and their electrical characteristics and applications. The small signal equivalent circuits of Bipolar and MOSFET are introduced along with applications including the analysis and design of single stage BJT and CMOSFET amplifier circuits and linear and switching power supplies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Construct truth tables, formulate logic expressions, minimize logic expressions using Boolean Algebra and Karnaugh maps; 2. Design and construct simple combinational logic circuits in Sum of Products (SOP) and Product of Sums (POS)

forms using simple logic gates; 3. Design and construct sequential (ripple) logic digital circuits using D and T flip-flops and simple logic gates; 4. Implement logic circuits through the use of a Computer Aided Design package and Field Programmable Logic Arrays (FPGA); 5. Describe the characteristics of semiconductor devices (Diodes, Bipolar and Metal Oxide Transistors); 6. Analyse and design a single-stage BJT and CMOS FET amplifier; and 7. Analyse and design a simple rectifier based linear and switched modes power supply.

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

Required Reading: Sedra, A. and Smith, K, 2009 6th edition Microelectronic Circuits Oxford University Press

Assessment: Laboratory Work, Six (6) Laboratory Based Problem Solving Sessions, 10%. Assignment, Semester Written Assignment (1500 Words), 10%. Test, Semester Tests, 20%. Examination, End of Semester Examination, 60%.

NEE2203 Experimental Data Analysis

Locations: Footscray Park.

Prerequisites: NEF1201 - Engineering Mathematics 2

Description: This unit focuses on the applications of probability and statistical principles in data analysis. The unit introduces probability theory and explores the basic principle of statistics. The unit is designed so that the probability and statistical principles covered will be applied to data analysis. The topics to be included are: Statistical treatment of experiment data. Systematic errors and random errors. Combining errors, linear situations, products and the general case. Mean and variance. Least squares fitting. Weighted sum of squares. Estimation of parameters. Regression Analysis. Application of data analysis techniques to experimental data in the context of real engineering problems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse simple random experiments by applying elementary probability theory. 2. Understand and address error propagation in data analysis procedures. 3. Apply statistical principles in basic parameter estimation and hypothesis testing problems. 4. Use the method of least squares for curve fitting. 5. Understand and apply data analysis techniques to engineering problems.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Taylor, J.R., (1996) 2nd ed. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements Sausalito, CA Edward, L. Robinson, (2016) 1st ed. Data Analysis for Scientists and Engineers Princeton, Princeton University Press

Assessment: Test, Semester Test (1 hour), 10%. Laboratory Work, Laboratory Report 1 - Team of Two (2000 words), 20%. Laboratory Work, Laboratory Report 2 - Team of Two (2000 words), 20%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE2204 Power System Supply Chain Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: The unit explores two key areas - Power System Supply Chain and Transmission. PART A: Supply Chain: Historical developments and power industry deregulation; Loads and utility ancillary services; Electricity supply basics; Thermal power plants; Other power plants; Alternative energy generation; Distributed generation and energy storage; Rotating machine basics; Transformer fundamentals; Overhead lines and underground cables; Power distribution networks and substation layouts; Auxiliary networks, protection equipment and SCADA PART B: Transmission: Since transmission lines are the key link between the power plant and customer, it is often considered the most important component of the entire power grid. Consequently, the specialised knowledge in this area is provided from the perspective of operation and planning engineers. Detailed mathematical analysis, modelling and performance evaluation of transmission line is exemplified and contextualised with the power circle diagram. Power transfer through transmission lines are studied and reactive power compensation through traditional and more advanced power electronic devices is explored. Steady-state analysis of transmission lines is performed, and travelling wave phenomenon studied to assess performance of transmission lines. Economic and environmental aspects of transmission lines are also briefly debated in this unit. Transmission line parameters and ferranti effect will also be explored.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discriminate between the elements of the supply chain and how they function in order to map and interrogate the roles of (a) transmission - Transformers, overhead lines and cables, (b) distribution - Transformers and substations, insulation equipment and (c) auxiliary networks - Protection equipment, energy management system, supervisory control and data acquisition system; 2. Contextualise alternative generation such as hydro generation, wind and solar generation and other energy generation systems to known and unknown situations; 3. Apply principles in the modelling of transmission lines of various lengths with ABCD constants with initiative and judgement; 4. Analyse transmission lines under steady state conditions and power transfers through transmission lines including -reactive compensation of transmission lines; 5. Illustrate and map transmission line travelling waves and transient conditions in relation to Lattice diagrams; 6. Assess the use of AC and DC voltages and selection of voltage levels for transmission in wide ranging settings; and 7. Justify and explain insulation system selection, fault levels, and busbar configurations.

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

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

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

NEE2205 Analogue Electronics

Locations: Footscray Park.

Prerequisites: NEF1205 - Engineering Fundamentals

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

device type i.e. either BJT or MOSFET.

Credit Points: 12

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

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

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

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

NEE2210 Engineering Design and Practice 2B

Locations: Footscray Park.

Prerequisites: Nil.

Description: This is a practical, PBL mode subject in which students work in teams to formulate responses of given problems specifically designed to integrate with the learning and content from units Linear Systems with Matlab Applications and Analogue Electronics. Teams of students will have an Electrical Engineering staff member as a 'coach/mentor or supervisor' whilst working on these problems. 'Specialist' staff from these units will be available to assist students with technical aspects of the problems. A language and communication staff member will assist with the development of communications on a weekly basis. Staff members will be available to provide workshops or seminars to assist students with the development of generic skills.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply knowledge of basic science and engineering fundamentals in order to identify complex problems and formulate solutions; 2. Communicate effectively, not only with engineers but also with the community at large; 3. Apply In-depth technical competence in at least one engineering discipline; 4. Adapt a systems approach to design and operational performance and integrate the principles of sustainable design and development; 5. Collaborate effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member; 6. Exhibit commitment to the social, cultural, global, environmental and ethical responsibilities of the professional engineer, and the need for sustainable development; and 7. Display the capacity to undertake lifelong learning by locating, evaluating, managing and using information effectively.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Students will be working on their projects as part of the laboratory work.

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

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

NEE3101 Telecommunications

Locations: Footscray Park.

Prerequisites: NEE2201 - Linear Systems with Matlab ApplicationsNEE2201 OR ENE2201

Description: This unit is designed to enable students to acquire specialised skills and expertise in the telecommunications field, specifically wireless and fixed network engineering. The unit will enable students to acquire theoretical knowledge, practical and critical analysis skills and apply these to research and complex technological problem solving scenarios. The unit will also enhance students' communication skills and other professional capabilities. The unit aims to alleviate and support employment demand in the telecommunications industry within Australia and overseas. Particular emphasis will be on telecommunication technologies and infrastructure for broadband wireless and optically connected broadband networks. The unit takes into account the current growth drivers of the global telecommunications industry.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate the theoretical concepts of a communication channel and the principles of digital communication systems in collaboratively planning and designing complex communication systems with accountability for personal and team outcomes; 2. Determine optimum signal link paths using Maxwell's equations including taking into account propagation mechanisms; 3. Prescribe antenna solutions to specified requirements and contexts with initiative and judgement; 4. Develop and modify propagation models for wireless communication links as well as design terrestrial and satellite links for a range of situations; 5. Conceptually map cellular network designs with creativity and technical skill; 6. Employ MatLab commands and Simulink to analyse and interpret communication systems; and 7. Interpret and use data generated by communication network elements to optimise performance.

Class Contact: Lab 1.0 hr Lecture 1.0 hr Tutorial 1.0 hr

Required Reading: There are a number of other textbooks that can be used in concert with the required texts below. Some of these texts are available online by subscription. Students please check with the Main library.Rodger Zimmer & William Tranter (2009) 6th Principles of Communications Wiley Many other sources of important information are available online.www.ieee.org/explore

Assessment: Laboratory Work, Continuous assessment in laboratory work, 10%. Test, Mid-semester written test, 15%. Examination, End-of-semester examination, 50%. Project, Full semester project, 25%. To pass the unit a student must pass the project by scoring no less than 50%.

NEE3102 Electronic Systems 2

Locations: Footscray Park.

Prerequisites: NEE2202 - Electronic SystemsNEE2202 OR ENE2202

Description: The digital electronics section of this unit introduces students to synchronous state machine design including Moore and Mealy models with system implementation using logic gates/flip-flops and description in VHDL. System level design is examined using the Algorithmic State Machine Design/Register Transfer Language methods along with VHDL description and FPGA implementation of controller and data-processor elements. The analog electronics section of the unit examines the frequency response of amplifiers and introduces wide-band and high

frequency amplifier design. The unit also includes an examination of differential amplifiers including modes of operation and design for specific performance characteristics. Feedback classification and the effect on circuit performance is also included along with an introduction to switched mode power conversion and analog filter analysis and design.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe common datapath elements and their applications; 2. Apply a system level approach to digital design using the Algorithmic State Machine (ASM) or the Register Transfer Language (RTL) design paradigm; 3. Synthesize ASM/RTL controllers and datapath elements using traditional methods and using VHDL with implementation on FPGA; 4. Analyse a range of analogue circuit types and assess the circuit performance; 5. Apply negative feedback on electronic circuits to achieve specific performance and stability requirements; 6. Design analogue circuits to meet performance criteria and select suitable components for circuit realisation.

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

Required Reading: Sedra, A. and Smith, K., 2009 6th edition Microelectronic Circuits Oxford University Press

Assessment: Laboratory Work, Laboratory Based Problem Solving Sessions - Six (6), two hours each, 10%. Assignment, Written Assignment (1500 words), 10%. Test, Semester Tests - Two (2), one hour each, 20%. Examination, End of Semester Examination (3 hours), 60%.

NEE3103 Electrical Machines

Locations: Footscray Park.

Prerequisites: NEE2101 - Electrical Circuits NEE2101 OR ENE2103

Description: This unit introduces students to Magnetic circuit theory, Faraday's and Lenz's laws. Students will be required to undertake calculation of forces on moving charges, and analyse various magnetic circuits. DC machines, as motors and generators, will be discussed including the development and application of equivalent circuits in the performance analysis of DC machines. Transformer fundamentals, applications of transformers in power systems and their performance analysis using equivalent circuits will further be covered. Single phase and three phase Induction machines will be investigated including the application of equivalent circuits in the performance analysis of induction machines. The starting methods of induction motors will be explored. Other topics that are critically reviewed in this unit are: synchronous machines, generator operations and analysis, motor operations and analysis, synchronous generator performance on infinite bus, synchronous condensor, power factor calculations and corrections.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamentals of mechanical and electromagnetic energy conversion in diverse contexts; 2. Demonstrate knowledge of the structure of DC and AC electrical machines and the purpose of the various components; 3. Apply relevant equivalent circuit models of various electrical machines and analyse their operational performance under wide ranging conditions; 4. Analyse simple power systems containing transformers and synchronous generators to solve fundamental problems; 5. Critically analyse various starting techniques of motors; 6. Construct test platforms for testing purposes and set up complex electrical connections of electrical machines; and 7. Review and evaluate appropriate applications of A.C. machines in industries.

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

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

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

NEE3104 Digital Systems

Locations: Footscray Park.

Prerequisites: NEF1205 - Engineering Fundamentals

Description: This unit starts with the examination of simple logic gates and applications including the description of circuit operation in truth table form, the derivation and manipulation of Boolean equations along with the Karnaugh Map reduction technique. Circuit implementation techniques using simple logic gates and universal gate sets are examined along with simple asynchronous (ripple) counting circuits. Other digital circuits such as memory, ADC/DAC and arithmetic operation circuits will be covered at an introductory level. Student designs are tested in logic simulation software and implemented on Field Programmable Logic Arrays (FPGA).

Credit Points: 12

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

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

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

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

NEE3201 Introduction to Control Systems

Locations: Footscray Park.

Prerequisites: NEE2201 - Linear Systems with Matlab Applications NEE2201 OR ENE2201

Description: This unit introduces feedback problems and their solutions. These are low sensitivity design, dynamic characteristics and closed-loop stability, Routh-Hurwitz stability tests, on closed-loop transfer functions, Root locus, frequency response and their interpretations in terms of relative stability and dynamic performance will be treated. Proportional (P), Proportional and Integral (PI), Proportional, Integral and Derivative (PID) controllers, lead, lag and lag-lead compensators will be introduced. Time domain and frequency domain design of lead, lag and lag-lead compensators will be emphasized. The unit also covers state-space models and state-space and transfer function models conversion. Linear state-variable (including estimated state) feedback controllers will also be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Competently state and differentiate the purposes and requirements of open-loop and closed-loop control systems; 2. Correctly calculate an overall transfer function by the use of both Mason's Gain Formula and Block Diagram Reduction as well as competently perform Routh-Hurwitz test on closed-loop control systems; 3.

Demonstrate the ability to perform elementary time-domain and frequency-domain analyses of simple control systems; 4. Competently use Root-locus technique and Bode diagram to analyse the relative stability and performance of LTI SISO systems; 5. Proficiently design P, PI, PID controllers, lead, lag, lag-lead compensators and linear state-variable (including estimated state) feedback controllers to meet time-domain and frequency-domain specifications of LTI SISO closed-loop systems.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Lab groups will be running on alternating weeks. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.
Required Reading: R.C. Dorf & R.H. Bishop (2017). 13th ed., Modern Control Systems. Upper Saddle River, N.J. Prentice Hall.
Assessment: Laboratory Work, Three (3) Lab Reports (1500 words each), 30%. Test, Two (2) Semester Tests (1 hour each), 20%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE3202 Power System Supply Chain Management

Locations: Footscray Park.
Prerequisites: NEE3103 - Electrical Machines NEE3103 OR ENE3105
Description: The unit explores two key areas - supply chain and transmission. PART A: SUPPLY CHAIN Historical developments and power industry deregulation; Loads and utility ancillary services; Electricity supply basics; Thermal power plants; Other power plants; Alternative energy generation; Distributed generation and energy storage; Rotating machine basics; Transformer fundamentals; Overhead lines and underground cables; Power distribution networks and substation layouts; Auxiliary networks, protection equipment and SCADA PART B: TRANSMISSION Since transmission lines are the key link between the power plant and customer, it is often considered the most important component of the entire power grid. Consequently, the specialised knowledge in this area is provided from the perspective of operation and planning engineers. Detailed mathematical analysis and performance of transmission line is exemplified and contextualised with the power circle diagram. Reactive power compensation through traditional and more advanced power electronic devices is also explored. along with steady-state analysis of transmission line, travelling wave phenomenon better assess performance of transmission lines. Economic and environmental aspects of transmission lines are also briefly debated in this unit. OBJECTIVES Main contents will be: Modelling of Transmission Lines Power Transfer through Transmission Lines Transmission Line Parameters and Ferranti Effect Transmission Line Travelling Waves and Transient Conditions Insulation System Selection Fault Levels and Busbar Configurations
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discriminate between the elements of the supply chain and how they function in order to map and interrogate the roles of (a) transmission - Transformers, overhead lines and cables, (b) distribution - Transformers and substations, insulation equipment and (c) auxiliary networks - Protection equipment, energy management system, supervisory control and data acquisition system; 2. Contextualise alternative generation such as hydro generation, wind and solar generation and other energy generation systems to known and unknown situations; 3. Apply principles in the modelling of transmission lines of various lengths with ABCD constants with initiative and judgement; 4. Analyse transmission lines under steady state conditions and power transfers through transmission lines including -reactive compensation of transmission lines; 5. Illustrate and map transmission line travelling waves and transient conditions in relation to Lattice diagrams; 6. Assess the use of AC and DC voltages and selection of voltage levels for transmission in wide ranging settings; and 7. Justify and explain insulation system selection, fault levels, and busbar configurations.
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr Forty eight (48) hours or equivalent for one semester comprising of lectures, laboratory and tutorials
Required Reading: Glover J.D., Sarma, M.S. and Overbye T.J. 5th Power System Analysis and Design Cengage Learning Recommended Reading: 1. Hadi Saadat: Power System Analysis (Second edition), 2002, 0-07-284796-4, McGraw Hill 2. Kothari, D.P. and Nagrath, I.J., Power System Engineering, 2nd Edition, 2008, Tata McGraw Hill. 3. Grainger J. J. and Stevenson W.D. Power System Analysis, 1994, McGraw Hill Stephen J. 4. Chapman, "Electric Machinery and Power System Fundamentals", McGraw Hill, 2002.
Assessment: Test, Mid-semester, 20%. Laboratory Work, Three (3) Lab excercises, 20%. Examination, End of semester examination (3 hours), 60%.

NEE3203 Embedded Systems

Locations: Footscray Park.
Prerequisites: NEE2106 - Computer Programming for Electrical Engineers NEE2106 OR NEE2102 OR ENE2202
Description: This unit introduces students to in depth study of embedded systems focusing on microcontrollers, embedded programming techniques and embedded system design. Hardware content will cover microcontroller peripherals e.g.,memory, timers, analogue to digital convertors (ADC), pulse width modulation (PWM), standard communication with external devices e.g., USART, SPI, I2C. Software programming techniques such as polling and interupts will be introduced. Project and lab work will be used to illustrate embedded systems design techniques, while case study examples will illustrate state of the art applications such as Internet of Things, industrial automation, and robotics.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the principles involved in embedded hardware and software design; 2. Discuss the primary components in an embedded systems; 3. Implement a real-time, embedded industrial control system using an embedded microcontroller with associated interface; 4. Implement an communications device to the embedded microcontroller application.
Class Contact: Lab 2.0 hrs Lecture 1.0 hr Tutorial 1.0 hr Forty-eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and group practical activities. Students will be undertaking practical assignments as part of the laboratory work, assessed as per the assessment breakdown.
Required Reading: Marwedel, P. 2011. Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems, Springer. Forouzan. B., Fagan. S. C., 2012. 5th ed. Data Communication and Networking, McGraw Hill.
Assessment: Laboratory Work, Three (3) Laboratory Based Problem Solving Session Reports (1500 words each), 30%. Presentation, Oral (Group presentation of 20 minutes), 20%. Project, Two Project Team Reports (3000 words each), 50%.

NEE3204 Sensors and Actuators in Sports

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit focuses on the study of sensors and actuators with special emphasis on those used in sports. The first part of the unit will introduce sensors that measure physical quantities such as temperature, force, pressure and acceleration. Sensor characteristics such as sensitivity, resolution, accuracy and bandwidth will be illustrated with respect to the aforementioned sensor modalities. Fundamental interface electronics for these sensors such as the voltage divider and bridge circuits

will be covered. The second part of the unit covers the use of DC motors, belt drives, gears and their variants as examples of mechanical actuators. A review of forces will be done leading to actuator design calculations based on mechanical loading requirements. Case study applications will be employed to illustrate the design considerations and safety for their use.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the merits and limitations of sensors and interface electronics; 2. Apply the fundamental principles of actuators and mechanical loading to real-world problems; 3. Interpret, predict and apply the technical characteristics of sensors and actuators to the design of basic measurement and actuation systems; 4. Integrate and articulate professional ethics and responsibilities for safety criteria in sensor and actuator design.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs

Required Reading: J. Edward Carryer, R. Matthew Ohline, Thomas William Kenny, (2011) 1st ed. Introduction to Mechatronic Design Prentice Hall

Assessment: Test, Mid Semester Test (1 hour), 20%. Laboratory Work, Six (6) Labs (2 hours each), 30%. Examination, Final Exam (3 hours), 50%.

NEE3205 Signal Processing Techniques

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces the student to the fundamentals of digital signal processing with a focus on frequency domain analysis. Students will learn about digital filtering techniques and basic signal transforms. Common digital filter types in both categories of finite impulse response (FIR) and infinite impulse response (IIR) filters will be covered. Topics on digital filter techniques, filter responses and the filter effects on time domain will be discussed. The use of signal transforms such as the discrete fourier transform will be discussed as a tool for investigating signal content from a frequency domain perspective. An overview of advanced signal transforms such as the wavelet transform will also be given. Popular signal processing software (e.g. Matlab), will be used to demonstrate these concepts.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the application need for digital filters and specify their parameters; 2. Elaborate the advantages and limitations of digital filters; 3. Apply signal transforms such as the Discrete Fourier Transform to investigate signal characteristics in the frequency domain; 4. Apply digital filters and signal transforms to data to remove noise and to extract important signal information; 5. Apply these filtering and transform techniques on real data using common engineering software.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs

Required Reading: Richard G. Lyons., (2010) 3rd ed. Understanding Digital Signal Processing Pearson Education

Assessment: Laboratory Work, Four (4) Labs (3 hours each), 40%. Test, Mid Semester Test (1 hour), 20%. Examination, Final Exam (3 hours), 40%.

NEE3207 Analogue and Digital Transmission

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit has been designed to enable students to acquire specialised skills and expertise in the telecommunications field; specifically wireless and fixed network engineering. The unit will enable students to acquire theoretical knowledge, practical and critical analysis skills and apply these to research and complex technological problem solving scenarios. The unit will also enhance students' communication skills and other professional capabilities. The unit aims to alleviate and support employment demand in the telecommunications industry within Australia and overseas. Particular emphasis will be on telecommunication technologies and infrastructure for broadband wireless and optically connected broadband networks. The unit takes into account the current growth drivers of the global telecommunications industry.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate the theoretical concepts of a communication channel and the principles of digital communication systems in collaboratively planning and designing complex communication systems with accountability for personal and team outcomes; 2. Determine optimum signal link paths using Maxwell's equations including taking into account propagation mechanisms; 3. Prescribe antenna solutions to specified requirements and contexts with initiative and judgement; 4. Develop and modify propagation models for wireless communication links as well as design terrestrial and satellite links for a range of situations; 5. Conceptually map cellular network designs with creativity and technical skill; 6. Employ MatLab commands and Simulink to analyse and interpret communication systems; and 7. Interpret and use data generated by communication network elements to optimise performance.

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

Required Reading: There are a number of other textbooks that can be used in conjunction with the required text below. Some of these texts are available online by subscription. Students please check with the Main library. Many other sources of important information are available online.www.ieee.org/exploreZimmer, R. & Tranter, W. (2014) 7th ed. Principles of Communication Wiley.

Assessment: Laboratory Work, Two (2) Laboratory Team Reports (1500 words each), 20%. Test, Mid-Semester Test (1 hour), 30%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE3208 Signal Processing

Locations: Footscray Park.

Prerequisites: NEE2201 - Linear Systems with Matlab Applications

Description: The unit covers analogue and digital signal processing techniques. In the analogue section, the frequency response of amplifiers and feedback configurations will be covered, followed by filter design including filter families such as Bessel, Butterworth, Chebyshev and Elliptic filters. The topic of oscillators and waveform shaping will be covered starting with oscillation criterion, followed by popular topologies such as RC,and LC oscillator families. The digital signal processing section of this unit introduces the students to the fundamentals of deterministic digital signal processing. The topics to be covered include the introduction to discrete-time signals and systems, the z-transform and its properties, sampling of continuous-time signals, anti-aliasing filters analogue to digital signal conversion, the frequency response function and its properties, analysis of discrete-time signal processing systems using transform techniques, design and realization of finite impulse response (FIR) filters and infinite impulse response (IIR) filters. Discrete Fourier Transform (DFT) and its computation with Matlab and Wavelet Transform in Matlab will also be introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate analysis and design calculations for amplifiers; 2. Design

analogue active filter circuits to meet performance criteria of specific application. This includes the selection of suitable circuit topologies for circuit realisation; 3. Analyse oscillator circuits and develop oscillator circuits to achieve specific characteristics and performance; 4. Perform signal to noise ratio analysis of analogue to digital signal conversion processes; 5. Calculate mathematical representations of discrete-time signals and systems; 6. Design and implement finite impulse response (FIR) filters and infinite impulse response (IIR) filters.

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

Required Reading: Oppenheim, A.V. & Schafer, R.W., (2009) 3rd ed. Discrete-Time Signal Processing Prentice-Hall

Assessment: Test, Two (2) Class Tests (1 hour each), 20%. Laboratory Work, Four (4) Lab Reports (1500 words each; Team of Two), 40%. Examination, Final Exam (3 hours), 40%.

NEE4100 Wearable Technology Design

Locations: Footscray Park.

Prerequisites: NEE2104 - Sports Technology Design

Description: This unit will introduce design concepts behind wearable electronics technology, combining previous knowledge of electronics, sensors and embedded systems with the engineering concepts required for wearable design. Topics on human factors, ergonomics and mechanical load-capacity design, theories of static and dynamic failure (following on from material in Sports Technology Design) will be covered in the first part. This will be followed by electronics design optimization, electronic textiles, and flexible electronics and flexible circuits technology. Students will apply knowledge gained by completing a mini project on the design of a wearable prototype to perform a specific measurement task.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the human factors involved in the design of wearables; 2. Apply the concepts of static and dynamic actions to wearable electronic design; 3. Implement concepts in the selection of electronics for a minimalist electronics design; 4. Demonstrate the ability to work both autonomously and as a member of a design team;

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Tutorial 1.0 hr Workshop 1.0 hr

Required Reading: McCann, Jane, and David Bryson, eds. (2009) 1st ed. Smart clothes and wearable technology Elsevier

Assessment: Laboratory Work, Six (6) Labs (2 hours each), 20%. Presentation, Oral presentation (20 minutes per group) and prototype demonstration, 20%. Project, Three (3) Group Project Reports (3000 words max), 60%.

NEE4101 Sports Data Analytics 1

Locations: Footscray Park.

Prerequisites: NEE2105 - Introduction to Data Analytics

Description: This unit builds on NEE2105 Introduction to Data Analytics and covers further concepts of statistical analysis with an emphasis on common statistical distributions, hypothesis testing, and variance analysis methods e.g., ANOVA. Model metrics such as receiver operating characteristics (ROC) and coefficient of variation will be discussed. The concept of feature extraction as a dimension reduction technique will be introduced and basic feature extraction techniques on time domain waveforms will be discussed. These include waveform morphological parameters, signal energy, moving averages and linear discriminant analysis. Applications of the statistical methods described will be explored through a project focused on biomechanical and physiological examples commonly found in sports.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the application need for statistical modelling and feature extraction; 2. Perform basic feature extraction on time domain waveforms; 3. Apply statistical analysis to extracted features using software; 4. Analyse results and present them professionally.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Workshop 2.0 hrs

Required Reading: Runkler, Thomas A., (2016) 2nd ed. Data Analytics: Models and Algorithms for Intelligent Data Analysis Springer-Verlag

Assessment: Laboratory Work, Four (4) Labs (3 hours each), 40%. Test, Mid Semester Test (1 hour), 20%. Project, Final Report (5000 words max), 40%.

NEE4103 RF Engineering

Locations: Footscray Park.

Prerequisites: NEE3207 - Analogue and Digital Transmission

Description: This unit introduces and 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. This unit is tailored for students hoping to begin careers in wireless network designing.

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 5. Utilise and critique different MIMO modes of operation.

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

Required Reading: The prescribed text books will be supplemented by other versions deemed necessary by the unit coordinator Wong, D. K. (2012) 5th edition Fundamentals of wireless Communications Hoboken/Wiley Rappaport T,S. (2007) 2nd edition Wireless Communications. NJ/Prentice Hall Molisch, A. F. (2005) 2nd edition Wireless Communications Chichester/Wiley

Assessment: Test, Mid-semester (2 tests of 1 hour duration), 20%. Laboratory Work, Laboratory exercise (4 labs with 4 pages of report on each lab), 20%. Examination, Final (3 hours closed book), 60%.

NEE4105 Alternative Energy Systems and Power Electronics

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide applied and creative knowledge and skills in the two broad areas of alternative energy systems and power 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 provide the basis for the consideration of alternative energy systems. Part A will revise conventional energy systems and the emissions associated with these systems. Then, the students will be introduced to unconventional energy sources such as solar, wind, biomass and fuel cells as well as energy storage technologies. Technical properties, environmental and economic advantages of these technologies will be discussed and learning activities will focus on mathematical modelling, and analysis of these alternative generation technologies. Finally, Part A will focus on the design of hybrid systems and their integration to existing distribution and transmission systems. Part B - Power Electronics: Part B provides an introduction to the theory, design and analysis of conversion of electric power by means of power electronics, including AC to DC and DC to DC power converters. The fundamental knowledge of electronic speed control techniques for DC motor drives will be covered for different applications. AC-DC single-phase and three-phase power converters: Diode and SCR bridge rectifiers will be explored. 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, flyback converters, and push pull converters. First quadrant, two quadrant and four quadrant drive. Different electronic speed control techniques for DC motor drives will be studied.

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 basics and operations of power semiconductor switches; 5. Critically review the theoretical concepts informing building blocks of power electronics conversion as they are implemented in different operational environments; 6. Analyse AC/DC and DC/DC power converters; and design different types of switching power supplies to increase efficiency; 7. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

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

Required Reading: Lecture and tutorial handouts will be distributed as required. 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. Simoes, M. G. and Farret, F. A. (2016) 1st ed. Modeling Power Electronics and Interfacing Energy Conversion Systems John Wiley & Sons.

Assessment: Laboratory Work, Two (2) 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%.

NEE4110 Electrical Power Systems, Analysis and Operation

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit will analyse electricity distribution in the deregulated Australian power industry to critically examine the planning, design and operation of electrical transmission and distribution networks. Network calculations and the bus-admittance matrix will be covered. The concept of load flow analysis and its use in network planning and analysis will be explored. Contemporary approaches including Gauss-Seidel, Newton-Raphson, and Fast Decoupled load flow analysis methods and their application to the solution of complex networks will demonstrate alternative and complementary strategies in the operation, design and planning of electrical distribution and transmission networks. The subject addresses electrical insulation properties and characteristics, insulator selection and co-ordination in electric energy networks. Sources of overvoltages, lightning impact on transmission and distribution networks, surge propagation theory, circuit interruption theory and circuit breaker operation are investigated as enduring challenges to be addressed through networks. The unit also considers the impact of breakdown in gases, liquids and solids on the provision of reliable electrical insulation in electrical networks.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Examine and evaluate different techniques of load flow solutions including calculations of voltage, angles, losses, generated reactive power, and slack power; 2. Model accurately a multi-bus system and carry out load flow studies; 3. Justify the selection and application of contemporary engineering methods to propose solutions to complex power system problems; 4. Analyse electrical insulation properties and characteristics including: insulator selection, insulation co-ordination in electric energy networks to optimise operational reliability; 5. Explore impacts of overvoltages, and lightning on transmission and distribution networks, 6. Investigate surge propagation and circuit interruption theories and circuit breaker operation on reliable insulation and protection of electrical networks;

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

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

Assessment: Laboratory Work, Four (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%.

NEE4120 Analog and Digital Transmission

Locations: Footscray Park.

Prerequisites: NEE3101 - Telecommunications It is also recommended that the student will have successfully passed all second year electrical engineering units.

Description: This unit is designed to provide the theoretical basis for the understanding of the engineering aspects of analogue and digital transmission which leads to the design, construction, and operation of existing and emerging communication systems. It is expected that the unit will provide the support for students requiring

basic knowledge of analog and digital transmission in order to handle concurrently studied Engineering Design projects that involve various aspects of analog and digital transmission in communication systems. Consequently the syllabus is to be presented as a collection of specialised lectures, the emphasis and sequence of which may be varied to accommodate the demands of any concurrent PBL exercises. Optical systems as well as optical transmission infrastructure will be introduced. In addition to delivery by lecture and tutorial, the unit will incorporate laboratory exercises and demonstrations of the concepts and techniques presented.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine signals and their characteristics as depicted in time and frequency domains; 2. Translate the information bearing nature of signals and the bandwidth considerations; 3. Implement the principles behind frequency translation and its depiction as various types of modulation; 4. Exploit the signal transition in linear and non-linear systems, and the recognition of such systems in terms of filters and other components; 5. Determine the types of noise present in telecommunication systems and the characterisation of thermal noise; 6. Perform the statistical analysis of random signals and the characterization of such signals in terms of correlation and power spectral density functions; 7. Employ the concept of signal to noise ratio and its influence in faithful reception of analog and digital signals; and 8. Outline the assessment of performance in digital communication systems in terms of bit error probability.

Class Contact: Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work

Required Reading: The prescribed textbooks are suplemented by many other textbooks most of which avail electronic copies on websites such as www.wiley.com.K.Daniel Wong (2012) Fundamentals of comunication engineering technologies Wiley Simon Haykin & Michael Moher (2009) 5th Communication systems Wiley N.Benvenuto et al (2007) Communication systems Wiley Students are encouraged to be imaginative and also explore other publishers that have a different approach to what is prescribed above.

Assessment: For group lab reports staff will take into account individual contribution when awarding marks. A student must pass each assessment item in order to pass the unit. Laboratory Work, Continuous assessment in laboratory work, 20%. Test, Mid-semester written test, 30%. Examination, End-of-semester examination, 50%.

NEE4200 Biomechatronics

Locations: Footscray Park.

Prerequisites: NEE2104 - Sports Technology DesignNEE3204 - Sensors and Actuators in Sports

Description: This unit introduces the concept of biomechatronics as a new of field of mechatronics applied to humans. This unit builds on earlier units in sensors and actuators and engineering design. Students will cover concepts of biosignals and biosignal conditioning circuits, kinematic sensing, and movement actuators as additional core hardware components of a biomechatronic system. The second part of the unit explores the engineering performance of designs using suitable Finite Element Analysis software tools supported by the fundamental theory of finite element analysis. Selected case studies in prostheses, exoskeletons and haptics will be covered. Design guidelines will be emphasized where required.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Research the state of the art in bio mechatronics; 2. Select sensors suitable for human motion monitoring and human bio sensing; 3. Analyse and design actuators to aid in artificial human movement; 4. Analyse the limitations of these designs using finite element analysis software; 5. Demonstrate the ability to work collaboratively with colleagues and produce tangible results

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: Graham Brooker, 2012 1st Introduction to Biomechatronics (Materials, Circuits and Devices) SciTech Publishing

Assessment: Test, Mid Semester Test (1 hour), 20%. Laboratory Work, Six (6) Labs (2 hours each), 30%. Examination, Final Exam (3 hours), 50%.

NEE4202 Sports Data Analytics 2

Locations: Footscray Park.

Prerequisites: NEE2105 - Introduction to Data Analytics

Description: This unit continues the data analytics concepts discussed in NEE2105 Introduction to Data Analytics, with a focus on classification and function estimation. Students will cover basic classification techniques such as clustering to more advanced pattern recognition techniques based around artificial neural networks. These will then be extended to the more general idea of regression as a technique for function estimation. Emphasis will be placed on the use of computational software which now implements the popular classification and regression algorithms. The role of feature extraction, model testing and validation will also be covered with respect to the algorithms discussed. Application data samples will be derived from sports and healthcare problems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the application needs for classification and regression; 2. Explicate and apply the methodology behind basic classification and regression algorithms; 3. Implement classification and regression on data analysis using common engineering software; 4. Interpret classification and regression results and provide fundamental interpretations; 5. Work in groups to problem solve and present solutions in a professional and ethical manner.

Class Contact: Lecture1.0 hrPC Lab1.0 hrWorkshop2.0 hrs

Required Reading: Runkler, Thomas A., (2016) 2nd ed. Data Analytics: Models and Algorithms for Intelligent Data Analysis Springer-Verlag

Assessment: Laboratory Work, Four (4) Labs (3 hours each), 40%. Test, Mid Semester Test (1 hour), 20%. Project, Final Report (5000 words max), 40%.

NEE4204 Computer and Fuzzy Logic Control Systems

Locations: Footscray Park.

Prerequisites: NEE3201 - Introduction to Control Systems

Description: The unit introduces pulse transfer functions and covers conversion of a continuous-time transfer function model into a zero-order hold equivalent pulse transfer function model. Conversion between pulse transfer function models and difference equation models are also treated. Analysis and design of discrete-time control systems with the Root Locus method and Bode diagrams in conjunction with the Bilinear transformation are emphasised. Performance trade-off in control design problems is discussed. The unit also introduces fuzzy sets theory in terms of fuzzy set definitions, properties of fuzzy sets, and operations on fuzzy sets. Concepts of fuzzy relations are also covered. Natural language formalisation and approximate reasoning using linguistic variables, fuzzy propositions, fuzzy if - then statements, and inference rules are emphasised. This will be followed by the introduction of theoretical design, analysis, and practical implementation of fuzzy controller design in the form of the structure of a fuzzy controller, the rule base, the data base, the inference engine, the choice of fuzzification and defuzzification methods.

Credit Points: 12

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

1. Experiment with use of pulse transfer functions in the description and analysis of computer controller systems; 2. Competently convert a continuous-time transfer function model into a zero-order hold equivalent pulse transfer function model; 3. Analyse and design discrete-time control systems with the Root Locus method; 4. Analyse and design discrete-time control systems with the use of Bode diagrams in conjunction with the Bilinear transformation; 5. Research into the need for permance trade-off in control design problems; 6. Review the basic mathematical concepts of fuzzy sets and the structure of fuzzy logic controller; 7. Competently design and implement fuzzy logic controller; and 8. Develop MatLab/Simulink models to analyse, design, and implement discrete-time and fuzzy logic control systems.

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

Required Reading: Fadali, M.S. and Visioli, A. (2012) 2nd ed. Digital Control Engineering: Analysis and Design Academic Press. Trillas, E. (2015) Fuzzy logic: an introductory course for engineering students Springer

Assessment: Laboratory Work, Three Lab Reports (1500 Words each; Team of two), 20%. Test, Mid-semester Test (1 hour), 20%. Project, Fuzzy Logic Control Project Report (2500 Words; Team of two), 20%. Examination, End of Semester Exam (3 hours), 40%.

NEE4208 Satellite and Broadband Link Design

Locations: Footscray Park.

Prerequisites: NEE3207 - Analogue and Digital Transmission

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 Satellite wave 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. Critically evaluate the technical fundamentals to design satellite links; 2. Apply high level technical competence in developing link budgets for a given microwave/satellite link; 3. Generate appropriate solutions to the design requirements for a low earth orbit satellite and a geostationary satellite; 4. Solve and implement techniques to guard against problems in satellite communications; and 5. Critically appraise the limits of the link performance for both microwave and satellite links.

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

Required Reading: The prescribed texts although old, are fundamental to satellite communication teaching.Pritchard, W., (2009) 2nd ed. Satellite Communication System Engineering. Pearson India Elbert, B., (2008) 2nd ed. Introduction to Satellite Communication. Artec House

Assessment: Test, Two Mid-semester Tests (1 hour each), 20%. Laboratory Work, Four Lab Reports (4 pages of report per lab), 20%. Examination, Final Examination (3 hours closed book), 60%.

NEE4211 Mobile Networks and Communications

Locations: Footscray Park.

Prerequisites: NEE3207 - Analogue and Digital Transmission

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Mobile and Personal communication engineer. This unit gives an overview of cellular Network design where students are taught Capacity calculations, Cell site engineering, Cell splitting and sectoring. Cellular network access mechanisms such as FDMA, TDMA and CDMA are analysed. Topics of interest such as Simplex, Half Duplex, Full Duplex, DSSS and Frequency Hopping are also taught. The unit further explores Spectral efficiency, Air link interface, Radio resource management, Mobility management, Handover and general Cellular traffic. In addition, Cellular networking, Micro and macro cellular systems, GSM, WCDMA, LTE systems and Mobile data networks are topics the unit covers. The wireless enterprise, PMR, Simulcast, Trunking, Standardisation, Security issues, Regulatory environment, Emerging and Future Standards are also covered to enhance student employability on graduation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialised technical cell planning for a specific wireless communication system; 2. Utilise a systems approach to evaluate wireless system performance in terms of quality of service and grade of service; 3. Critically review and implement radio cell planning software tools; 4. Survey and investigate the operation of the key wireless standards, GSM, WCDMA LTE and dimension networks accordingly; 5. Develop procedures for the operation and identification of strengths and weaknesses of popular wireless multiple access techniques.

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

Required Reading: These three text books complement the teaching of this unit.Holma, H., & Toskala, A. (2009) 6th ed. LTE for UMTS, OFDMA and SC-FDMA Based Radio Access Chichester/Wiley Holma, H., & Toskala, A. (2010) 5th ed. WCDMA for UMTS - HSPA Evolution and LTE Chichester/Wiley Molisch, Andreas F. (2010) 2nd ed. Wireless Communications Chichester/Wiley

Assessment: Test, In-Class Test (2 hours), 20%. Laboratory Work, Laboratory Reports

(2000 words each; Team of Two), 30%. Examination, End-of-Semester Examination (3 hours), 50%.

NEE4212 Electric Energy Systems Protection and Communication

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study aims to provide applied and creative knowledge and skills in the two broad areas of electric energy systems protection and communication. The unit is delivered in two parts: Part A - Protection: Part A covers the planning, design and operation of electrical protection systems for the generation, transmission and distribution systems of electric energy: planning, design standards and performance requirements; principles and types of protection systems (over-current, impedance, differential, backup, fuses); application of protection to generators, motors, transmission lines, transformers, busbars, and distribution; sources of overvoltage, lightning impact on transmission and distribution networks, surge propagation theory, circuit interruption theory; instrument transformers steady state and transient behaviour; electrical studies for planning and design of protection systems; power system communications for protection application. Part B - Communication: Part B deconstructs the relationships between power system automation, control, and communication concepts and technologies, as integral elements of a state of the art power system network, i.e. a smart grid. Power system automation, protection and control concepts will be studied with examples from real world applications such as SCADA technologies. Part B will also review the communication technologies, network topologies, and standardization efforts in the power systems communication arena, and discuss the relevant standards, communication architectures, and protocols developed for use in these networks. Security concerns in power system communication networks will be outlined and the importance of developing and maintaining a secure network against cyber-attacks will be further elaborated.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate the implementation of different protection schemes applicable to generation, transmission and distribution systems; 2. Design protection systems including relay settings and protection coordination; 3. Design for the use of communication media and architectures in power systems; 4. Evaluate and assess recent innovations on power system communications; such as the IEC 61850 protocol; 5. Critically review the communication standards, protocols and architectures most commonly employed in power system protection and distribution networks; and 6. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

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

Required Reading: Lecture notes and hand outs. Kalam, A. and Kothari, D.P. (2010), 1st ed. System Protection and Communications, New Age International (P) Ltd, Ozansoy, C. (2010), 1st ed. Modelling and Object Oriented Implementation of IEC 61850, Lambert Academic Publishing, Saarbrucken, Germany.

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

NEE4214 Overhead and Underground Power Line Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit advances students' skills and capabilities to work in the electrical power supply industry. Students will gain specialist knowledge about cable systems, types of system topologies, manufacturing practices and standards. They 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 addressed. Subsequently, basic underground cable design practices are reviewed and installation practices for both transmission and distribution projects are considered as well as relevant application concepts such as hydraulic pressures, commissioning and industry standards. Students will also study power delivery requirement (in voltage and megawatts) and the maximum outage in order to specify the electrical, mechanical and environmental requirements for an Australian overhead line.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialist technical knowledge of cable systems, types of systems, manufacturing practices and standards to a variety of current professional contexts; 2. Design and implement specifications for the equipment needed for an underground system design; 3. Apply specialist knowledge of underground cable design practices and installation practices for both transmission and distribution projects; 4. Critically apply specialised technical knowledge and skills to ascertain the electrical, mechanical and environmental requirements for an Australian overhead line for a given power delivery requirement; 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 a given overhead line in regards to construction and maintenance for the next 30 years considering OHS issues and ongoing operational regimes; and 7. Collaborate with others with responsibility and accountability for own learning in planning, problem solving and decision making in professional practice.

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

Required Reading: To be advised by the unit coordinator.

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

NEE4220 Wireless and Broadband Communications

Locations: Footscray Park.

Prerequisites: NEE3101 - Telecommunications NEE3207 - Analogue and Digital Transmission NEE3101 OR NEE3207 Successful completion of 192 credit points.

Description: This unit offers an overview of digital modulation with emphasis on wireless applications. It is expected that the following commonly used modulation schemes such as QPSK, MSK, GMSK and QAM will be studied. Students will be taught Vector space representation of digital signals, Correlation receiver, Matched filter receiver, Signal-space representation of noise, Maximum likelihood sequence estimation (MLSE) detector and performance in AWGN channels. Network Access schemes such as CDMA and OFDM and their application to wireless LAN and Cellular

Systems will be introduced. A Layered structure of computer communication protocols such as ISO OSI 7 layer model and TCP/IP protocol suit will be covered. Network connecting devices such as repeaters, hubs, bridges, routers, and gateways will be covered in addition to IP and IP addressing. This will be followed by Sub-netting, super-netting, Routing protocols, ARP and RARP, ICMP and IGMP plus Transport layer protocols; UDP and TCP will be covered. These topics will be enhanced by Flow control, error control, and congestion control in TCP. Routing protocols, RIP, OSPF, and BGP will be introduced. We hope to cover modern optical Networks and the application of Dense Wavelength Division Multiplexing (DWDM) in short and long haul communication.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Investigate digital communications and modulation as used in weird and wireless transmission; 2. Analyse receiver techniques for digital modulation links; 3. Evaluate and contrast key wireless systems: GSM, WCDMA and WLAN; 4. Formulate the basic principles involved in data communication systems; 5. Critically review the data network architecture, operation, and performance analysis; 6. Evaluate the protocols employed in data networks; 7. Explore the particular aspects of local area and wide area networks; and 8. Synthesize wireless networks, their operation, and interfacing with network backbone.

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

Required Reading: Forouzan, B.A. (2010) 4th ed. TCP/IP Protocol Suite McGraw Hill. Haykin, S. and Moher, M. (2009) 5th ed. Communication Systems John Wiley & Sons.

Assessment: Laboratory Work, Two (2) Laboratory Group Reports (Team of two, 2,000 words each), 15%. Test, Mid-Semester Written Test (1 hour), 15%. Examination, End-of-Semester Examination (3 hours), 50%. Project, Full Semester Project Report (3,000 words; Team of Two), 20%.

NEF2101 Fluid Mechanics 1

Locations: Footscray Park.

Prerequisites: NEM1001 - Algebra and Calculus

Description: Fluid Mechanics deals with the study of the properties and movement of liquids. Fluids are found and used in every facet of our lives, ranging from the water we are so much dependent on to complex hydraulic machines. The history of fluid mechanics is as old as civilisation itself, as water has been used for centuries for irrigation, power, navigation, and so on. This unit of study aims to provide students with a strong understanding of the basic concepts of fluid mechanics, which is essential for most engineering disciplines. It would introduce and teach students numerous concepts in static fluids as well as fluids in motion. Most of these concepts would be taught using practical examples found in day-to-day life (eg. objects immersed in water, water flowing in garden hoses and pipes, pumps, etc). Practical lab experiments would be undertaken to explain these concepts using hands-on experiments and demonstrations. Topics include: Hydrostatics, pressure, force on immersed surfaces; Pressure measurement, piezometers and U-tube manometers; Stability of floating bodies, Archimedes principle and metacentric height; Hydrodynamics, classification of flows, continuity, momentum and energy equations and their applications; Flow in pipes, pipe friction equations and Moody's diagram, Flow measurement in pipes (venturi meter and orifice meter); Pumps, types of pumps, performance equations, affinity laws, pumps in series and parallel, cavitation and surge.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts of Fluid Mechanics (hydrostatics as well as hydrodynamics), complemented with practical laboratory based experiments; 2. Calculate hydrostatic force on submerged bodies; 3. Evaluate the factors that control the stability of floating bodies; 4. Use continuity, momentum and energy equations to solve problems related to pipes and inter-reservoir pipe flow; and 5. Identify types of pumps and select suitable pumps for a variety of situations.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 2.0 hrs Forty Eight (48) hours for one semester comprising a mixture of lectures, tutorials and group based practical laboratory experiments. Weekly contact is four hours comprising of a lecture and either a tutorial or a lab.

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

Assessment: Practicum, Two lab experiment based assessments with group report for one assessment, 20%. Test, One mid-semester test, 15%. Examination, End of Semester Examination (3 hours), 65%.

NEF2251 Fundamentals of Electrical and Electronic Engineering

Locations: Footscray Park.

Prerequisites: NEF1205 - Engineering Fundamentals 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. Part A - Electrical Circuits. Part A begins with a revision of basic fundamentals including Direct-Current (DC) circuits. The concept of nodal-analysis (node-voltage method) for the analysis of DC circuits is introduced. The principle of Superposition, derivation of Thevenin and Norton equivalent circuits are discussed in detail as well as the maximum power transfer theorem. Alternating-Current (AC) circuits are explored and the analysis of these circuits using complex numbers is covered. Three-phase AC systems are studied and the concept of power factor correction is introduced. An overview of electrical transformers is given. Finally, DC and AC motors are examined as well as synchronous generators. Part B - Digital Electronics. Part B begins with a discussion of number systems including the binary system and hexadecimal numbers. Arithmetic operations and Boolean expressions and their reduction techniques are explored. The design of combinational digital circuits using NAND/NOR design techniques/gates, latches, and flip-flops is introduced and studied in detail. These are done through Karnaugh Maps and Boolean Algebra. Special emphasis is given to the study of sequential digital circuits and their design techniques. Finally, asynchronous and synchronous counter circuits, analogue to digital conversion and microprocessor interface devices are introduced.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse and solve DC, AC circuits and balanced three-phase systems using a range of techniques; 2. Appraise the significance of transformers in electric circuits and how they operate, and perform transformer operational and performance calculations; 3. Investigate the operational principles of motors and generators, and use their equivalent circuits to estimate their operating and performance characteristics; 4. Distinguish a range of number systems including the binary system, octal and hexadecimal systems and convert between these different number systems; 5. Identify different Logic Gates, truth tables and examine their use in

given contexts; 6. Develop and simplify Boolean expressions using Boolean laws and in sum of products and/or product of sums expressions from logic truth tables; 7. Design and optimise combinational and sequential digital circuits using NAND/NOR design techniques as well as asynchronous counters for a given count sequence; 8. Assess the significance of analogue to digital conversion in electronic circuits; and 9. Collaborate effectively with responsibility for personal and group outputs.

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

Required Reading: Glover, J.D. (2012) 5th edition Power Systems: Analysis and Design Cengage Learning Tocci, R.J. & Widmer, W.D. (2010) 11th edition Digital Systems: Principles and Applications. Prentice-Hall Rizzoni, G. (2006) 5th edition Principles and Applications of Electrical Engineering. McGraw Hill

Assessment: Test, Two (2) Class Tests (one (1) hour), 20%. Laboratory Work, Two (2) Laboratory Group Reports (1000 words each), 20%. Examination, Final Examination (3 hours), 60%.

NEF3101 Project Management

Locations: Footscray Park.

Prerequisites: Completion of at least 96 Credit Points

Description: Prospective employers in the Industry seek Graduates with strong project management skills to ensure that projects deliver specified outcomes and are both sustainable and profitable. This Project Management unit introduces students to a project management framework - the Project Management Body of Knowledge (PMBoK). Students will learn network planning with Gantt charts, resource allocation and scheduling techniques for executing engineering projects. The unit also addresses topics such as feasibility studies and project evaluation, contract administration and tendering processes and conducting financial feasibility studies for projects.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map and apply a project management framework (PMBoK) to selected engineering projects; 2. Conduct technical and financial feasibility studies; formulate a detailed project management plan, design network logic diagrams, determine critical paths and optimise project resources; 3. Administrate contracts and preparation of tender documents; 4. Create project plans/schedules and conduct critical path analysis; apply commercially available software, such as Microsoft Project to support budget, resource and time management within an engineering project; 5. Develop project cash flows and budgets with respect to project control at various stages of projects.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr

Required Reading: Lecture Materials and associated Notes will be distributed to students as required. Meredith, J.R., Mantel, S.J., Hoboken, H. and Jr. Meredith, J.R. (2014) 9th ed. Project management: a managerial approach NJ : John Wiley There are a number of other textbooks that can be used in conjunction with the required texts. Some of these texts are available online by subscription. For example, Harold Kerzner, Harold Hoboken Project management [electronic resource]: a systems approach to planning, scheduling, and controlling (2013) 11th ed. N.J. Wiley.

Assessment: Report, Develop a Due Diligence Report (first six weeks) and a Project Management Plan (PMP) - second six weeks; Group Reports (2500 words each), 20%. Presentation, Two group Oral Presentations (1) at the completion of Due Diligence report and (2) at the completion of the PMP report (5 mins/ student/presentation), 10%. Report, MS Project Computer Lab Report - Group (based on a Case Study - 1500 words each) - 1 to 12 weeks, 20%. Examination, End-of-Semester Examination (3 hours), 50%. The examination focuses upon the individual student's ability to demonstrate his or her ability to fluently apply engineering techniques, tools and resources, as defined in Engineers Australia competency 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within both reports or the presentation. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEF3201 Engineering Management

Locations: Footscray Park.

Prerequisites: Completion of at least 96 CP

Description: Prospective employers in contemporary engineering disciplines seek graduate engineers with strong management knowledge and skills. This unit is designed to teach specialised engineering management concepts graduates need to perform their duties industry. Topics covered include principles of engineering management, project tendering process, principles of life cycle engineering, financial modelling of engineering systems and planning techniques for repetitive engineering processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the time value of money concepts for the economic evaluation of engineering systems or projects; 2. Implement general management principles for the successful delivery and management of engineering projects; 3. Exhibit the ability to apply techniques for repetitive construction or production; evaluate project performance 4. Articulate and apply basic principles of project life cycle costing, including reporting, planning and evaluation of systems; 5. Examine from an economic and functional viewpoint the feasibility of alternative design solutions; and 6. Demonstrate the ability to apply financial modelling to a project, including conduct of sensitivity analyses and application of techniques to account for uncertainty in the project evaluation process.

Class Contact: Lab 1.0 hr Lecture 1.0 hr Tutorial 2.0 hrs Forty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work.

Required Reading: There are a number of other textbooks that can be used. Some of these texts are available online by subscription. Students please check with the Main library.

Assessment: Test, Mid Semester Test (Week 6, 50 minutes), 20%. Report, Develop a Financial Model using MS Excel and submit a report - Group Assignment (1 -12 weeks), 30%. Examination, Semester Examination (3 hours), 50%. The examination focuses upon the individual student's ability to demonstrate his or her ability to fluently apply engineering techniques, tools and resources, as defined in Engineers Australia competency 2.2. In addition, the tasks assess the student on the individual components of Learning Outcomes (LO) (1 to 5) which are not assessed within both the test and report. As the examination is the one clear way by which these competencies and LO's can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination in order to pass the unit. In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEF4102 Capstone Project 1

Locations: Footscray Park.

Prerequisites: NEF3101 - Project ManagementNEF3101 PROJECT MANAGEMENT AND have completed 288 credit points from the Course

Description: The capstone project is the culminating experience of the student's

engineering program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial engineering project or research project, related to the student's discipline area. Students will take the responsibility to organise, plan and carry-out the various tasks required for successful completion of the project. Students will be taught research methods to support this activity. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. This unit focuses on the research, scoping, designing and planning of the project. Project proposals will be presented as a report as well as end-of-semester oral presentation. Upon successful completion of this unit, students will continue with Capstone Projects B where the project outcomes will be created and delivered.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse the problem; 2. Use Engineering research methods to evaluate the feasibility of a range of solutions taking into account such factors as cost, technical requirements, business requirements, environmental and sustainability issues; 3. Synthesise, prototype, critically analyse and/or test project designs or research hypotheses ensuring that design outcomes meet client specifications; 4. Effectively plan a project and confidently perform all aspects of project management including scoping, planning, scheduling, resourcing, risk assessment, reviewing, delivering, evaluating and contract management; 5. Produce a range of high quality professional and technical documents including a project proposal; project contract; project management plan; and PowerPoint presentations; and 6. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and one (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors.

Required Reading: None required.

Assessment: Presentation, Oral Presentation (7 minutes per person), 10%. Report, Project Proposal (See detail below), 60%. Project, Project Management Plan (See detail below), 30%. In the project proposal, students will apply their skills and knowledge to critically analyse a complex engineering problem or research question, conduct a detailed literature review and investigation and propose a detailed solution or hypothesis to be tested. In the Project Management Plan students will document the complete design of their engineering solution or research investigation as well as a detailed plan on how the engineering solution will be created or how the research investigation will be conducted. This will include a detailed work break-down structure, identification and allocation of resources, risk analysis and records of meetings and communications with the supervisor and other parties involved with the project. In the oral presentation, students will present their proposal in a clear, effective and professional manner. The student is required to satisfactorily complete and pass the project proposal before attempting the project management plan.

NEF4105 Professional Engineering Practice

Locations: Footscray Park.

Prerequisites: NEF3101 - Project ManagementNEF3201 - Engineering Management

Description: This unit is designed to prepare engineering students for professional life. One component involves students in career planning, preparing a resume and portfolio, and undertaking a mock interview process. Another component focuses on the Codes of Ethics of Engineers Australia and similar bodies, professional conduct of engineers and their social, economic, legal and environmental responsibilities. Students are also oriented to the interface between engineering, business and labour: the nature of engineering and business organisations; their administrative, marketing and financial activities; issues around intellectual property rights; business start-up and sources of business finance; industrial hazards and safety; and union activities. The importance of lifelong learning, and community engagement, participation and contribution are also addressed.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate comprehensive understanding of professional opportunities and recruitment practices in a range of employment documents and mock interview; 2. Critically review the role of a professional engineer, codes of ethics and standards of professional engineering bodies and speculate on their application in specific contexts; 3. Justify the importance of community participation and professional development by engineers and reflect on the nature of their potential contribution to lifelong learning; 4. Appraise workplace hazards and safety and make recommendations accordingly; 5. Assess the role of unions and collective bargaining in an organisation and predict areas of contest and possible resolution; 6. Investigate and analyse intellectual property matters affecting the engineering profession; 7. Compare business types, appraise regulatory requirements of starting a business and create a business plan with emphasis on securing funding.

Class Contact: Lecture1.0 hrPC Lab1.0 hrTutorial2.0 hrsForty eight (48) hours or equivalent for one semester comprising of lectures, tutorials, and laboratory work. Students will be working on their assignments and reports as part of the laboratory work.

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

Assessment: Assignment, Individual Employment Documents and Mock Interview (1000 words), 20%. Case Study, Individual Report on Professional Conduct & Development, and Ethics (1000 words), 20%. Essay, Individual Essay on Inquiry into Workplace Safety, Intellectual Property, and/or Union Activities (1000 words), 15%. Assignment, Business Plan Report (Team of two; 2500 words), 35%. Presentation, Business Plan Presentation (Team of two; 15 minutes), 10%.

NEF4202 Capstone Project 2

Locations: Footscray Park.

Prerequisites: NEF4102 - Capstone Project 1

Description: The capstone project is the culminating experience of the student's engineering program and provides students with the opportunity to apply and integrate their knowledge and skills gained from earlier years. This is achieved in a context of a year-long and substantial engineering project related to the student's discipline area. Students will take the responsibility to organise, plan and carry-out the various tasks required for successful completion of the project. Wherever possible, projects will be sourced from industry partners. Projects may be undertaken by individual students or in small teams. This unit continues the work done by students in the prerequisite unit Capstone Project 1. In this unit, the project outcomes will be created and delivered to the satisfaction of the client. At the completion of the unit, students will hand over their project deliverables and present project outcomes in a report as well as end-of-semester oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering knowledge to create, test and validate project designs or research activities to deliver on outcomes that meet client specifications; 2. Effectively manage a complex design or research project; 3. Produce a range of

high quality professional and technical documents including project reports; and PowerPoint presentations; and 4. Communicate with all stakeholders in an ethical and professional manner and confidently defend ideas and proposals to the client and university audiences.

Class Contact: One (1) hour per week and (1) hour of meeting with an academic mentor. This unit is delivered in problem-based learning mode, and students are expected to spend a substantial portion of their time working independently. Students are expected to attend weekly meetings with their mentors.

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

Assessment: Presentation, Final Oral Presentation (7 minutes per person), 10%. Report, Project Report (20,000 - 32,000 words equivalent , maximum of 4 team members. See details below), 40%. Project, Project Assessment (monitoring of student/s progress), 50%. The project outcome is assessed against the project proposal and required deliverable from semester 1. Project assessment is required to be completed with a minimum satisfactory pass to complete the unit. The project report documents the creation of project deliverable or research outcomes with detailed analysis and evaluation of the project. The outcomes of the project are also presented orally in the final oral presentation.

NEM2101 Mechanical Engineering Design

Locations: Footscray Park.

Prerequisites: NEF1204 - Introduction to Engineering DesignNEF1205 - Engineering Fundamentals

Description: During this unit students will work individually and collaboratively to develop broad skills in designing a range of machine elements using both mathematical and computer based methods. The first half of the unit will focus on the design of mechanical components for static conditions. It will also follow on from stress analysis theory with a more specific emphasis on failures resulting from static loading and its influence on mechanical engineering design. The second half of the unit will focus on design optimisation techniques which will include graphical optimisation, linear programming and will also introduce students to computer based topology optimisation. Throughout the unit computer aided drawing (CAD) software will also be used to design and generate solid models of mechanical elements. The computation methods presented in the unit follow on from those introduced in the unit Introduction to Engineering Design and are included to provide students with skills in using design software which is often used in engineering practice.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental mechanics and scientific skills to the design and selection of mechanical elements 2. Identify, formulate and solve engineering design problems in a systematic way 3. Create innovative solutions to complex engineering problems using relevant computer software 4. Select and justify the use of mathematical methods to optimise mechanical engineering designs 5. Adapt mechanical engineering design skills to solve authentic, 'real-world' problems taking into consideration relevant variables

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

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

Assessment: Portfolio, Part 1: Individual drawing portfolio (before week 6) Part 2: Mathematical Optimisation Solutions (after week 6), 20%. Assignment, Group design & analysis task, 15%. Assignment, Group CAD challenge, 15%. Examination, Final Examination (2 hours), 50%.

NEM2102 Introduction to Engineering Materials

Locations: Footscray Park.

Prerequisites: Nil.

Description: Atomic structure and bonding and its effect on mechanical and physical properties of solids. Introduction to microstructures of polymers, metals and ceramics. Fundamentals of cement and concrete microstructure- property relationships; classification of cementitous materials for engineering design. Deformation mechanisms in crystalline solid. Mechanism of strengthening of metals; phases in alloys. Introduction to phase diagrams and their application to ferrous alloys. Phase transformations through time-temperature- transformations and their applications to heat treatment of plain carbon steels and cast irons. Structure-property relationship in alloy and stainless steels.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop an understanding of microstructure- property relationship of solid materials; 2. Develop appreciation of limitations of basic materials in engineering design; 3. Develop cognitive skills in decision-making process for areas of optimum engineering design; 4. Cognisance of the role materials play in maintaining a sustainable environment; and 5. Produce written technical reports individually and as a part of a team.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Rojter, J (2014) Introduction to Engineering Materials, Lecture Notes Victoria University Callister, D.W. Jr (2013) Materials Science and Engineering - An Introduction John Wiley & Sons Budinski, G.K. & Budinski, K.M. (1999) Engineering Materials - Properties and Selection Prentice-Hall Askeland, R.D., & Fulay, P.P. (2008) Essentials of Materials Science and Engineering, Cengage Learning Stamford CT, USA

Assessment: Students will work in groups but present individual components in the team reports. The reports will be used for formative assessment. Assignment, Student will as a team submit a major report based on open-ended current technical issues. The report will also include individual reflective journals, 18%. Test, Mid-semester, covering introductory lectures, 20%. Examination, Covering large part of the course including laboratory and assignment work, 50%. Laboratory Work, Require demonstration of laboratory skills, analysis of data, library research to contextualize knowledge acquired in the course of experimentation, 12%. Total combined assessment word equivalence is approximately 5000 words. Additional conditions: Attendance in all laboratory sessions is compulsory.

NEM2104 Numerical Modelling of Mechanical Systems

Locations: Footscray Park.

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

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

topics in the unit will be studied using real-life applications of engineering and physical phenomena.

Credit Points: 12

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

Class Contact: Lecture 2.0 hrs Workshop 2.0 hrs Matlab required an all computers

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

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

NEM2201 Thermodynamics 1

Locations: Footscray Park.

Prerequisites: NEF1202 - Engineering Physics 2

Description: This unit builds on NEF1202 - ENGINEERING PHYSICS 2, as the first Thermodynamics subject for Mechanical Engineering students. It will lead to a thorough understanding of and the fluent skills of applying the Fist Law of Thermodynamics. Students will apply the First Law of Thermodynamics to various simplified engineering problems. The subject then introduces the Second Law of Thermodynamics and its relevance in setting the directions of the engineering processes. The unit elaborates on the upper limits and for some ideal processes. It then quantifies the Second Law of Thermodynamics using entropy, introduce the entropy increase principles and calculate the irreversibility changes during various engineering processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the thermodynamics properties of pure substance and apply the ideal gas law to a range of engineering situations; 2. Apply systematic engineering synthesis with initiative and judgement to distinguish the various closed and open systems from engineering applications; 3. Analyse simple engineering systems involving energy balance by applying the First Law of Thermodynamics; 4. Appraise the various thermodynamical systems so that these systems perform within the limits set by the Second Law of Thermodynamics; 5. Calculate the entropy changes of a system and determine the entropy generation of various engineering processes; and 6. Apply the energy and mass conservation laws to determine the performance of ideal and actual refrigeration systems used at home and industries.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Comprehensive class, laboratory and activity notes. On-Line material. Cengel, Y.A. and Boles, M.A. 2014 8th Edition Thermodynamics - An Engineering Approach McGraw Hill

Assessment: Additional Information: 1. Test - Students will be assessed on their in-depth understanding of thermodynamics properties of pure substance, the use of steam tables, and applications of the first law of Thermodynamics to solve the energy balance in closed and open systems of engineering applications. 2. Test - Students will be tested on their understanding of the second law of Thermodynamics, the Carnot cycle and the application of first and second laws of Thermodynamics to ideal refrigeration systems. 3. Laboratory Work - Students will perform an experiment in groups on a refrigeration system and write individual reports of professional standard to demonstrate their understanding of working principles of the refrigeration system, their ability of analysis of the experimental data, and discuss their experimental results to learn the difference between the idealization of the refrigeration system studied in class and an actual refrigeration system. Test, Class test; calculations, sketches max. 1000 words, 10%. Test, Class test; calculations, sketches max. 1000 words, 10%. Laboratory Work, Laboratory on Refrigeration; calculations, sketches max. 1000 words, 10%. Examination, Final, 70%. 4. Examination - This final examination will exam all the content covered during the semester and will assess the competence of the students in applying the first and second laws of Thermodynamics to analysis the energy balance for many systems from engineering applications. Students will also be assessed in-depth understanding by the application of Thermodynamics principles to refrigeration systems and fluent application of these principles to determine the performance of actual refrigeration systems.

NEM2202 Dynamics

Locations: Footscray Park.

Prerequisites: NEF1202 - Engineering Physics 2

Description: This unit of study aims to give students an understanding of principles of engineering dynamics including particle dynamics and rigid body dynamics (kinematics and kinetics) in two and three dimensional space, as well as to develop problem solving, computing skills in the areas of mechanism design. It covers the following topics. Introduction to dynamics, Kinematics of particles - rectilinear and plane curvilinear motion co-ordinates systems, 3-D curvilinear motion and relative motion. Plane kinematics of rigid bodies - rectilinear and plane curvilinear motion, relative velocity, instantaneous centre of zero velocity, relative acceleration, space curvilinear motion. Kinetics of particles - Newton's law, work and energy, impulse and momentum. Plane kinetics of rigid bodies - moments and products of inertia, Newton's law, work and energy, impulse and momentum. Three-dimensional dynamics of rigid bodies - kinematics, kinetics, gyroscopic motion.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply fundamental knowledge to solve problems related to particle dynamics and rigid body dynamics in two and three-dimensional space; 2. Solve a wide range of problems using kinematics of particles, plane kinematics of rigid bodies, kinetics of particles, plane kinetics of rigid bodies and three-dimensional kinematics and kinetics of rigid bodies; 3. Communicate effectively (both written and oral) and work as effective members of a team; and 4. Apply experimental techniques to real world engineering problems.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Meriam J.L., & Kraige L.G. (2013) (7th SI ed.). Engineering mechanics: Dynamics John Wiley and Sons

Assessment: Assignment, Part 1: Preliminary laboratory submission (approx. 1000 words). Part 2: Final report (approx. 2000 words). Group submissions (Hurdle), 20%. Portfolio, Short answer mathematical problems (weekly). Includes oral presentation of a solution, 10%. Test, Prerequisite knowledge test (before wk 6), 10%. Examination, End-of-semester examination (3 hours), 60%.

NEM3101 Engineering Analysis and Modelling

Locations: Footscray Park.

Prerequisites: NEM2202 - Dynamics

Description: This Unit of Study introduces students to the application of fundamental laws of physics, mathematical concepts and computer programming tools in the process of systematic analysis and predicting behaviour of engineering systems. It exposes students to generic analytical skills and methods relevant to contemporary engineering practice and illustrates their practical application to various generic

engineering systems for the purpose of their evaluation, and numerical modelling and simulation of their behaviour, such as performance of internal combustion engine, shock and vibration or sound. After an introduction to the analysis of engineering systems and to formulation of simple numerical predictive models of mechanical systems involving differential equations in the time domain, the need for the analysis of mechanical systems in the frequency domain is explored. Students are introduced to the concept of a signal and become familiar with the relationship between the frequency and the time domains and practice the implementation of Fast Fourier Transform. Graphical presentation of multidimensional sets of data, such as time-frequency is practiced. A simple model of a mechanical second order system is used to introduce the concept of the transfer function and its use for prediction of response. Students explore a modern environment for numerical simulations involving Ordinary Differential Equations and transfer functions. Students are introduced to the use of transducers, instrumentation and computer data acquisition systems to validate the results of simulations and discuss discrepancies. The UoS will culminate in students giving end-of-semester oral presentation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify suitable approach to the engineering system analysis in either the time or the frequency domain; 2. Formulate models of simple engineering systems with Ordinary Differential Equations and transfer functions and then numerically simulate and predict the behaviour of these systems; 3. Acquire and process large sets of experimental data and derive dependent parameters through computer programming; 4. Compute and scale frequency spectra of signals representing the response of a mechanical system using Fast Fourier Transform and use them to interpret the behaviour of the system; 5. Produce computation automation scripts (computer programs); 6. Produce written technical reports individually and as part of a team; and

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Palm W.J., 2013 Introduction to MATLAB® for Engineers McGraw-Hill Chapman S.J., 2013 MATLAB® Programming with Applications for Engineers Cengage Learning

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

NEM3102 Design of Mechanical Systems

Locations: Footscray Park.

Prerequisites: NEM2101 - Mechanical Engineering Design

Description: In this unit students will develop the design and judgement skills required to resolve complex problems in Mechanical Engineering Design. They will work individually and collaboratively to design a range of machine elements in mechanical engineering systems. The unit builds on the prerequisite knowledge developed in NEM2101 Mechanical Engineering Design and has a major focus on the design of components subject to fatigue conditions. Computer aided drawing (CAD) software will be used to design and generate solid models of mechanical elements. Students' learning is consolidated through a real world project specifically designed to enhance their classroom-based learning providing a rich and authentic context for learning.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adapt fundamental mechanics and scientific skills to the design and selection of mechanical elements; 2. Diagnose engineering design problems and formulate appropriate design solutions; 3. Analyse existing mechanical engineering designs and develop creative alternatives using computing methods.; 4. Collaborate effectively with other members of their design team to apply knowledge and skills in diverse contexts; and 5. Present a clear and coherent exposition of knowledge and ideas to a variety of audiences.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: K. Nisbett & R. Budynas (2010) 9th metric Shigley's Mechanical engineering design. McGraw Hill.

Assessment: Assignment, Design report and presentation (approx. 2500 words). Group submission., 20%. Assignment, Design report and Oral presentation (approx. 2500 words). Group submission., 20%. Examination, End of semester examination (3 hours) - Hurdle, 60%. The assignments will be undertaken in pairs or groups of three and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.1, 1.2, 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment). In order to be eligible for a supplementary assessment, students must normally achieve an overall mark between 45-49% for the unit.

NEM3103 Thermodynamics 2

Locations: Footscray Park.

Prerequisites: NEM2201 - Thermodynamics 1

Description: This unit is the continuation of from the Thermodynamics 1 and is specifically for Mechanical Engineering students. The Thermodynamics 2 will focus on the applications of the principles learnt from Thermodynamics. This includes the learning to analysis the air-conditioning system, various engines, power plants and simple combustion process. It is expected that the students can analysis real engineering problems involving thermal energy after studying this subject.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine the various thermodynamic properties of mixtures; 2. Describe basic concepts of air-conditioning, and determine the energy and mass balance in air-conditioning systems; 3. Define the various cycles related to petrol engines, diesel engines, gas turbine, and jet engines and determine their performance; 4. Define the various cycles related to steam power cycles and determine their performance in large power stations; 5. Describe the basic concepts of combustion; determine the air to fuel ratio and flame temperature.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Comprehensive class, laboratory and activity notes. On-Line material.Cengel, Y. A. and Boles, M. A. (2014) 8th ed. Thermodynamics - An Engineering Approach McGraw Hill

Assessment: Test, Class Test 1; calculations, sketches (max. 1000 words), 15%. Test, Class Test 2; calculations, sketches (max. 1000 words), 15%. Laboratory Work, Laboratory on Air Conditioning; calculations, sketches (max. 1000 words), 15%. Examination, Final Examination (3 hours), 55%.

NEM3201 Manufacturing Materials

Locations: Footscray Park.

Prerequisites: NEM2102 - Introduction to Engineering Materials

Description: This subject will aim to extend the knowledge of materials science in

alloy steels, leading edge non-ferrous alloys, polymers, ceramics and glasses and composites and integrate it into issues of sustainable engineering product design and manufacturing technologies. This subject gives students an understanding of the engineering practice through an introduction to problem solving methodology and knowledge of the responsibilities of the professional engineer. The content will include merit matrices for material selection for economic and sustainable design and manufacture; diffusion in solids and the application of mathematical diffusion models to surface treatments of alloys; thermo- mechanical strengthening treatments of metal alloys; structure and properties of aluminium, magnesium, zinc, nickel, copper and titanium alloys, and their applications in engineering design; structure, properties and heat treatment of ceramics and glasses; introduction and structure to polymers, elastomers, foams and polymer composites; casting processes metals and polymers; introduction to surface physics and its application to powder metallurgy and joining processes; the application of introductory plasticity theory to solid forming processes; and joining processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. To attain an understanding of processes and key issues relating to engineering science in manufacturing and environment; 2. Solve a range of numerical and engineering problems found in engineering practice and design; and 3. Identify and apply formulation and solution, effective communication, system approach to design and undertake life-long learning.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Rojter, J., 2014 Manufacturing Materials Victoria University. Class Notes Kalpakjian, S., 2010 Manufacturing Engineering and Technology Addison-Wesley Rojter, J (2014) Introduction to Engineering Materials, Lecture notes Victoria University Callister, D.W. Jr (2013) Materials Science and Engineering - An Introduction John Wiley & Sons Budinski, G.K & Budinski, K.M. (1999) Engineering Materials - Propoerties and Selection Prentice-Hall Askeland, R.D., & Fulay, P.P. (2011) Essentials of Materials Science Stamford CT, USA

Assessment: Students will work in groups but present individual components in the team reports. The reports will be used for formative assessment. Laboratory Work, Required to demonstrate: laboratory skills, analysis of data, library research to contextualize knowledge acquire in the course of experimentation, 12%. Assignment, Student will, as a team, submit a major report based on open-ended current technical issues. The report to include individual reflective journals, 18%. Test, Mid-semester - covering introductory lectures, 20%. Examination, 3 hours - covering large part of the course including laboratory and assignment work, 50%. Total combined assessment word equivalence is approximately 5000 words. Additional conditions: - Attendance in all laboratory sessions is compulsory.

NEM3202 Fluid Mechanics 2

Locations: Footscray Park.

Prerequisites: NEF2101 - Fluid Mechanics 1

Description: This unit builds on Fluid Mechanics1 and is a more advanced subject. This subject will give an in-depth coverage of the conservation laws in integral and differential forms (Navier-Stokes equations). Some exact solutions for simple laminar flows will be given. It will explain the dimensional analysis and similarity, their applications in extrapolating experimental data based on prototype to full scale engineering devices. The subject will then study the various flows include boundary layers, flow around bluff bodies to determine the drags and lift forces which are important to many engineering applications. Finally, the subject will cover turbo-machinery which includes pumps and turbines. The behaviour of the flows inside these turbo-machinery devices and their effect on the performance of these devices will be studied.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the conservation laws of integral and differential forms in wide ranging contexts to determine the forces on engineering devices from fluid flows; 2. In-depth understanding of dimensional analysis and similarity to Interpret experimental data from prototype to the full scale device; 3. Compressive understanding of flows in turbulent boundary layers and in flow around bluff bodies to determine the drags and lifting forces from the flows; 4. Detail study of the flow characteristics in the commonly used turbo-machinery devices such as centrifugal pumps and turbines; 5. Integrate the principles and theoretical concepts of fluid mechanics and collaboratively plan and design creative, sustainable solutions to complex engineering problems with accountability for personal and team outcomes; and 6. Communicate solutions orally and in writing to small specialist groups.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

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

Assessment: Test #1; Application of conservation laws of integral and differential forms to calculate forces on engineering devices from fluid flows and application of knowledge of dimensional analysis and similarity to analysis experimental data. Test #2: Application of knowledge on turbulent boundary layer and flow around bluff bodies to determine the total drags and lifting forces for flow around devices which are important to engineering applications. Laboratory Work: Forces due to flow around a cylinder in a wind tunnel. Students will conduct experiments in groups. Using a wind tunnel to measure the drags of flow around a cylinder at various wind speed. Reports Professional standard from each student will be expected to contain the analysis of the drags and Drag coefficients vs Reynolds numbers, the contribution of the drags due to pressure difference and That due to surface friction, and to extrapolate the experimental results from to a drag around a large circular building. Test, Class test; calculations, sketches max. 1000 words, 10%. Test, Class test; calculations, sketches max. 1000 words, 10%. Report, Laboratory on drags on a cylinder; calculations, sketches max. 1000 words, 10%. Examination, Final Semester Examination (3 hours), 70%. Final Exam: This final examination will exam all the content covered during the semester and will assess the competence of the students in applying the conservation laws of integral and differential forms to analysis the forces on engineering devices from fluid flows, fluent application of dimensional analysis principles to interpolate experimental data and competence in determining the forces and performances of the turbo-machinery devices such as centrifugal pumps and turbines.

NEM3203 Stress Analysis

Locations: Footscray Park.

Prerequisites: NEC2102 - Solid Mechanics

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

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and evaluate solutions to engineering problems of 3-dimensional stress

and strain, especially fundamental problems of elasticity in mechanical engineering.
2. Collaborate and investigate real-world engineering problems of stress and strain.
3. Present clear and coherent exposition of mechanical engineering knowledge.
4. Analyse and interpret problems, results and their significance.

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

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

Assessment: Report, Report 1: Application of stress and strain, (Approx. 500 words) (Group), 5%. Report, Report 2: Computer Modelling (Approx. 1500 words) (Group), 10%. Case Study, Case study and portfolio of evidence. Mechanical engineering application. (Approx. 2000 words) (Group), 25%. Examination, Restricted Open Book Examination (3 hours), 60%. The reports and case study are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, students must achieve a minimum mark of 50% in the examination (and 50% in the overall unit assessment) in order to pass the unit.

NEM4101 Mechanical Vibrations

Locations: Werribee, Footscray Park.

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

Description: Mechanical vibration is an important consideration for the performance, functionality and integrity of many structures and machines. This unit of study critically reviews theoretical concepts related to mechanical vibrations. It is designed to promote the requisite knowledge, skills and competencies to analyse and resolve vibration issues across a broad range of applications. Students' learning is consolidated through real world projects specifically designed to enhance their classroom and laboratory based learning. Student progress is monitored and evaluated through reports, weekly quizzes and a final examination. The unit incorporates the following topics: Fundamental vibration theory; various types of damping; response due to initial conditions (free vibrations); harmonic and complex forcing functions; Fourier analysis and the Fourier spectrum; Shock Response Spectrum; single, two and multi degree-of-freedom systems; mode shapes; vibration measurement and instrumentation; random vibration analysis; and vibration absorbers and vibration control.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Map and articulate the fundamental concepts of mechanical vibrations and justify their application in a variety of engineering design contexts; 2. Measure and analyse the salient vibration characteristics of vibratory systems such as structures, machines and vehicles; 3. Develop numerical models of vibratory systems such that they can be used to predict and enhance performance; 4. Use vibration theory to calculate and predict the vibration behaviour of complex systems (including two and multi degree-of-freedom); 5. Analyse the vibration behaviour of structures and machines taking into account economic, industrial, human and environmental considerations; and 6. Produce accurate, clear and coherent technical reports on the vibratory behaviour of structures and mechanical systems for a variety of audiences.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Rao S.S. (1995) Third Ed. Mechanical Vibrations Addison-Wesley Publishing Company Inman D.J. (2001) Second Ed. Engineering Vibration Prentice Hall Class Notes

Assessment: Formative assessment in the form of group reports (four reports) are hurdle assessment tasks and will be assessed as 0 (unsatisfactory) or 1 (satisfactory) and every team member receives the same mark. As these are designed to assist the learning process, unsatisfactory reports may be re-submitted repeatedly after feedback has been obtained from the facilitator. The mid-semester and final examinations are largely based on the work undertaken for the reports. Test, Weekly Quiz. The quizzes, to be undertaken individually, will be based on the lecture material and specific reading material., 10%. Examination, Mid-semester examination (open book), 40%. Examination, Final examination (open book), 50%. Report, Project-based reports. Formative assessment undertaken in groups (hurdle assessment), 0%. The formative assessment components of the unit will be used to give students structured feedback about their capability development of GC1 as applied to real-life vibration problems and challenges. Lectures and workshops will develop GC2 and GC3 by studying real-life systems, structures, machines and installations.

NEM4102 Finite Element Analysis

Locations: Footscray Park.

Prerequisites: NEM3203 - Stress Analysis NEM2101 - Mechanical Engineering Design NEM3202 - Fluid Mechanics 2 and at least 192 CP

Description: Finite element analysis (FEA) is a numerical technique originally developed to find solutions related to the mechanics of solids. Today, it is widely used by engineers to predict the behaviour of a broad range of systems. The unit will build on the students' understanding of FEA that they developed as part of Fluid Mechanics 2 and will further demonstrate the use of the commercial software application. The unit will also introduce students to computational fluid dynamics (CFD) and will allow students to apply concepts learnt as a part of Fluid Mechanics 2 using the commercial software. In this unit, students will also apply the solid modelling skills that they have developed as a part of units Mechanical Engineering Design and Fluid Mechanics 2.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Create Finite Element Models and interpret results of FEA for a complex structures; 2. Apply computer aided FEA to solve problems related to engineering structures in two and three-dimensional space; 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.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs All class rooms need to have ANSYS FEA software loaded.

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

Assessment: Test, Test of the theory and application of FEA (minimum of one hour), 15%. Test, Test of the theory and application of CFD (minimum of one hour), 15%. Portfolio, Face to Face and written evidence demonstrating consistent progress related to the learning activities and outcomes. (This is a hurdle task), 70%. The portfolio focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline especially FEA and CFD and apply established engineering methods to

complex engineering problems, fluent application of engineering techniques, tools and resources and effective communication in professional and lay domains as defined in Engineers Australia competencies 2.1, 2.2 and 3.2. As the portfolio is the one clear way by which these competencies can be assessed on an individual basis, this is a hurdle assessment task.

NEM4201 Structural Dynamics

Locations: Footscray Park.

Prerequisites: NEM2202 - DynamicsNEM3101 - Engineering Analysis and ModellingAnd must have completed at least 192 CP

Description: Many structures designed by engineers often experience dynamic loads. Examples include: traffic forces on bridges (vehicular and pedestrian), seismic and wind loads on tall buildings, wave forces on offshore structures, dynamic forces acting on all kinds of vehicles (road, sea and aerospace), impacts and collisions as well as blast loads. In fact, some of the most spectacular structural failures in history have been due to a poor understanding of dynamic loads and their effects on structures. The study of the dynamic behaviour of structures spans a broad range of engineering disciplines. This unit will introduce students to the fundamental principles of structural dynamics and their applications to the determining the dynamic characteristics and behaviour of structures. Topics to be studied include: mass-spring-damper representation of dynamic systems, discretisation of continuous systems, frequency analysis and experimental modal analysis for the extraction of modal parameters such as natural frequencies, damping and mode shapes and structural modifications to improve dynamic performance.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Create, develop and optimise a discretised model of continuous structure; 2. Generate and analyse and evaluate the Frequency Response Function of a structure by calculation and experimental means; 3. Plan and execute experiments to produce modal measurements on a structure using either impact or random excitation; 4. Analyse and interpret data from modal measurements to determine natural frequencies, damping and mode shapes; 5. Effectively collaborate as a team member to contribute professional judgement and report on the analysis and outcomes of the investigation.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Journal and conference papers related to the literature review of projects will be provided by the Lecturer.

Assessment: Portfolio, Weekly journal entry demonstrating consistent progress related to the learning activities and outcomes. This is a hurdle task and must be competed, 10%. Test, Test on the fundamental theory and application underpinning structural dynamics., 30%. Report, Written engineering report on the major project., 60%. The weekly journal is a continuous measure of a student's performance in using and understanding the full range of tools and principles related to structural dynamics (a task critical to the duties of a professional engineer analysing the dynamics of a structure). The journal focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline especially and apply established engineering methods to complex engineering problems, fluent application of engineering techniques, tools and resources and effective communication in professional and lay domains as defined in Engineers Australia competencies 2.1, 2.2 and 3.2. As the portfolio is the one clear way by which these competencies can be assessed on an individual basis, this is a hurdle assessment task.

NEM4202 Advanced Engineering Analysis

Locations: Footscray Park.

Prerequisites: NEM3101 - Engineering Analysis and Modelling

Description: Advanced Engineering Analysis introduces students to advanced methods of signal and system analysis in the frequency and the time domain based on experimental data. Enhanced signal analysis techniques in both domains, such as synchronous averaging, digital filtering, spectral averaging, Power Spectral Density are studied. Various spectral estimates, such as Auto- and Cross Spectrum are used to determine the causal relationship between response and excitation of systems in the form of Frequency Response Function (FRF) and its time domain equivalent, the Impulse Response Function. Students apply these techniques to experimental signals for the purpose of machine condition monitoring, validation of modelling and simulation results and for vibration modal analysis of mechanical or civil engineering structures. The concept of Transfer Function is then extended to the study of dynamics of systems - an underlying theory behind modern automatic control systems. Practical aspects of design of stable controllers in various automatic control systems are studied as well as systematic analysis of behaviour of engineering systems, including their automatic control. Students work collaboratively in a project exposing them to generic analytical skills and methods relevant to contemporary engineering practice engaging them in authentic practical applications in the analysis of various generic engineering systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and perform digital signal processes relevant to mechanical and structural engineering; 2. Identify and participate in measurement of Frequency Response Function, other aspects of dual channel analysis techniques of systems and their applications; 3. Describe fundamentals of control theory; 4. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 5. Produce technical reports and participate effectively in discussions and debates.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Randall R.B. (1987) Frequency Analysis Bruel & Kjaer, Demnark Dorf R.C. and Bishop R.H, (2004) 10th ed. Modern Control Systems Prentice Hall

Assessment: Test, Test (week 5, 1 hour), 10%. Portfolio, Comprised of regular minor reports and reflections (written) of the design process and demonstration of the skills developed. (Hurdle), 30%. Examination, Final Examination, 60%. Students will work in groups of two but prepare individual portfolios. Final Examination is weighted by the average score for group reports. The portfolio is a hurdle assessment as it is the only task that assesses LO 4 and 5.

NEM4420 Mechanical Design Project

Locations: Footscray Park.

Prerequisites: NEM3102 - Design of Mechanical SystemsNEM3203 - Stress Analysis

Description: This unit is the capstone design project for the course that requires students to undertake a major design task based on a real engineering project. Students will work individually and collaboratively to resolve a complex engineering problem. Students will implement design and project management process, drawing on principles and theoretical knowledge developed in the prerequisite units. Regular written and oral progress reports will be a feature of the unit, and the major assessments will comprise a reflective design journal, language skills exercises, one interim and one final design report. The final report will document the complete design process, the analysis of the design and comparison with the original project specifications. Students will be required to work with intellectual independence acting responsibly and accountably as professionals.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Diagnose problems and formulate solutions with intellectual independence in wide ranging 21st century engineering contexts; 2. Implement a systematic approach to the design problem demonstrating initiative and professional judgement; 3. Innovate and propose creative mechanical designs, using engineering drawings and solid modelling, to meet the agreed specifications; 4. Plan, manage and execute a project by, designing to specification and meeting the client's requirements and reporting timelines; 5. Collaborate effectively with other designers working on related project tasks as well as stakeholders who may be influenced by the project and negotiate project outcomes; and 6. Communicate effectively orally as well as in writing and present a clear and coherent exposition of knowledge and ideas to a variety of audiences including professional audiences and external parties.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Nil Required Text for this unit. Lecturer will provide the Design brief and specifications document to students.
Assessment: Portfolio, Comprised of regular minor reports and reflections (written) of the design process and demonstration of the skills developed, 15%. Presentation, Comprised of regular presentations providing updates on the design process and demonstration of skills developed. Includes final design presentation, 40%. Report, Interim Design Report (maximum 6,000 words) – team collaboration, 10%. Report, Final Design Report (maximum 16,000) – team collaboration, 35%.

NFP0102 Physics Foundations

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit aims to provide students with fundamental understanding of basic physics concepts. This unit emphasises on building a strong foundation of understanding in the key concepts that are explored in further mathematical detail in Engineering Physics 1. NFP0102 Physics Foundations, will cover numbering systems and standards of measurements, introduction to kinematics with one and two dimensional motion, forces and friction, work, energy and power, momentum and impulse, rotational mechanics.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse motion in one and two dimensions and apply kinematic equations to calculate displacement, velocity and acceleration; 2. Evaluate the interaction of forces, both conservative and non-conservative, on an object; 3. Analyse the conversion of mechanical energy and work; and 4. Apply the concepts of conservation of energy and conservation of momentum to describe interactions between two bodies or objects.
Class Contact: Lab 1.0 hr Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Learning materials will be provided by the lecturer.
Assessment: Test, Three (3) in class tests., 15%. Examination, End of semester examination (2 hours), 50%. Assignment, Problem and Project Based assignments, 35%.

NHE5100 Honours Research Project

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: In the Honours program students will undertake a full time research project. Initially students will have access to the honours handbook listing potential projects offered by the various supervisors. The student and the supervisor will then collaboratively agree on the specific research project for the honours program. Various guided workshops will be run in a collaborative mode for peer to peer learning and to create a vibrant research environment. The workshops will cover a range of topics, including writing a risk assessment, research proposal, performing a literature review, giving oral presentations, preparing a research thesis, and understanding intellectual property. The literature review will provide the scientific background and rationale for the research project. Students will also be engaged in collaborative, hands on practical activities in the laboratory which test theoretical concepts discussed with their supervisor. The research thesis is the culmination of the knowledge, skills and their application over the course of honours studies.
Credit Points: 48
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit advanced theoretical and technical knowledge in the discipline area by critically reviewing and evaluating relevant scientific literature; 2. Design, implement, troubleshoot and manage a research project to successful completion; 3. Analyse, evaluate and interpret data within the context of key literature; 4. Communicate professionally with a range of people including direct supervisor, peers, researchers, and industry representatives; 5. Produce a scholarly honours thesis based on their research project which complies with requisite academic conventions; 6. Critically reflect on own learning and progress of professional goals.
Class Contact: No formal contact hours, although a normal fulltime load is considered a minimum of twenty (20) hours per week. Regular meetings will be scheduled with the BSc (Hons) supervisor.
Required Reading: To be advised by the supervisor.
Assessment: Assignment, Project Proposal (3000 words), 10%. Presentation, First Oral - Introduction of Proposed Research Project (20 minutes), 5%. Literature Review, Review of Literature Relevant to Research Project (5000 words), 15%. Presentation, Final Oral - Presentation of Results and Conclusions from research project (20 minutes), 10%. Thesis, Research Thesis (15,000 words), 60%. At the commencement of the academic year, each student is assigned two examiners from within the College with appropriate discipline knowledge. In some instances an external examiner may be appointed. These two examiners, along with the Research supervisor, assess and provide feedback on the Project Proposal, literature review and the Research Thesis. The assessment is across the entire course. The two oral presentations are presented to a gathering of the College Science staff, research students and all of the Honours students. All attendees, except the Honours students, assess the oral presentations against a rubric. Prior to the final mark for the thesis being determined, the student is given an opportunity to meet with the examiners and answer questions the examiners may have in regard to the material presented in the thesis. .

NHE5101 Honours Research Project

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: In the Honours program students will undertake a full time research project. Initially students will have access to the honours handbook listing potential projects offered by the various supervisors. The student and the supervisor will then collaboratively agree on the specific research project for the honours program. Various guided workshops will be run in a collaborative mode for peer to peer learning and to create a vibrant research environment. The workshops will cover a range of topics, including writing a risk assessment, research proposal, performing a literature review, giving oral presentations, preparing a research thesis, and understanding intellectual property. The literature review will provide the scientific background and rationale for the research project. Students will also be engaged in collaborative, hands on practical activities in the laboratory which test theoretical

concepts discussed with their supervisor. The research thesis is the culmination of the knowledge, skills and their application over the course of honours studies.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit advanced theoretical and technical knowledge in the discipline area by critically reviewing and evaluating relevant scientific literature; 2. Design, implement, troubleshoot and manage a research project to successful completion; 3. Analyse, evaluate and interpret data within the context of key literature; 4. Communicate professionally with a range of people including direct supervisor, peers, researchers, and industry representatives; 5. Produce a scholarly honours thesis based on their research project which complies with requisite academic conventions; 6. Critically reflect on own learning and progress of professional goals.

Class Contact: No formal contact hours, although a normal part time load is considered a minimum of ten (10) hours per week. Regular meetings will be scheduled with the BSc (Hons) supervisor.

Required Reading: To be advised by the supervisor.

Assessment: Assignment, Project Proposal (3000 words), 10%. Presentation, First Oral - Introduction of Proposed Research Project (20 minutes), 5%. Literature Review, Review of Literature Relevant to Research Project (5000 words), 15%. Presentation, Final Oral - Presentation of Results and Conclusions from Research Project (20 minutes), 10%. Thesis, Research Thesis (15,000 words), 60%. At the commencement of the academic year, each student is assigned two examiners from within the College with appropriate discipline knowledge. In some instances an external examiner may be appointed. These two examiners, along with the Research supervisor, assess and provide feedback on the Project Proposal, literature review and the Research Thesis. The assessment is across the entire course. The two oral presentations are presented to a gathering of the College Science staff, research students and all of the Honours students. All attendees, except the Honours students, assess the oral presentations against a rubric. Prior to the final mark for the thesis being determined, the student is given an opportunity to meet with the examiners and answer questions the examiners may have in regard to the material presented in the thesis. .

NIT2101 Computer and Internet Security

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), cloud computing, and databases.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Audit a system for security vulnerabilities; 2. Manage and use system security and logging tool; 3. Identify strengths and weaknesses in security products; 4. Apply security tools to strengthen a networked system; 5. Analyse a system for deploying the most appropriate security solution; 6. Design and implement a security solution given a set of constraints.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Jie Wang, Zachary A. Kissel (2015) 2nd Introduction to Network Security: Theory and Practice Wiley

Assessment: Laboratory Work, Practical Knowledge Test (one hour), 20%. Report, Project report (2500 - 3000 words), 30%. Examination, Final Written Examination (3 hours), 50%.

NIT2112 Object Oriented Programming

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit provides in-depth understanding of a modern object oriented language. The unit develops skills in software development, through an algorithmic approach and the application of principles of objected oriented programming. Content includes: introduction to programming; basic constructs of a programming language; sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries; one dimensional arrays; graphical user Interface.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Discuss and apply fundamental aspects of computer program development; 2. Describe and conduct software development activities; 3. Develop algorithms using basic programming constructs; 4. Manipulate primitive data types and structured data types; and 5. Apply object-oriented software principles in problem solving.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr

Required Reading: Lewis J., DePasquale P., & Chase J. (2014) 3rd ed. Java Foundations: Introduction to program design and data structures, Pearson International Edition.

Assessment: Test, Test (60 min), 25%. Assignment, Assignment (programming tasks), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2113 Cloud Application Development

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT1102 - Introduction to Programming

Description: This unit introduces the basic concept and fundamental principles of cloud computing and popular cloud development platforms. Students will learn programming skills in cloud and practise the design and development process of cloud applications in various platforms. Cloud computing undergoes constant evolution, and there are several competing platforms, such as Amazon. This unit includes important topics in cloud computing, e.g., virtualization, storage, infrastructure/platform/software as a service, reliability, security, MapReduce programming, etc. The knowledge will be applied to design, develop and deploy cloud based applications in Amazon web services platform.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design cloud applications architecture in major cloud platforms; 2. Develop cloud applications by using cloud services in different level, e.g. IaaS, PaaS, SaaS; 3. Apply the current cloud technologies, framework architecture and principles in cloud application development; and 4. Analyse the usage of cloud computing in different sectors and the impact of cloud on society.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Paul Mehner (2013) 1st ed. Developing Cloud Applications with Windows Azure Storage Microsoft Press

Assessment: Assignment, Cloud application design (1000-1500 words), 25%. Project, Cloud application development (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2122 Server Administration and Management

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit provides students with the knowledge of server administration, including database and operating system administration. Content includes: database (DB) administration; operating system (OS) administration; system administration: network connection, data backup, software administration; TCP/IP (Transmission Control Protocol/Internet Protocol) configuration; creating DNS (Domain Name Servers), wireless communication systems administration; firewalls, IPSec protocols.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain fundamentals of database, operating systems, and server administration; 2. Develop server administration and maintenance skills; and 3. Configure real-life network infrastructures, including wireless systems.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Ross Mistry, Shirmattie Seenarine (2012) 2nd Microsoft SQL Server 2012 Management and Administration Sams Publishing
Assessment: Laboratory Work, Practical Knowledge Test (one hour), 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2124 Network Management

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT1104 - Computer Networks
Description: This unit explores the fundamentals and practice of network management methodologies. This includes the study of standard network management models such as the FCAPS model that includes fault management, configuration management, accounting management, performance management, and security management. Management models like FCAPS will be used to justify and assess the applicability of various network management tools like the Simple Network Management Protocol. Content includes: FCAPS (Fault, Configuration, Accounting, Performance, and Security) model, Simple Network Management Protocol (SNMP); network management tools and systems, such as CiscoWorks LAN Management Solution (LMS).
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principles of network management; 2. Develop the skills required to manage networks; 3. Master the applicability of the available tools; 4. Perform network management tasks.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Alexander Clemm (2006) 1st Network Management Fundamentals 1st ed. Cisco Press
Assessment: Assignment, Two (2) Reports (4-5 technical questions), 25%. Test, Two (2) Practical Knowledge Tests (30 minutes each), 25%. Examination, Final Written Examination (2 hours), 50%.

NIT2171 Introduction to ICT Management

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit will equip students with broad and coherent knowledge and skills for both business and information system management. It aims to meet the demands for professionals with advanced technologies to serve management and staff across various teams. Students will explore the development, use and management of an organization's information system, and propose a service agreement to establish the collaboration between IT experts and the other teams in the organization.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review and evaluate the current ICT management techniques and skills in business; 2. Identify and resolve ICT related management issues and problems in an organisation; and 3. Propose an ICT service agreement for collaboration with other service teams.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Schilling, M (2012) 4th ed. Strategic Management of Technological Innovation McGraw-Hill, USA Recommended Reading: Fitzsimmons, J.A & M.J Fitzsimmons (2010) Service Management: Operations, Strategy, Information Technology, McGraw-Hill, USA. Adomi, Esharenana E. (2010) Frameworks for ICT Policy: Government, Social and Legal Issues: Government, Social and Legal Issues, IGI Global
Assessment: Test, two tests (10% each), 20%. Assignment, Group assignment (2000-2500 words), 30%. Examination, (3 hours), 50%.

NIT2201 IT Profession and Ethics

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit articulates the role of the IT profession within the local and global communities. The unit examines a wide range of ethical and privacy issues and concepts in the ICT field. The unit develops student critical thinking skills by introducing topical and controversial issues related to computing ethics and privacy problems. Content includes: the role of a computing professional; understanding how computers impact on society; information privacy concepts as applied to the management of information systems; different industry policies; mechanisms for implementing these policies; Australian Computer Society (ACS) code of ethics; social issues of privacy, intellectual property, and the digital divide.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify the key roles of computing in the local and global communities; 2. Demonstrate an understanding of the different principles underlying ethical decision making; 3. Critically discuss social and ethical issues in Information and Communication Technology (ICT) domains; 4. Identify and relate appropriate privacy measures and their management for computing environments; 5. Identify specific ethical and privacy issues in networked computing environments; and 6. Communicate effectively on a range of IT-related topics using appropriate language.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation. Quinn, M.J. (2014) 6th ed. Ethics for the Information Age Pearson International
Assessment: Assignment, Assignment-1 (1000-1500 words), 25%. Assignment, Assignment-2 (1000-1500 words), 25%. Examination, Final Written Examination (2 hours), 50%.

NIT2212 Database 2

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT1201 - Introduction to Database Systems
Description: This unit provides students with an in-depth understanding of the design and implementation of modern multi-user database systems. Content includes: design and implementation of robust and scalable database applications; issues pertaining to multi-user database environments, such as transaction management and performance; in-depth study of Structured Query Language (SQL); database application development tools; database performance optimisation.
Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review design principles underlying multi-user database management systems; 2. Apply database theories to real-life database applications; 3. Demonstrate knowledge of the technologies that underpin multi-user database systems; 4. Analyse a real-life problem, and design and implement a system using a commercial database management system; and 5. Evaluate the robustness and scalability of database systems.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Connolly, T.M., and Begg, C.E. (2015) 6th ed. Database Systems: A Practical Approach to Design, Implementation and Management Pearson International

Assessment: Test, Practical Knowledge Test (one hour), 25%. Assignment, Report (1000-1500 words), 25%. Examination, Final written examination (3 hours), 50%.

NIT2213 Software Engineering

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: Description: This unit introduces students to the design of software systems. It covers modelling of systems using Unified Modelling Language (UML) and relevant visual models in this design. Content: Introduction to UML; use of a UML-based modelling tool; analysis and design; use cases; objects and classes; class diagrams; interaction diagrams.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design software systems using UML; 2. Apply a UML-based modelling tool in the design of software systems 3. Apply the different types of models of UML to design of software systems; and 4. Correctly construct and lay out all types of diagrams.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Bernd Bruegge & Allen Dutoit (2014) 3rd ed. Object-Oriented Software Engineering Using UML, Patterns, and Java Pearson Education Limited

Assessment: Test, Practical Knowledge Test (45 minutes), 25%. Assignment, Assignment (1000-1500 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2222 Networking Technologies

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

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

Credit Points: 12

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

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Kurose, J.F. & Ross, K.W., (2012) 6th ed. Computer Networking Pearson Addison-Wesley

Assessment: Assignment, Assignment 1, 20%. Assignment, Assignment 2, 30%. Examination, Final Written Examination (3 hours), 50%. Assignments are design tasks based around IP Addressing, Sub-netting and Dynamic Routing.

NIT2223 Mobile & Wireless Networks

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT1104 - Computer Networks

Description: This unit provides students with an in-depth awareness of the fundamentals of Cisco WLAN and an overview of current technologies, together with an understanding of some scientific aspects of wireless communications and the necessary techniques to implement a WLAN. Content includes: wireless regulatory bodies; Wireless Local Area Networks (WLAN) fundamentals, such as Bluetooth, WiMAX, ZigBee; cordless phone technologies; wireless standards such as 802.11; authentication and encryption methods; wireless systems architectures, such as Cisco Unified Wireless Network Architecture.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain WLAN fundamentals; 2. Install and configure WLAN and clients; 3. Implement and design WLAN; and 4. Conduct WLAN troubleshooting and maintenance.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Henry Chou and Michael Kang, 2010 CCNA Cisco Certified Network Associate Wireless study guide McGraw Hill

Assessment: Test, Practical Knowledge Test (1 hour), 25%. Assignment, Assignment (Wireless LAN Deployment Project), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT2271 ICT Change Management

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: ICT is the most dynamic sector in the 21st century. ICT change management is a challenge to modern organisations. This unit provide students with knowledge and skills in effectively management changes and mitigate risks. The content includes ICT change management process, ICT change plan, ICT change recording and documentation, ICT change automation, risk mitigation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse key factors involved in ICT change management; 2. Develop ICT change management strategy; 3. Plan and deploy change management; and 4. Identify risk and develop risk mitigation plans for ICT change management.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs Forty-eight (48) hours for one semester comprising lectures and laboratory sessions.

Required Reading: Text will be provided by the lecturer. Esther Cameron and Mike Green, (2015) 4th ed. Making Sense of Change Management : A Complete Guide to the Models, Tools and Techniques of Organizational Change Kogan Page Ltd Recommended Reading: Melanie Franklin (2014), Agile Change Management : A Practical Framework for Successful Change Planning and Implementation, Publisher Kogan Page Ltd

Assessment: Test, two tests (10% each), 25%. Assignment, Assignment (equivalent to 1,000 words), 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3001 IT Professional 1

Locations: Footscray Park.

Prerequisites: Students have to complete the common first year and six units of a major plus two units of the graduating core in the second year.

Description: In this unit, the first of two IT Professional units, students will undertake

an IT industry placement of at least 192 hours during the semester. Students will put into practice the knowledge and skills developed in their course. The placement needs to be approved by the Course Coordinator. Students will get an opportunity to gain valuable real-world IT professional experience, and know the relevant industry practices such as the respective skill of particular major 'Web and Mobile Application Development', 'Network and System Computing', time management, project management, client liaison, and budgets.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Gain relevant industry experience; 2. Demonstrate critical reflective practice in the assessment of their personal strengths and development needs in the context of their work-readiness and career planning; 3. Identify and convey the knowledge, skills and attributes required for the professional workplace in a relevant IT major setting; 4. Develop leadership skills by working on a project within an industry; 5. Apply degree-related knowledge and skills to real-life situations.

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

Required Reading: Nil.

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

NIT3002 IT Professional 2

Locations: Footscray Park.

Prerequisites: NIT3001 - IT Professional 1

Description: In this unit, students will continue undertaking IT industry placement of at least 192 hours during the semester after completing the first unit, Industry Placement 1. Students will put into practice the knowledge and skills developed in their course. The placement needs to be approved by the Course Coordinator. The students will get an opportunity to gain valuable real-world IT professional experience, and know the relevant industry practices such as the respective skill of particular major 'Web and Mobile Application Development', 'Network and System Computing', time management, project management, client liaison, and budgets.

Credit Points: 48

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

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

Required Reading: Nil.

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

NIT3101 IT Project 1

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2201 - IT Profession and EthicsNIT2212 - Database 2NIT2213 - Software EngineeringNIT2122 - Server Administration and ManagementNIT2222 - Networking Technologies(NIT2201 and NIT2212 and NIT2213) OR (NIT2201 and NIT2122 and NIT2222)

Description: This unit centres on an industry sponsored group project. In a team students develop an IT solution to solve a real-world problem for their client. Student activities include: business case analysis, requirements modelling, data and process modelling, and project management. This unit brings together the knowledge and skills acquired by students in earlier units and apply them to a real-world system development project.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit knowledge for working on a real-world software development project; 2. Apply software engineering and database design methodologies in real-world project implementation and deployment; 3. Work collaboratively to demonstrate initiative, responsibility and accountability for own learning and professional practice within IT project management in authentic, contemporary settings 4. Effectively communicate complex ideas and judgements in planning, problem solving and decision-making in professional settings to a range of audiences

Class Contact: PC Lab4.0 hrs

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

Assessment: Presentation, Oral presentation-1 on project progress (5-10 minutes), 15%. Presentation, Oral presentation-2 on project update (5-10 minutes), 15%. Other, Peer and client assessments, 20%. Project, Group project documentation (4,000-5,000 words), 50%.

NIT3104 Computer Architecture

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit of study explores the design of a computer system at the architectural level. Topics covered computer hardware, computer software, data and communications, which makes up the architecture of a computer system. In addition to concepts of computer systems, the unit will discuss modern computer systems' applications such as Google applications, Cloud computing and Mobile applications. Although computer technology is developed very quickly, the basic architecture of computer systems has changed surprisingly little. This understanding is at the foundation of being a competent and successful system analyst, system architect, system administrator or programmer.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Rationalise key processor components; 2. Review and analyse computer systems; 3. Use simulator programs to model computer system components; and 4. Design and construct application specific solutions in the field of computer architecture.

Class Contact: Lecture2.0 hrsPC Lab2.0 hrs

Required Reading: Reading material will be negotiated in consultation with the lecturer and will be appropriate to the topic under investigation.Randal E. Bryant and David R. O'Hallaron (2015) 3rd ed. Computer Systems: A Programmer's Perspective Pearson Reference book: John L. Hennessy (2011) Computer Architecture: A Quantitative Approach, 5th ed. Morgan Kaufmann

Assessment: Test, Practical Knowledge Test (one hour), 25%. Assignment, Computer simulation, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3112 Advance Web Application Development

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT1101 - Web Development and CMSNIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringNIT1101 OR NIT2112 OR NIT2213
Description: This unit provides students with knowledge and practice of designing and developing large complex web applications, e.g., large enterprise software systems in web-based environment. Students will learn of advanced software frameworks for web development and apply them in practice. A number of techniques will be introduced which include Web Service and Services, MVC (Model-View-Controller) framework, etc
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse requirements of large and complex web applications for a real-world business case; 2. Apply advance web application frameworks in designing large and complex web application; and 3. Create and develop and prototype large web applications with current popular technologies, e.g., Web services.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Imar Spaanjaars (2013) 1st ed. Beginning ASP.NET 4.5 in C# and VB USA/John Wiley & Sons, Inc.
Assessment: Assignment, Large web system design and development, 25%. Project, Large web system prototyping and development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3113 Advanced Programming

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringNIT2112 OR NIT2213
Description: This unit explores the methodologies and approaches used in programming for computer networks through using appropriate features and the application programming interface of a modern programming language. Content includes: In-depth study of classes and objects, polymorphism; advanced graphical user interfaces (GUI), programming for Transmission Control Protocol (TCP) and Universal Datagram Protocol (UDP); file input and output; object streams and exception handling.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit specific network programming ability; 2. Demonstrate an understanding of networking with URLs (Uniform Resource Locators), sockets and datagrams; 3. Establish a simple server using TCP/IP protocol; 4. Implement a network client; 5. Program basic client-server communications; and 6. Compose advanced object-oriented solutions for problem solving using Model-View-Controller framework.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Deitel & Deitel (2015) 10th ed. Java How to Program (Early Objects) Pearson Education
Assessment: Test, Test (one hour), 25%. Assignment, Assignment (programming tasks), 25%. Examination, Final written examination (3 hours), 50%.

NIT3114 Online Business System Development

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT2112 - Object Oriented ProgrammingNIT2213 - Software EngineeringNIT2112 OR NIT2213
Description: The Building Online Business Systems unit introduces broad fundamental concepts of business information systems, online systems and e-commerce, information management in organisations and current enterprise system development technologies. The unit will focus on introducing problem-solving techniques and critical thinking for designing and developing online business systems along with other topics including information strategies, E-business, Web 2.0, Cloud computing, Enterprise systems, information security and risk management. Current online business system trends and likely future developments and applications of information systems will also be discussed.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse business requirements and design the online business system including architecture, components and interfaces; 2. Develop prototypes of online business systems for specific domains; 3. Apply the current technologies and frameworks for building online business systems; and 4. Analyse the importance and impact of online business systems on e-business, business process management and enterprise management.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Paul Redmond (2016) 1st ed. Lumen Programming Guide: Write PHP microservices, REST and web service APIs Apress
Assessment: Assignment, Online business system design and analysis, 25%. Project, Online business system prototype development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3122 Enterprise Network Management

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT2122 - Server Administration and ManagementNIT2222 - Networking TechnologiesNIT2122 or NIT2222
Description: The Enterprise Network Management unit aims to provide students with an understanding of issues relevant to enterprise networks and related technologies, as well practical skill and techniques to manage the enterprise network. Topics studied include Enterprise Network Infrastructure, Domain Name Systems, Network Group Policy Design and Implementation, Security Planning and Administration, System Maintenance and Trouble Shooting and their related technologies.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop solutions for enterprise network architecture; 2. Build and configure small-scale enterprise network; 3. Analyse and identify potential issues in managing enterprise network; and 4. Manage and maintain enterprise network infrastructure.
Class Contact: Lecture2.0 hrsPC Lab2.0 hrs
Required Reading: Shannon McFarland (2011) 1st ed. IPv6 for Enterprise Networks (Networking Technology) Cisco Press
Assessment: Laboratory Work, Practical Tasks (4 to 6 labs), 20%. Assignment, Enterprise network Design and Implementation, 30%. Examination, Final Written Examination (3 hours), 50%.

NIT3123 Advanced Networking Technologies

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT2222 - Networking TechnologiesNIT2223 - Mobile & Wireless NetworksNIT2222 or NIT2223
Description: This unit will introduce students to the latest networking technologies and their ability to handle advanced communications applications. Students will work with an industry or community organisation to design an advanced network for their current and/or future networking and data communication needs. Content includes: advanced networking technologies, such as Ad-hoc Networks, ubiquitous networks, and sensor networks; an industry standard framework for network design and

evaluation.

Credit Points: 12

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

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

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

Assessment: Test, Practical Knowledge Test (one hour), 25%. Project, Group project design, documentation and presentation (1000-1500 words), 25%. Examination, Final Written Examination (2 hours), 50%.

NIT3171 ICT Business Analytics and Data Visualisation

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2171 - Introduction to ICT Management NIT2271 - ICT Change Management NIT2212 - Database 2 NIT2171 OR NIT2271 OR NIT2212

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

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review the current algorithms, methodologies and modelling for ICT business analytics; 2. Evaluate various ICT business analytic tools and techniques; and 3. Propose a business analytics report to solve practical problems identified in an ICT business project.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

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

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

NIT3201 IT Project 2

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2201 - IT Profession and Ethics NIT2212 - Database 2 NIT2213 - Software Engineering NIT2122 - Server Administration and Management NIT2222 - Networking Technologies (NIT2201 and NIT2212 and NIT2213) OR (NIT2201 and NIT2122 and NIT2222)

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

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit knowledge for working on a real-world software development project; 2. Apply software engineering and database design methodologies in real-world project implementation and deployment; 3. Work collaboratively to demonstrate initiative, responsibility and accountability for own learning and professional practice within IT project management in authentic, contemporary settings 4. Effectively communicate complex ideas and judgements in planning, problem solving and decision-making in professional settings to a range of audiences

Class Contact: PC Lab 4.0 hrs Forty-eight (48) hours for one semester comprising group project work.

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

Assessment: Presentation, Oral presentation-1 on project progress (5-10 minutes), 15%. Presentation, Oral presentation-2 on project update (5-10 minutes), 15%. Test, User Acceptance Test, 20%. Project, Group project documentation (1,000-2,000 words per student), 50%. Oral presentations - 25% LiWC (presentations of the progress of projects with clients' feedback and requirements) Project documents - 75% LiWC (working with client to create and produce analysis and design project documents).

NIT3213 Mobile Application Development

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2112 Object Oriented Programming OR NIT2213 Software Engineering

Description: This unit introduces the development of applications on mobile and wireless computing platforms. Major mobile platforms (e.g., Android and IOS) will be used for teaching programming techniques and the development process of applications. Focus of this unit will be the tools and frameworks required for developing applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and develop mobile applications in major mobile platforms; 2. Publish and maintain these applications in the marketplace; 3. Apply current software technologies, framework architecture and standards used in mobile application development; and 4. Analyse the ecosystem of current mobile platforms as well as their features and differences.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Steve Derico (2015) 1st ed. Introducing iOS 8 O'Reilly Media Neil Smyth (2015) 6th ed. Android Studio Development Essentials eBookFrenzy

Assessment: Test, Practical Knowledge Test (one hour), 25%. Project, Mobile application development, 25%. Examination, Final Written Examination (3 hours), 50%.

NIT3222 Virtualisation in Computing

Locations: Footscray Park, VU Sydney.

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

Description: This unit provides students with knowledge and skills of virtualisation in computing including design, implement and management of virtualisation. Content: fundamentals of virtualisation in computing, server virtualisation, storage virtualisation, desktop virtualisation, application virtualisation, design and develop

virtualised environments, manage and administration of virtualised systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply core knowledge of virtualisation; 2. Manage a virtualisation environment with industry products; 3. Design and develop virtual machines with main-stream industry technologies; 4. Design, develop and manage desktop virtualisation; and 5. Design, develop and manage application virtualisation.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Jason Kappel, Anthony Velte, and Toby Velte (2009) Microsoft Virtualization with Hyper-V McGraw Hill

Assessment: Test, Practical Knowledge Test (one hour), 25%. Assignment, Design and implement virtualised environment (individual or group design project), 25%. Examination, Final Written Examination (2 hours), 50%. Assignment is assessed in simulated environment (LiWC) .

NIT3274 Small IT Business

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT2171 - Introduction to ICT Management NIT2271 - ICT Change Management NIT2171 OR NIT2271

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

Credit Points: 12

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

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Hatten, T. S (2015) 6th Edition Small Business Management: Entrepreneurship and Beyond Sydney: Cengage Learning Recommended Text: Longenecker, Justin G, Moore, Carlos W, Petty, J.W, Palich, Leslie, E (2003) Small business management : an entrepreneurial emphasis 12th ed. Thomson South-Western, Mason, Ohio.

Assessment: Test, Test (one hour), 10%. Project, Team Project: Business Website Development, 40%. Examination, Final Examination (3 hours), 50%.

NIT5081 Fundamentals of Cyber Security

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: The Fundamentals of Cyber Security unit covers the importance of cybersecurity, the most common risks, and how to mitigate them. Students in this unit will learn about cyber security and how it is related to the industry growth. This unit introduces the basic cyber security concepts and the common architectures used as industry standards. Student will have an opportunity to study different types of malware and the potential attack vectors, including viruses and trojans, use network and system tools to manage security issues and maintain the working environment. Latest information technologies related to network security, such as cryptography, used to secure interactions.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit mastery of skills and knowledge required to support and secure network environments, 2. Critically review and analyse cybersecurity architecture and state-of-the-art security technologies, 3. Design and implement security system using network and system tools, and 4. Evaluate security risks and prepare incident response plan.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

Required Reading: Wu, C.H. & Irwin, J.D. (2013) 1st ed. Introduction to Computer Networks and Cybersecurity CRC Press

Assessment: Test, Practical test (2 hours), 20%. Assignment, Project-based Assignment (2,500 words), 30%. Examination, Final examination (3 hours), 50%.

NIT5082 Cloud Security

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: Cloud computing offers organisations a multitude of potential benefits including cost savings, backup of valuable data, global access and improved business outcomes. However, there are a variety of information security risks that need to be carefully considered. In this unit, students will learn a broad set of policies, technologies, and controls deployed to protect data, applications, and the associated infrastructure of cloud computing. Students need to identify the majority of security issues that an organization may have when it moves its applications and data to cloud environment. Students will be asked to deal with data residency, data privacy and Industry & Regulation Compliance. Both basic and advanced technologies of cloud security will be introduced in this unit, such as cloud firewall, cloud encryption gateway, tokenization of data.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate and adapt cloud data protection platforms, 2. Investigate and analyse security risks for cloud data storage and cloud-based applications, 3. Critically review cloud security threats, propose protection solutions, and 4. Apply appropriate tools to secure cloud services.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

Required Reading: Thuraisingham, B. (2013) Developing and Securing the Cloud CRC Press

Assessment: Test, Practical test (1 hour), 10%. Assignment, A project-based group assignments (3,500 words), 40%. Examination, Final examination (3 hours), 50%.

NIT5083 Enterprise Security Management

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: Enterprise computer networks may be vulnerable to both inside and outside threats. Enterprise networks including Internet access, intranets, extranets and various business activities must be protected. Enterprise needs to manage and control security policies choosing from hundreds of available security rules. Within the network infrastructure, security protection software including firewalls, intrusion detection systems (IDS), virus detection systems, and Public Key Infrastructure (PKI) and Virtual Private Network (VPN) solutions. Important corporate information may be

distributed across a variety of different systems. Networks have security point products - often from various vendors - with different security attributes and settings. Administrators are faced with the task of Enterprise Security Management such as coordination, implementation and monitoring of security attributes across varied, dispersed infrastructures. The dynamic nature of corporate networks means that they are no longer defined by physical boundaries, but instead by enterprise-wide security policies.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Audit an enterprise system for security vulnerabilities; 2. Critique the strengths and weaknesses in security products and adapt security measures; 3. Review and adapt system security and logging tools; 4. Critical review and analyse a system for deploying the most appropriate security solution; 5. Design and implement an enterprise security management system.

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

Required Reading: Chwan-Hwa (John) Wu, J. David Irwin. (2013) 1st ed. Introduction to Computer Networks and Cybersecurity CRC Press

Assessment: Test, Practical Test (2 hours), 20%. Assignment, Case Study – Enterprise Security Solution (2,500 words), 30%. Examination, Final Examination (2 hours), 50%.

NIT5084 Cyber Security Law, Regulation and Policy

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: The unit examines cybersecurity from legal, politics and technology perspectives. It covers public and private sector activities, government regulation, and international law and politics. It will allow students to evaluate legal challenge of cyber and digital worlds. It will enable them to develop knowledge and skills in relation to the legal rules, policies and cyber law in Australia and globally. In recognition of the interdisciplinary nature of cybersecurity problems, the unit is conducted through a series of seminars taught by guest lecturers from IT and legal industries and related areas.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Exhibit mastery of theoretical knowledge about the nature of the internet and cyberspace 2. Evaluate legal challenges of cyber and digital worlds from the IT point of view 3. Acquire knowledge and skills to interpret and implement the legal rules and policies 4. Analyse and track global trends and issues in cyberspace

Class Contact: Lab 2.0 hrs Lecture 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), laboratory sessions and online activities.

Required Reading: Clark, D., Berson, T. and Lin, H.S., (2014) At the Nexus of Cybersecurity and Public Policy: Some Basic Concepts and Issues The National Academies Press

Assessment: Exercise, Exercise/class presentation, 20%. Assignment, Group-based Assignment (2,500 words), 30%. Project, Technical Report (4,000 words or 15 pages), 50%.

NIT5110 Networking Systems

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit presents an overview of computer networking systems, laying the foundation for more advanced wired and wireless networking units in the course. It includes a perspective on the evolution of networking systems and their future. Topics include: computer networks and the Internet, seven-layer OSI Model, network design, subnetworking, routing, switching, VLAN, IPv6, network implementation with CISCO routers and switches, and etc. This knowledge and skills will be applied to analyse, evaluate, develop and design current and future computer networks.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse existing networks to evaluate their suitability for the application; 2. Investigate complex system requirements, develop network design and implement to meet the changing needs of new applications and organisation models; and 3. Elucidate the advantages of a network design and communicate them, to both specialised and non-specialised audiences, to justify the suitability, or otherwise, of existing computer network and the proposed new network system architecture.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Kurose, J.F. and Ross. K.W., (2012) 6th ed. Computer Networking: A Top-Down Approach Pearson

Assessment: Assignment, Design Project/Report (1500 words), 25%. Test, Semester Test (2 hours), 30%. Examination, Final Examination (3 hours), 45%.

NIT5120 Software Engineering

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit appraises software engineering processes in areas of software development and management in preparation for building real-world software applications. Topics include the software development process and software life-cycle models, software process improvement, requirements, classical analysis and design, object oriented analysis and design, implementation and testing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare and critically evaluate alternative life cycle models for a given project, and formulate recommendations for an appropriate model. 2. Evaluate requirements for a complex software system. 3. Quantify and prioritise project tasks and assign resources. 4. Construct and explicate software development techniques for both classical and objected oriented systems. 5. Communicate to specialised and non-specialised audiences the progress of system development and progress of a software project by preparing and presenting project milestone reports.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

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

Assessment: Test, Lab Test (2 hours), 20%. Assignment, Term Assignment (15 hours), 20%. Examination, Final Examination (3 hours), 60%.

NIT5130 Database Analysis and Design

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit discusses the specialised skills for designing and using relational databases. It is a core unit in this advanced and applied IT course. The unit provides students with an in depth knowledge of the daily administration of the relational

database. SQL is the standard language used in industry for storing information such as websites and business applications.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Abstract data requirements into data models using entity-relationship model and design relational databases; 2. Design proper queries with SQL language to adapt and translate data into useful information to users; 3. Assess and rationalise database design with functional dependencies and normal forms; 4. Propose and devise query optimisation, transaction and security management for relational database management systems; and 5. Exhibit mastery of theoretical knowledge and ability of creative application relating to the Relational Data Model and Relational Database Management Systems.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Elmasri, R. and Navathe, S.B., (2015) 7th ed. Fundamentals of Database Systems Pearson

Assessment: Test, Lab Test (2 hours), 20%. Assignment, Term assignment (3000 words), 20%. Examination, Final Examination (3 hours), 60%.

NIT5140 Information Security

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5110 - Networking Systems

Description: Information is an asset to all individuals and businesses. Information Security refers to the protection of these assets in order to achieve confidentiality, integrity and availability. Security is critical to IT applications and business success. This unit discusses the concept and specialised applications of information security. Topics covered include cryptography fundamentals, computer security, network security, data security, web security, e-business security, social issues of security and implementation. This unit provides students with advanced knowledge and skills for IT security industry.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review cryptographic algorithms such as DES, RSA and security standards; 2. Survey and investigate specific security issues in networked computing environments; 3. Analyse the security of computer systems, networks, databases, websites and e-business; 4. Propose advanced solutions to prevent hacking, impersonation, forging; and 5. Design and implement protocols to protect networks against hacking.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Stallings, W., (2014) 6th ed. Cryptography and network security: principles and practices Prentice Hall

Assessment: Assignment, Class project with detailed specifications (3000 words), 20%. Test, Two tests (10%, one hour each)-Short questions, 20%. Examination, Final Exam (3 hours), 60%.

NIT5150 Advanced Object Oriented Programming

Locations: Footscray Park, VU Sydney.

Prerequisites: Nil.

Description: This unit provides practice in object oriented programming and methodology using advanced features of ASP.NET MVC. This unit is aimed at students with some programming background in an object orientated language. Model-View-Controller (MVC) is a modern software architecture pattern that allows for code reuse and separation of concerns, and provides new way to develop ASP.NET Web Applications. Building upon MVC framework, a deeper investigation into technologies such as C#, HTML, CSS, Web, HTTP, JavaScript, Databases and Object Relational Mapping will be undertaken. Application development using ASP.NET MVC will also involve the use of professional Content Management System to construct complete, real-world sites.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compose advanced object-oriented solutions for problem solving; 2. Design and develop real world applications using ASP.NET MVC; and 3. Demonstrate skills in databases design and development using Object Relational Mapping.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Galloway, J., Haack, P., Wilson, B., and Allen, K.S. (2012) Professional ASP.NET MVC 4 John Wiley & Sons, Indianapolis, Indiana

Assessment: Assignment, Practical programming project 1 (2000 words), 20%. Assignment, Practical programming project 2 (3000 words), 30%. Examination, Summative assessment (2 hours), 50%.

NIT5160 Cloud Computing

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5110 - Networking Systems

Description: This unit provides an in-depth analysis of cloud computing systems. It addresses concepts related to parallel computing and distributed systems. It presents contemporary cloud infrastructures, interrogates how they are being deployed at leading companies such as Amazon, Google and Apple, and their application in fields such as healthcare, banking and science. Furthermore it discusses how to successfully deploy a cloud application across the enterprise using virtualization, resource management and networking support, with content delivery networks and storage area networks.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Devise and defend innovative solutions to complex problems by utilising cloud computing systems; 2. Simulate and verify a proposed new cloud computing system design; and 3. Extrapolate systems and processes related to cloud computing which can be applied in a variety of contexts.

Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.

Required Reading: Dan C. Marinescu, (2013) 1st ed. Cloud Computing: Theory and Practice Morgan Kaufmann

Assessment: Assignment, Lab Assignment (2000 words in total), 20%. Assignment, Project Assignment (3000 words), 30%. Examination, Final Examination (2 hours), 50%.

NIT6041 Thesis 1

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5150 - Advanced Object Oriented Programming NIT6130 - Introduction to Research NIT5140 - Information Security EPM5600 - Principles of Project Management EPM5700 - Project Management and Information Technology NIT5150 and NIT6130 and NIT5140 and (EPM5600 or EPM5700)

Description: A minor thesis enables students to apply knowledge and technical skills

to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base. The minor thesis (24 CP) is normally to be completed over two semesters. In Thesis 1, the student must clearly define a problem, produce a research plan, and undertake and present a review of theoretical and experimental literature on the topic area. The student introduces and formulates the problem and describes the proposed investigation. Thesis 2 is the continuation of Thesis 1 work and is usually undertaken in the following semester, when the student must submit a final, formal written thesis covering two semesters' work. To graduate from the Masters of Applied Information Technology, students are required to complete at least a 24 CP thesis.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise an academic research problem, design and produce a research plan; 2. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 3. Prepare and deliver presentations on the thesis topic, addressing and incorporating feedback; and 4. Perform a critical review of the relevant literature which demonstrates advanced knowledge of requisite concepts and technologies.

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

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

Assessment: Presentation, Mid-term oral presentation (20 minutes), 10%. Assignment, Research proposal (3000 words), 30%. Presentation, Final oral presentation (20 minutes), 15%. Literature Review, Literature Review (4000 words), 45%.

NIT6042 Thesis 2

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT6041 - Thesis 1

Description: Thesis 2 is a continuation of Thesis 1, undertaken usually in the following semester when the student must submit a written thesis covering two semesters' work. A minor thesis enables students to apply knowledge and technical skills to the investigation of a contemporary research problem thereby making a contribution to the disciplinary evidence-base. The minor thesis is to be completed normally over two semesters of study. Thesis 2 comprises a written report of independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, and undertake and present the theoretical and experimental review of literature on the topic area. Results and conclusions from the study are elaborated and presented.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 2. Prepare and deliver presentations on the final phase of the research, addressing and incorporating feedback; 3. Apply academic learning skills to the construction and compilation of a formal thesis incorporating a review of literature, methodology and methods, collection and analysis of data, findings and conclusion; and 4. Present the technical aspects of the research topic and compose thesis according to VU guidelines.

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

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

Assessment: Presentation, Oral presentations (20 minutes), 15%. Thesis, Thesis (final report) (14,000-16,0000 words), 85%.

NIT6043 Thesis 3

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT5150 - Advanced Object Oriented Programming NIT6130 - Introduction to Research NIT5140 - Information Security EPM5600 - Principles of Project Management EPM5700 - Project Management and Information Technology NIT5150 and NIT6130 and NIT5140 (EPM5600 or EPM5700)

Description: A major thesis enables students to apply knowledge and technical skills to the investigation of a contemporary research problem, thereby making a contribution to the disciplinary evidence-base and is normally completed over two semesters. In Thesis 3, the student must clearly define a problem, produce a research plan, and undertake and present an in-depth theoretical and experimental review of literature on the topic area. The student introduces and formulates the problem and describes the proposed investigation. Thesis 4 is the continuation of Thesis 3 work and is usually undertaken in the following semester, when the student must submit a final, formal written thesis covering two semesters' work.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Appraise an academic research problem, design and produce a research plan; 2. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 3. Prepare and deliver presentations on the final phase of the research, addressing and incorporating feedback; and 4. Perform a critical review of the relevant literature which demonstrates advanced knowledge of requisite concepts and technologies.

Class Contact: Tutorial 6.0 hrs Seventy-two (72) hours for one semester comprising face-to-face supervision and online activities.

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

Assessment: Presentation, Mid-term oral presentations (20 minutes), 10%. Thesis, Research proposal (3000 words), 30%. Presentation, Final oral presentation (20 minutes), 15%. Literature Review, Literature review (4000 words), 45%.

NIT6044 Thesis 4

Locations: Footscray Park, VU Sydney.

Prerequisites: NIT6043 - Thesis 3

Description: A major thesis enables students to apply knowledge and technical skills developed during the Master of Applied Information Technology course to the investigation of a contemporary research problem thereby making a contribution to the disciplinary evidence-base. The minor thesis is to be completed normally over two semesters of study. Thesis 4 comprises of a comprehensive written report of independently conducted academic research which demonstrates the student's ability to clearly define a problem, produce a research plan, and undertake and present and indepth theoretical and experimental review of literature on the topic area. Results and conclusions from the study are elaborated and presented. Thesis 4 is a continuation of Thesis 3, undertaken usually in the following semester when the student must submit a written thesis covering two semesters' work.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and justify an appropriate research methodology and methods to collect and analyse data; 2. Prepare and deliver presentations on the final phase of the research, addressing and incorporating feedback; 3. Apply academic learning skills to the construction and compilation of a formal thesis incorporating a review of literature, methodology and methods, collection and analysis of data, findings and conclusion; and 4. Present the technical aspects of the research topic and compose thesis according to VU guidelines.
Class Contact: Tutorial 6.0 hrs Seventy-two (72) hours for one semester comprising face-to-face supervision and online activities.
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation. Joyner, R.L, Rouse, W. and Glatthorn, A.A., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press
Assessment: Presentation, Oral presentations (20 minutes), 15%. Thesis, Thesis (final report) (20,000-24,000 words), 85%.

NIT6110 Advanced Wireless Networking

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5110 - Networking Systems
Description: Advanced Wireless Networking builds on and extends the specialised knowledge and skills students acquired in the NMIT core unit 'Network Systems'. It identifies and analyses at an advanced level key existing and emerging wireless networking technologies. It also examines the history of wireless network development, standardization, and deployment. The complex problems each technology was designed to solve and the relationship between technologies in the marketplace are elaborated. Key technical and usage trends (current and emerging) are addressed. Topics include: The Wireless Ecosystem, Wireless Personal, Local and Metropolitan Area Networks, Various Generations of Cellular Communications: 2G, 3G, 4G and beyond.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse existing wireless networks in order to conceptually map current and emerging mobile devices technology; 2. Investigate wireless system requirements and extrapolate findings to develop wireless networks for mobile communication; and 3. Elucidate and justify the advantages of the proposed wireless network design to both specialist and non-specialist audiences.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Burbank, J.L., Andrusenko, J., Everett, J.S., Kasch, W.T.M., (2013) 1st ed. Wireless Networking: Understanding Internetworking Challenges Wiley-IEEE Press
Assessment: Report, Weekly Labs (100 word report for each Lab), 20%. Project, Design Project Report (2000 words), 20%. Test, Semester Test (1 hour), 20%. Examination, Final Examination (3 hours), 40%.

NIT6120 Mobile Applications

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: This unit will address the creation of mobile applications across platforms and Web systems for contemporary and emerging popular smartphone use. It provides hands-on experience in developing applications for Google Android, Apple iOS, and Windows Phone. Topics covered include: smartphone platforms; the approach for developing identical applications for each platform; Web Applications; and Cross-Platform Development with Phone Apps. Multiple platforms emphasises the portability of apps that students create and encourages a deeper understanding of programming principles to benefit students throughout their career.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design and implement innovative solutions to potential mobile applications in a variety of user domains; 2. Test and verify the proposed new mobile applications, with consideration of various platforms and operating systems; and 3. Communicate complex aspects of product development and implementation to specialist and non-specialists audiences including potential users.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Thomas J. Duffy, (2013) 1st ed. Programming with Mobile Applications: Android™, iOS, and Windows® Phone 7 Cengage Learning
Assessment: Report, Weekly Labs (100 word report for each Lab), 20%. Project, Design Project Report (500 words), 20%. Test, Mid-Semester Test (1 hour), 20%. Examination, Final Examination (3 hours), 40%.

NIT6130 Introduction to Research

Locations: Footscray Park, VU Sydney.
Prerequisites: Nil.
Description: The focus of this unit is the investigative skills required to conduct research in industry or within a higher degree by research. Students will gain advanced skills to conduct research in Science and Technology disciplines and to prepare them for carrying out independent research in thesis units. They will be trained in writing a research proposal to develop their research project. Instruction will be provided in conducting a critical literature review to contextualise proposed research. Students will learn to critically evaluate ethical issues related to their topic. Oral and written communication skills will be developed through a series of presentations. The unit will be taken by students at the same time that they enrol in the minor thesis.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically discuss social and ethical issues in Information and Communication Technology (ICT) domains; 2. Critically reflect on the current state of an aspect of information technology based on the existing literature; 3. Communicate research concepts to specialist and non-specialist audiences; 4. Strategise and implement concepts associated with writing a research thesis, such as planning and structure; and 5. Prepare and critically evaluate research plan for further investigation to contribute to the evidence base within the discipline of IT.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Joyner, R.L. Rouse, W. and Glatthorn, A.A., (2013) 1st ed. Writing the Winning Thesis or Dissertation: A Step-by-Step Guide Corwin Press
Assessment: Assignment, Ethics Issues (2,000 words), 25%. Assignment, Literature review (2,000 words), 25%. Assignment, Research Methodology (2,000 words), 25%. Assignment, Research Experiment Design and Analysis (2,000 words), 25%.

NIT6140 Sensor Networks

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5110 - Networking Systems

Description: Sensor Networks are used to monitor a variety of systems, from environmental threat alerts to civil structure and health monitoring. This unit presents the fundamental concepts, practical aspects and applications of wireless sensor networks. Using contemporary examples the unit provides an overview of the current state of the technology. Topics include: Wireless Sensor Network Application, Factors Influencing Wireless Sensor Network Design, Physical to Application Layers with Cross-layer Solutions, Time Synchronization, Localization, and Topology Management, Wireless Multimedia, Underwater and Underground Sensor Networks. Students will learn to analyse the requirements of new advanced applications, and design the architecture of a wireless sensor network.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Investigate and develop the requirements of a new application to present it to a prospective client; 2. Create innovative solutions to emerging applications of sensor network systems, so as to meet the client brief and requirements; and 3. Simulate and verify proposed new sensor network designs to test a number of real-world application scenarios.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Dargie, W. and Poellabauer, C., (2010) 1st ed. Fundamentals of Wireless Sensor Networks: Theory and Practice Wiley
Assessment: Report, Lab Report (100 words for each Report), 20%. Project, Design Report (500 words), 20%. Test, Semester Test (1 Hour), 20%. Examination, Final Examination (3 Hours), 40%.

NIT6150 Advanced Project

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5110 - Networking Systems NIT5120 - Software Engineering NIT5130 - Database Analysis and Design NIT5150 - Advanced Object Oriented Programming EPM5600 - Principles of Project Management EPM5700 - Project Management and Information Technology (NIT5110 or NIT5120 or NIT5130 or NIT5150) and (EPM5600 or EPM5700)
Description: Modern applications and websites are developed quicker and at a lower cost, often (but not always) by a team of programmers. Complex software will be developed using software engineering principles to ensure correct requirements are met and the maintainability of the finished product. Each student will work on a project as a member of a software development team, or on an individual software development project. The project will focus on software development for industrial and business applications such as computer games, financial systems and medical information systems. To successfully complete the project, students will be required to apply an advanced body of knowledge and specialist cognitive and technical skills in one or more computing and software engineering areas including user interface, software development, database management systems, networking, wireless/mobile computing, web based and general application development environments. At the successful conclusion of this unit, students should be able to make use of software engineering processes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adapt and manage complex software development processes to produce software more quickly and accurately, and with a lower failure rate; 2. Produce a software application with a strong industrial background; 3. Devise and design software systems by critical application of software engineering principles; 4. Create and generate requisite project documentation including project analysis and design documents; 5. Implement milestone testing of software and user acceptance testing; and 6. Interpret and transmit information to both specialist and non-specialist audiences. 7. Critically Reflect understanding on computer ethics in practical project development.
Class Contact: Tutorial 3.0 hrs Thirty-six (36) hours for one semester comprising face-to-face tutorials and via virtual classroom supervision and online activities.
Required Reading: Schach, S.R., (2010) 8th ed. Object Oriented and Classical Software Engineering McGraw Hill
Assessment: Report, Project Proposal (1000 words), 10%. Project, System Analysis and Design Report (4000 words), 40%. Project, Final System Delivery and Evaluation (5000 words), 50%.

NIT6160 Data Warehousing and Mining

Locations: Footscray Park, VU Sydney.
Prerequisites: NIT5130 - Database Analysis and Design
Description: Data mining is the computational process of discovering patterns from large data sets. This unit discusses concepts and techniques of data warehousing and mining. Data mining is one of the most advanced tools used by IT industries. The topics covered include data warehouse models, data pre-processing, Online Analytical Processing, association rules mining, classification, clustering, sequential data mining and neural networks for data mining. In addition, students will learn how to use and apply relevant commercial data mining software to find solutions to real life business problems. This unit complements the student knowledge of database systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically analyse the features and applications of data warehouses; 2. Disaggregate and appraise the components in a typical data warehouse architecture; 3. Extrapolate knowledge and skills to design a data warehouse to support and provide business solutions; 4. Investigate and apply knowledge discovery processes and associated algorithms to large business datasets; and 5. Experiment with popular data mining software and propose a conceptual framework to evaluate its useability and functionality.
Class Contact: Lecture 2.0 hrs Tutorial 1.0 hr Thirty-six (36) hours for one semester comprising lectures (pre-recorded or face-to-face and via virtual classroom), tutorials, laboratory sessions and online activities.
Required Reading: Han, J., and Kamber, M. (2011) 3rd ed. Data Mining: Concepts and Techniques Morgan Kaufmann
Assessment: Assignment, Development of data warehouse (1000 word report and 200 line codes), 20%. Test, Multiple Choice (1 hour), 20%. Examination, Final Exam (3 hours), 60%.

NNE7001 Environmental Management

Locations: Footscray Park.
Prerequisites: Nil.
Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigate and provide solutions to various environmental issues. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. This unit is designed to enable students to develop broad knowledge of contemporary environmental issues, the ability to develop and implement systems and procedures to ensure compliance with legal environmental requirements, and to appreciate the importance of risk management and sustainable development. It focuses specifically on specialised skills relating to air pollution control management, solid wastes

management and water pollution control, and the assessment of project environmental impacts are key elements in maintaining public health and protecting the environment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically assess and demonstrate key issues relating to ecology and sustainable development issue; 2. Develop and implement systems and procedures to demonstrate knowledge of contemporary environmental issues and to ensure compliance with legal environmental requirements 3. Gain in-depth knowledge in pollution control technologies available to minimise the air and water pollution as well as solid wastes on the environment; 4. Evaluate different types of technologies to minimise impacts on human society and the environment and provide recommendations for upgrading their efficiency; 5. Formulate high quality technical reports, present information on environmental management technologies and demonstrate professional skills.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: There is no specific text book for this unit. Students can refer any of the below recommended text books.RECOMMENDED TEXTS: Vesilind, P, Morgan, S. And Heine, L.G (2010), Introduction to Environmental Engineering, 3rd (SI) edn, Cengage Davis, M and Cornwell, D. (2008), Introduction to Environmental Engineering, 4th (Intl) edn, McGraw Hill Davis, M & Masten, S. (2009), Principles of Environmental Engineering and Science, 3rd (Intl) edn, McGraw Hill Metcalf and Eddy (2003), Wastewater Engineering - Treatment and Reuse, 4th edn, McGraw Hill Gray, N.F. (2005),Water Technology, 2nd edn, Elsevier Kiely, G. (1997) Environmental Engineering, McGraw Hill Tyler Miller, JR (2007) Living in the Environment, 15th edn, Thomson Learning

Assessment: Test, In-class Test (0.5 hr), 10%. Assignment, Group Report (2000 words each), 30%. Presentation, Oral Presentation (15 min), 10%. Examination, Final Examination (3 hours - equivalent to 3000 words), 50%.

NNE7002 Advanced Water and Waste Water Treatment

Locations: Footscray Park.

Prerequisites: Nil.

Description: Advanced water and wastewater treatment processes becoming very important and popular due to the stipulated stringent environmental regulations and rapid urbanisation. Conventional treatment processes are mostly becoming ineffective as water sources and discharged wastewater consists of significantly high levels of persistent and other organic/inorganic micro-pollutants. Highly polluted industry (trade) wastewater discharge into reticulation systems is also very costly and complex due to the charges levied on trade waste generators. Safe water is a scarce resource in most of the parts in the World and therefore, the modern water and wastewater industry focuses to apply novel advanced treatment systems to overcome the current challenges in the industry. This unit of study focuses teaching and learning of the modern and effective techniques related to advanced water and wastewater treatment. This unit mainly covers the topics such as Advanced Primary treatment technologies (Diffused air floatation - DAF), secondary Treatment methods (Membrane Bioreactor-MBR, SBR, RBC, and ANAMMOX), Biological Nutrient Removal, Recovery of Energy and resources, Advanced membrane separation technologies (UF/NF/RO/FO), Advanced oxidation processes (AOPs) and Activated Carbon Adsorption techniques.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the fundamentals of advanced water and wastewater treatment and apply in various industrial contexts and challenges to develop sustainable and innovative solutions to the water and wastewater industry; 2. Critically apply the knowledge and expertise relevant to advanced water and wastewater treatment systems professionally; 3. Investigate and evaluate different types of water and wastewater treatment processes and provide recommendations for upgrading their efficiency; 4. Design and install efficient and reliable advanced water and wastewater treatment facilities to produce safe water, recover energy and resources; 5. Formulate high quality technical reports, present information on advanced water and wastewater technologies and demonstrate professional skills.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: There is no specific text book for this unit. Students can refer any text book relevant to Wastewater Treatment and Reuse.Recommended Text: D. G. Rao, R. Senthilkumar, J. Anthony Byrne, S. Feroz. (2012). Wastewater Treatment: Advanced Processes and Technologies. 4th edition, Metcalf & Eddy Inc.

Assessment: Project, Conduct a Scientific Group Project and produce a high quality technical report (2000 words each), 40%. Presentation, Oral Presentation (15 minutes each), 10%. Test, Mid Semester Test (1 hour), 10%. Examination, Final Examination (3 hours), 40%.

NNG6001 HDL and High Level Synthesis

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in Hardware Description Language (HDL) and High level Synthesis. The unit content has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer using EDA and VHDL tools. In this unit the students will be exposed to hardware modelling and advanced design and optimisation techniques using HDL and /or Verelog languages. Students will acquire knowledge and skills and demonstrate their application advance in circuit design using FPGAs with industry standard EDA tools. This design will include high level synthesis, optimization, verification and implementation techniques to meet the demands of the 21st century design specifications.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply specialist technical competence in designing Integrated Circuit using Hardware Description Language (VHDL) and or Verilog; 2. Generate the Architectural-level Synthesis of selected design problems; 3. Solve and implement Synthesis Field Programmable Gate Array (FPGA) for a complex design problem; 4. Identify and critically evaluate High level optimisations of the designed problem; 5. Generate standard Coding of the design problem; and 6. Utilise Industry Standard Electronic Design Automation (EDA) tools for the design problem.

Class Contact: Forty-eight hours (48) for one semester comprising lectures, laboratory exercises and project work.

Required Reading: There are a number of other text books that can be used in parallel to the prescribed one.Ewout S. J. Martens; Georges Gielen; 2008. High-level modelling and synthesis of analog integrated systems USA, Springer

Assessment: A Pass must be achieved in each assessment item in order to complete the unit. Project, Project (3000 words), 40%. Laboratory Work, Four (4) Laboratory Exercises (500 words per report), 30%. Examination, Written examination (2 hours-equivalent to 2000 words), 30%.

NNG6003 EDA Tools and Design Methodology

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in EDA tools and design Methodologies. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer exposed to EDA tools and design methodologies. This unit will familiarize the students with EDA design flow environment, and embedded development tools for analogue and digital applications (Specific Integrated Circuits ASIC). The design flow covers full and semi-custom IC design and mixed signal design. Getting these skills will enhance a student's employability in a profession where these skills are highly sought after.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Utilise and apply high level competence in EDA design flow environment for all IC design; 2. Apply high level technical competence in Back-end IC design flow and tools to all design; 3. Apply Front-end IC design flow and tools to all design; 4. Implement Functional design and verification in all design; and 5. Utilise the Mixed signal design flow for all design.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, laboratory/workshop and project.

Required Reading: There are a number of other text books that can be used in parallel the prescribed one.Chang, H., Cooke, L., Hunt, M., Martin, G., McNelly, A. and Todd, L, (2004) Surviving the SOC Revolution - A Guide to Platform-Based Design San Francisco: Kluwer Academic.

Assessment: A Pass must be achieved in order to complete the unit. Assignment, Assignment (1500 words), 25%. Project, Research project (4000 words), 40%. Laboratory Work, Three (3) laboratory reports (500 words each), 35%. The total combined assessment word equivalence is approximately 6,000 words.

NNG6014 RF and Mixed Signal Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an RF and mixed signal circuit designer. This unit covers specialised circuit design for RF wireless communication systems, including transceiver architectures and layout techniques, LNAs, oscillators, mixers, and phase detectors. Students will also learn how to design low voltage low power integrated circuits; design flow for analog and mixed signal circuits and systems utilising industry standard Electronic Design Automation (EDA) tools.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialised technical RF and mixed signal design to the developed circuit; 2. Utilise a systems approach to evaluate RF circuit performance in terms of noise isolation and interference; 3. Critically review and implement various circuit design tools in order to insure proper performance; 4. Survey and investigate the operation of the key RF and mixed signal design standards; and 5. Propose and justify procedures for the operation and identification of strengths and weaknesses of popular RF circuit design techniques for both analogue and digital systems.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, laboratory exercises and tutorial projects.

Required Reading: Leung, B. (2011) 2nd VLSI for Wireless Communication Springer There are a number of other text books that can be used in parallel the prescribed text above, which the Lecturer will provide to students.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Laboratory Work, Three (3) Reports (500 words per report), 30%. Project, Project Report (3000 words), 40%. Examination, Final Examination (2 hours - equivalent to 2000 words), 30%.

NNG6551 Microwave Electronic Circuit Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Microwave electronic circuit designer. This subject will provide an in-depth approach to electronic circuit design based around the 'Micro strip' transmission line structure. Students will be given small design projects to cover frequencies relevant to mobile communications (i.e. 0.9 to 3 GHz). Extensive use will be made of Agilent's simulation and design package, ADS and other software packages in this course. In general the unit contains a review of basic transmission line theory; a review of microwave transmission structures; a discussion of corrections for micro strip discontinuities; a review of the Smith Chart; consideration of matching requirements for small signal amplifiers; a review of matching techniques; Bias circuit design, power amplifier design and Passive RF Components.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply in-depth technical electronic circuit design for microwave systems; 2. Utilise a systems approach to evaluate microwave system performance in terms of quality of service and grade of service; 3. Critically review and implement various circuit design tools; 4. Survey and investigate the operation of the key microwave standards; and 5. Propose procedures for the operation and identification of strengths and weaknesses of popular microwave access techniques for both analogue and digital systems.

Class Contact: Forty-eight (48) hours for one semester, comprising of lectures, tutorial and laboratory.

Required Reading: Pozer, D.M. (2011) 4th Microwave Engineering Wiley Other recommended text: Microwave & RF Engineering: A simulation approach with Keysight Genesys Software Written by Ali Behagi & Stephne Turner. Volume 1 2015. Publisher: BT Microwave LLG ISBN-13: 978-0983546030

Assessment: A Pass must be achieved in each assessment item in order to complete the unit. Assignment, Four (4) Assignments (1500 words each assignment), 30%. Laboratory Work, Three (3) Laboratory Practicals, 30%. Examination, Final Examination (3 hours), 40%.

NNG6600 Global Engineering Communication

Locations: Footscray Park.

Prerequisites: Nil.

Description: The material taught will provide students with a thorough grounding in academic discourse elements including relevant writing conventions and English language features required to critically analyse, write, present and communicate with a variety of professional audiences. This unit has been designed to provide students with the opportunity to share views and issues within the group to create a better

understanding of the research task and to feel greater confidence with the research materials and research writing. The development of research and language skills through this unit will complement discipline based research activities. Students undertaking this unit will be able to negotiate assessment tasks which may stem from these activities.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and exploit academic discourse conventions in the field of engineering to explain and critique theories, theoretical propositions, and methodologies; 2. Exhibit, explicate and implement a critical understanding of and ability to employ discipline-specific linguistic and language elements needed in the field of engineering in order to communicate appropriately within discipline conventions; 3. Elucidate and convince in proficient English academic writing conventions to support all aspects of the design and development work fundamental to research activities; 4. Communicate and construe research information and theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional; 5. Conceptually map and critically reflect on the research process by identifying researchable problems and propose meaningful research questions, which are appropriate within discipline conventions.

Class Contact: Sixty (60) hours for one semester consisting of two (2) hours per week of face-to-face lectures, two (2) hours of workshops that involve group work, presentations and blended learning activities.

Required Reading: Reading material will be provided or specified in Unit Guides, with additional material provided through VU Collaborate.

Assessment: Journal, A reflective journal which includes at least 5 entries reflecting the various session topics (400x5 = 2000 words), 20%. Annotated Bibliography, An annotated bibliography of 6-8 texts (1000 words), 20%. Presentation, Abstract/summary (100 words) followed by oral presentation to class, comparing 2-3 readings relevant to student's research topic (5 mins), 30%. Review, A literature review report on an agreed aspect of student's research topic (3000 words), 30%.

NNM6513 Fibre Network Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in optical communication systems and networks. To meet the needs of modern optical infra-structure such as the national broadband network, the unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer in modern optical connected networks. This unit provides a detailed study of optical fibre systems. It commences with a review of basic optical theory. Optical fibre types are presented and the attenuation in silica optical fibres is considered. Modes in slab waveguides and optical fibres are studied particularly for the effect of dispersion and distortion. The sources and detectors required in optical fibre systems are explained along with noise in detector systems. Finally, the design of fibre optic communication systems is presented, including optical amplifiers, wavelength division multiplexing and Bragg gratings, plus an introduction to fibre optic sensing.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply critical high level practical competence to the underlying physical phenomena that enables communication through optical fibres; 2. Determine and critically evaluate the advantages and disadvantages of optical fibre communication systems compared to copper cables; 3. Critique and justify the operation, characteristics and components of fibre communication systems; 4. Generate innovative and appropriate solutions to complex and unknown problems involving components of optical communication system; and 5. Develop practical designs for given fibre optic communication system specifications.

Class Contact: Seminar4.0 hrsForty-eight (48) hours for one semester comprising of Lectures, Tutorials and Laboratories.

Required Reading: More text book recommendations will be made by the unit coordinator.Palais, J.C. (2005) 5th Fibre Optic Communications Prentice-Hall, NJ.

Assessment: Laboratory Work, Reports on Laboratory classes (2000 words), 20%. Test, Written Test (2 hours), 30%. Examination, Written Exam (3 hours), 50%.

NNM7001 Power Generation

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and develop critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. Content has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to the field of engineering and power generation. The unit addresses in a readily accessible format processes by which power is generated with special emphasis on alternative renewable energy generation sources such as solar, wind, biomass and fuel cells. This unit takes into account the many challenges that Australia faces today due to the excess power supply but with a decrease in demand. The unit addresses the global pressures on replacing fossil fuel plants to renewables and the need for cheap and affordable power.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine design needs for power generation taking into account environmental effects; 2. Apply specialist competence to a power generation system to ensure optimal performance; 3. Identify appropriate solutions to problems inherent in power generation for given scenarios; 4. Utilise a systems approach to analysis, design and operational performance of a power generator; 5. Critically evaluate generation schemes applicable to a given application in order to enhance efficiency; and 6. Determine system performance in terms of power transients and disturbances to maintain uninterrupted power distribution.

Class Contact: Lecture1.0 hrPC Lab2.0 hrsTutorial2.0 hrs

Required Reading: To be advised by unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, 2 Hour in-class test (equivalent to 2000 words), 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour written exam (equivalent to 3000 words), 45%. Normally exam requirements are explained in advance.

NNM7002 Transient Analysis, Stability and Surge Protection

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit content has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to transient analysis, stability and power surge protection. This unit will provide hands-on approach to addressing dynamic and transient stability issues. Major limits to power transfer are voltage and angle

stability, and this module will put these in the context of the operation of the National Electricity Market. Students will engage in the modelling of power system components for dynamics and simulation approaches for voltage and angle stability. Familiarisation with an interactive package such as PSSE /SINCAL/PowerWorld is mandatory and Stability Enhancement options such as Excitation, SVC and Tap Locking will be explored. Practical exercises using the interactive package on more extensive systems for both distribution and transmission systems will be available. A number of simple systems have been chosen to illustrate limitations to analysis techniques and applications in power supply systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop methodologies used to carry out transient analysis in power systems; 2. Apply specialist expertise in monitoring power system performance; 3. Identify and recommend appropriate solutions to complex problems in given surge scenarios; 4. Utilise a systems approach to transient analysis; 5. Critically evaluate stable power supplies and supplies under surge; and 6. Determine power supply system performance in terms of transients and surges.

Class Contact: Lecture1.0 hrPC Lab2.0 hrsTutorial2.0 hrs

Required Reading: To be advised by the unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, In-class 2 Hour Test (equivalent to 2000 words), 25%. Assignment, 2000 word Assignment, 30%. Examination, 3 Hour written exam (Equivalent to 3000 words), 45%. Exam requirements are normally explained in advance.

NNM7003 Overhead Design and Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: Material taught in this unit contributes to the training a student needs In order to acquire the skills required to work in the electrical power supply industry. In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving in overhead design and construction of power distribution networks. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important in power generation and distribution. Students will study power delivery requirement (in voltage and megawatts) and the maximum outage in order to specify the electrical, mechanical and environmental requirements for an Australian overhead line. This will lead into the design of an overhead line for a given Basic Insulation Line (BIL); in this practical undertaking students are expected to conduct transient analysis from a lightning and switching perspective.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically apply specialised technical knowledge and skills to ascertain the electrical, mechanical and environmental requirements for an Australian overhead line for a given power delivery requirement (in voltage and megawatts) and a given maximum outage per 100 kilometre years; 2. Design and simulate an overhead line for a given Basic Insulation Line (BIL) and conduct transient analysis from a lightning and switching perspective; 3. Produce an environmental impact statement for a given overhead line route taking into account environmental and community statutory requirements and propose strategies to address emergent issues; 4. Conceptually map and evaluate the key design aspects of a given overhead line in regards to construction and maintenance for the next 30 years (including OHS issues and ongoing operational regimes); and 5. Survey the key design and construction characteristics for transmission, sub-transmission and distribution lines in order to maintain uninterrupted power supply.

Class Contact: Lecture1.0 hrPC Lab1.0 hrSeminar2.0 hrsTutorial1.0 hr

Required Reading: To be advised by the unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, 2 Hour in-class test equivalent to 2000 words, 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour Written - equivalent to 3000 words, 45%. Exam requirements are normally explained in advance.

NNM7004 Underground Design and Construction

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to underground design and construction required in power generation. This unit provides an expert introduction to underground power system design. Students gain specialist knowledge about cable systems, types of system topologies, manufacturing practices and standards. The uses and design parameters of the equipment necessary for underground system design are also addressed. Subsequently, basic underground cable design practices are reviewed and installation practices for both transmission and distribution projects are considered as well as relevant as application concepts such as hydraulic pressures, commissioning and industry standards. Following an underground system case study, students undertake a final assignment replacing a low Pressure Fluid-Filled system and upgrading a High Pressure Fluid-Filled system.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialist technical knowledge of cable systems, types of systems, manufacturing practices and standards; 2. Design and implement specifications of the equipment needed for an underground system design; 3. Apply specialist knowledge of underground cable design practices and installation practices for both transmission and distribution projects; 4. Evaluate and apply relevant hydraulic pressure specifications, commissioning and industry standards to a given scenario; 5. Critically review a system case study of replacing a Low Pressure Fluid-Filled system and upgrading a High Pressure Fluid-Filled system in the High Voltage Lab; and 6. Independently or in collaboration with peers propose and complete a project that investigates type of cable, manhole spacing, pulling considerations and all relevant design calculations for underground power supply.

Class Contact: Seminar2.0 hrsWorkshop2.0 hrsSixty hours (60) for one semester, comprising lectures, tutorials, hardware and computer based labs.

Required Reading: To be advised by the unit coordinator.

Assessment: A pass must be achieved in each assessment to complete the unit. Test, 2 Hour in-class test - equivalent to 2000 words, 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour written exam - equivalent to 3000 words, 45%. Examination requirements are explained in advance.

NNM7005 Power Quality and Harmonics

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other

professional capabilities important to power quality and harmonics during generation and distribution. The subject of power quality is very broad by nature. It covers all aspects of power system engineering from transmission and distribution level analyses to end-user problems. Therefore, electric power quality has become the concern of utilities, end users, architects and civil engineers as well as manufacturers. This unit is intended for undergraduate students in electrical and other engineering disciplines as well as for professionals in related fields. The increased use of power electronic components within the distribution system and the reliance on renewable energy sources which have converters as interface between the source and the power system lead to power quality problems for the operation of machines, transformers, capacitors and power systems. Power quality of power systems affects all connected electrical and electronic equipment, and is a measure of deviations in voltage, current, frequency, temperature, force, and torque of particular supply systems and their components. In recent years there has been considerable increase in nonlinear loads, in particular distributed loads such as computers, TV monitors and lighting. These draw harmonic currents which have detrimental effects including communication interference, loss of reliability, increased operating costs, equipment overheating, machine, transformer and capacitor failures, and inaccurate power metering. This subject is pertinent to engineers involved with power systems quality control, electrical machines performance evaluation, electronic equipment for power measurement, computers for power monitoring and manufacturing equipment that is power driven.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialist technical knowledge to determine power quality and harmonics in a variety of contexts; 2. Design and implement parameters of the equipment needed to diagnose power in order to determine quality and the presence of harmonics; 3. Apply specialist practices to ensure efficiency in both transmission and distribution of quality power; 4. Critique and apply specifications needed in commissioning power distribution; 5. Survey and propose solutions to power quality problems of electrical machines and power systems; and 6. Propose, implement and evaluate modelling, simulation and measuring techniques for transformers, machines, capacitors and power generation systems.

Class Contact: Lecture1.0 hrPC Lab2.0 hrsTutorial2.0 hrs

Required Reading: To be advised by unit coordinator

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Test, 2 hour in-class - equivalent to 200 words, 25%. Assignment, 2000 words, 30%. Examination, 3 Hour written examination - equivalent to 3000 words, 45%. Examination requirements are explained in advance.

NNM7006 Insulation Co-Ordination and Sub-Station Design Principles

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to insulation coordination and sub-station design principles. The unit is designed for students specialising in the field of Electrical Power Engineering and will upgrade knowledge, skills and application of skills related to power sub-stations design and insulation coordination. This follows the procedures and protocols of international standards like AS1824, BS 6651, IEEE 1313.2 and 998, and IEC 62305 and 60099. These standards provide guidelines to design sub-station layout for transmission and distribution networks with a view to protect costly power apparatus from random occurring overvoltage transients. The design rules of sub-stations are broad and cover many areas of civil, mechanical, material science, life science and telecommunication engineering. This unit also highlights the steps involved in design and analysis of sub-station layouts. The theoretical and practical knowledge gained from this module notes and Sub-Station visit is the excellent foundation for those students who will start to work and design in the new and operating sub-station environment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design a sub-station layout for transmission and distribution systems, taking into account future power supply demand requirements; 2. Adhere to stringent requirements of insulation coordination principles to power system design; 3. Devise overvoltage protection systems on random occurring lightning and switching transient surges; 4. Demonstrate with real world sub-station layouts and analysis with the learned concepts can strengthen the generic concept followed in the industry; 5. Survey and conduct a case study for a site specific case; and 6. Propose, conduct and justify computational modelling to meet industry standards.

Class Contact: Lecture1.0 hrPC Lab2.0 hrsTutorial2.0 hrs

Required Reading: To be advised by unit coordinator.

Assessment: A pass must be achieved in each assessment item in order to pass the whole unit. Test, 2 Hour in-class - equivalent to 2000 words, 25%. Assignment, Written report (2000 words), 30%. Examination, 3 Hour written exam - equivalent to 3000 words, 45%. Examination requirements are normally explained in advance.

NNM7007 National Electricity Market and Regulation Principles

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to the national electricity market and regulation principles. The unit includes an overview of the regulation principles governing the management of electricity markets. Whilst the principles are general, they are demonstrated through the specifics of the National Electricity Market. The role of workplace OH&S regulations governing the supply and delivery of energy to the end user is considered. Students are exposed to authentic work relevant issues that underpin the regulation principles governing the management of electricity markets that supply and deliver energy to end users. Further, the unit covers the role and requirements of workplace Occupational, Health & Safety.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critical review the Role of the governments, COAG (Council of Australian Governments), and MCE (Ministerial Council on Energy); 2. Implement specialist recommendations by the regulators, AEMC (Australian Energy Market Commission), AER (Australian Energy Regulator), jurisdictional regulators; 3. Survey and critique the Objectives of electricity markets; 4. Conduct a specialist review of the role of market and system operators, AEMO (Australian Energy Market Operator); 5. Adhere to the Australian Energy Market Agreement and various legislative and regulatory instruments including the National Electricity Law and Rules (economic and technical requirements); 6. Employ specialist review of the Economic regulation of Network Service Providers including setting of revenues, incentives and network access regimes; and 7. Critical review of the Categories of Market Participants and compliance obligations.

Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Seminar 2.0 hrs Workshop 1.0 hr
Required Reading: To be advised by unit coordinator.
Assessment: A pass must be achieved in each assessment item to complete the unit. Test, In Class Test (2 hours), 25%. Assignment, Assignment (7000 words), 30%. Examination, Written Exam (3 hours), 45%. Examination requirements are normally explained in advance.

NNM7008 Environmental Issues and Sustainability

Locations: Footscray Park.
Prerequisites: Nil.
Description: The electricity supply industry is constantly being challenged by the environmental organisations for polluting the landscape. The unit will address the issues and the challenges facing the power supply industry and highlight ways to improve the environment and not be seen as major polluters. In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to environmental issues and sustainability in power generation and distribution. This unit is designed for postgraduate students specialising in the field of Electrical Power Systems. However, the content and perspectives have a wider relevance across energy engineering. The unit focuses on environmental issues relevant to electricity supply and delivery, and their potential impact on the future of the Australian electricity industry in the context of wider sustainability objectives.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critique an environmental impact assessment methodology and make recommendations regarding its useability; 2. Propose and justify advanced solutions to complex problems of sustainable energy in a variety of contexts; 3. Investigate and critically review energy and climate policies claiming to promote a more sustainable energy future; 4. Formulate and implement protocols to protect sustainable energy technologies and communicate these to specialist and non-specialist audiences; and 5. Design conduct and evaluate a specialised project on sustainable and renewable energy to test efficiency and reliability.
Class Contact: Lecture 1.0 hr PC Lab 1.0 hr Seminar 2.0 hrs Tutorial 1.0 hr
Required Reading: To be advised by unit coordinator.
Assessment: A pass must be achieved in each assessment item to complete the unit. Test, In Class Test (2 hours) (equivalent to 2000 words), 25%. Assignment, Assignment (2000 words), 30%. Examination, Written Exam (3 hours) (equivalent to 3000 words), 45%. Exam requirements are normally explained in advance.

NNP7001 Fundamentals in Process Engineering 1

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: In this unit students will acquire advanced theoretical knowledge and critical analytical skills which can be applied towards setting up complex problem solving scenarios inherent in process engineering systems. The unit material has been developed to enhance students' fundamental knowledge important to practice as an Engineer working in process engineering within water and foods industries. In order to build fundamental specialist knowledge required in the discipline of process engineering, this unit provides an overview of essential elements in process engineering thermodynamics. Processes require competent understandings of entropy and enthalpy, differences between simple and complex mixtures, vapour liquid equilibria, power cycles and chemically reacting systems. The unit will further develop the fundamental understandings by showing working examples of theories to achieve practically meaningful information that forms an essential element of modelling and designing processes in real applications. The unit explores equilibrium between solid, liquid and vapour phases of single components, and mixtures, forming the basis of understanding classic industrial operations such as drying and distillation. This is followed by phase behaviour in multicomponent systems, where food and water components can be isolated according to practical properties such as concentration, temperature and pressure. Thermodynamic cycles which form the basis of industries such as power generation will be included. The role of reactions in these processes will also be a component, where product yields and thermodynamic considerations are a key part when understanding and designing foods and water processes.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map essential fundamental knowledge in thermodynamics needed for a process engineering specialisation applied in various contemporary and emerging foods and water processing; 2. Gain essential fundamental knowledge in process engineering thermodynamics needed to contribute to the discourse and practice in 'engineering sustainability' and link to innovation; 3. Critically apply knowledge and skills relevant to process engineering problems and to the broader Engineering discipline to new and uncertain professional practice scenarios, exhibiting a high level of personal autonomy and accountability; 4. Apply fundamental knowledge in process engineering thermodynamics to design, implement and evaluate food and water process projects or research which address complex issues and communicate findings to peers and broader audiences 5. Have the fundamental knowledge supporting an ability to formulate and strategize project management plans accurately meeting stakeholder needs and expectations.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Honig, Jurgen M. (2007) 3rd ed. Thermodynamics : Principles Characterizing Physical and Chemical Processes Academic Press Çengel, Yunus A. (2015) 8th ed. Thermodynamics : an engineering approach McGraw-Hill Recommended reading: J.M. Coulson and J.F. Richardson (1996) Coulson & Richardson's chemical engineering 6th ed. Oxford; Boston : Butterworth-Heinemann Sandler, S. I. (1999) Chemical and Engineering Thermodynamics 3rd ed. John Wiley & Sons
Assessment: Test, Two (2) In Class Tests (1 hour each, approximately 1000 word equivalent), 30%. Assignment, Two (2) individual written research assignments (1500 words each), 30%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7002 Fundamentals in Process Engineering 2

Locations: Werribee, Footscray Park.
Prerequisites: NNP7001 - Fundamentals in Process Engineering 1
Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied towards setting up complex problem solving scenarios inherent in process engineering systems. The unit material has been developed to enhance students' fundamental knowledge important to practice as an Engineer oriented towards processing systems in water and foods industries. In order to build fundamental specialist knowledge required in the discipline of process engineering, this unit provides an overview of critical fundamental elements in process engineering heat transfer and mass transfer, as well as fluid flow and transport phenomena. Processes require competent understandings of fundamentals of the transfer of thermal energy and mass, the behaviour of bulk fluids flowing through equipment and piping, as well as transport

of molecules at a more fundamental molecular level. The unit will further develop the fundamental understandings by showing working examples of theories to achieve practically meaningful information that forms an essential element of modelling and designing processes in real applications. The unit explores the modes of heat transfer, the utilisation of boiling and condensation, and principles of heat exchangers. Mass transfer will also be presented, covering fundamentals of adsorption, distillation, extraction, ion exchange, drying and leaching. Theories including the calculation of heat and mass transfer coefficients will need to be understood as part of applying the fundamental processes. Fluid mechanics will be included, showing the types of fluid flow and how to find fluid properties to calculate flow resistances, pressure drops and residence times, with relevance to process equipment design. The flow of fluids at the molecular scale will also be shown, where fundamentals of molecular diffusion through gas, liquids and solids are an important feature of water and foods processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map essential fundamental knowledge in heat and mass transport phenomena needed for a process engineering specialization applied in various contemporary and emerging foods and water processing; 2. Gain essential fundamental knowledge in process heat and mass transfer operations needed to contribute to the discourse and practice in 'engineering sustainability' and link to innovation; 3. Critically synthetises acquired knowledge and apply relevant skills to solve process engineering problems within new and uncertain professional practice scenarios with a high level of personal autonomy and accountability; 4. Apply fundamental knowledge of heat and mass transfer phenomena to design, implement and evaluate engineering aspects of food and water processing on various projects or research addressing more broader and complex issues, and communicating ideas and solutions to their peers and broader audiences; and 5. Have the fundamental knowledge supporting an ability to formulate and strategize project management plans accurately meeting stakeholder needs and expectations.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: Holman, J. P. (2010) 10th ed. Heat transfer McGraw-Hill Education Theodore, Louis (2010) Mass transfer operations for the practicing engineer New York: Wiley Recommended reading: Crowe, C. T. (2005). Engineering fluid mechanics 8th edition. New York: Wiley Bird, R. Byron (1960). Transport phenomena. New York: Wiley Plawsky, Joel L., (2001). Transport phenomena fundamentals. New York : Marcel Dekker Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.

Assessment: Test, Two (2) In Class Tests (1000 words - 1 hour each), 30%. Assignment, Two (2) individual written research assignments (1500 words each), 30%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7003 Process Chemistry

Locations: Footscray Nicholson, Werribee, Industry, Footscray Park.

Prerequisites: NNP7002 - Fundamentals in Process Engineering 2

Description: In this unit students will acquire advanced theoretical knowledge in chemistry and physical chemistry related to food and water processing. The students will also gain practical and critical analytical skills relevant for addressing complex problem solving scenarios inherent in process engineering systems. Students will built on knowledge of basic chemistry properties, actions and reactions, in particular, matter and energy, atomic theory and the periodic table, solutions and aqueous chemistry, physical chemistry including chemical equilibrium and kinetics, acids and bases, thermochemistry and nuclear chemistry. This unit will provide students with knowledge of the main organic and inorganic constituents of food and water including waste water: proteins (structure and types of amino acids, peptide bonds, protein structures, conjugated proteins, structure-function relationship); carbohydrates (basic chemistry of carbohydrates, structure and examples of mono-di, oligo and polysaccharides, structure-function relationship); lipids (definition and main classes of lipids, structure and nomenclature of fatty acids, types of fatty acids, structure-function relationship); water (importance of water in food, structure of water and ice and their relation towards properties of food, types of water and its relation towards properties of food, relationship between water activity and moisture in food systems; minerals (importance of variety of minerals in food and water, important minerals and their properties in relation to properties of food and water); vitamins (importance of vitamins, structure-function relationship).

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically appraise chemical properties of carbohydrates, proteins, fats, minerals and vitamins in food and water; 2. Characterize both solid and liquid systems using chemical and physical analysis techniques 3. Apply or design appropriate processing methods utilizing physical properties of organic and inorganic materials in food and water 4. Articulate principles underpinning laboratory testing and procedures of physicochemical properties of food and water; 5. Collate, determine and critically evaluate the data in terms of the specific food or water system to confidently apply theories towards the particular industry challenge.

Class Contact: Lecture2.0 hrsPC Lab1.0 hrTutorial1.0 hrWorkshop1.0 hr

Required Reading: Damodaran, S., Parkin, K.L., Fennema, O.R. (2008) 4th ed. Fennema's Food Chemistry Boca Raton : CRC Press; Taylor and Francis Group van Loon, G. W. Duffy, S. J. (2011) 3rd ed. Environmental Chemistry. A Global Perspective Oxford; New York : Oxford University Press Recommended reading: Atkins, P.W., De Paula, J. (2010) Atkins' physical chemistry Oxford ; New York : Oxford University Press Walstra, P. (2003) Physical chemistry of foods New York : Marcel Dekker Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.

Assessment: Test, Two (2) In Class Tests (1000 words, 1 hour each), 20%. Report, Four (4) Lab reports 750 words (3000 words in total), 40%. Examination, Final Examination with short answer and long answer question (2 hours, 2000 words equivalent), 40%. Total combined assessment word equivalence is approximately 7,000 words.

NNP7004 Safety and Quality Assurance

Locations: Footscray Nicholson, Werribee, Footscray Park.

Prerequisites: NNP7003 - Process Chemistry

Description: Consumers expect high quality, safe food produced and packaged under hygienic conditions. At the same time humans process water for various purposes noting that different waters vary in qualities such as temperature, colour, taste and odour. These qualities influence the suitability of water for certain purposes. Water for industry must be of adequate quality and required safety. In our global economy, where ingredients may be sourced from around the world and different manufacturing and production standards may be used, it becomes increasingly important to understand regulatory systems and ensure that standards regulating quality of food and water are enforced. This unit provides an introduction to the concepts and principles of food and water quality evaluation assurance, food and water legislation, food and water standards. It explores the concept of quality from sensory, scientific, regulatory and legal perspectives, including the concepts of total

quality control (TQC) and total quality management (TQM). The importance of quality assurance principles and systems and both Australian and International standards codes in relation to food and water are emphasized.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review and apply principles of quality assurance and quality management systems in food and water processing, distribution and services; 2. Interpret and apply Australian and International legislations and standard codes with respect to quality assurance of food and water in manufacturing and services sectors; 3. Assess and implement principle statistical control techniques to assure the quality of food and water; 4. Apply and integrate the principles and practices of safety management of food and water; 5. Develop and design processing approaches using appropriate risk management tools (HACCP, SRP, ERAC) to ensure delivery of safe, clean and hygienic food and water;

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

Required Reading: Newslow, D. (2013) Food Safety Management Programs: Applications, Best Practices and Compliance Boca Raton: CRC Press Pollard, S.J.T. (2008) Risk management for water and wastewater utilities London: IWA Publishing Recommended reading: Hubbard, M. R. (2012) Statistical quality control for the food industry. 3rd ed. New York : Chapman and Hall Mortimore, S. (2001) HACCP Oxford : Blackwell Science Boyd, C.E. (2015) Water Quality An Introduction Zurich: Springer International Publishing Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.

Assessment: Test, Two (2) In Class Tests (1000 words - 1 hour each), 30%. Assignment, One (1) individual written research assignments (1500 words equivalent), 15%. Case Study, One (1) team case study (1500 words equivalent), 15%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7005 Units of Operation in Process Engineering

Locations: Werribee, Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in process engineering systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. In order to enhance and extend specialist knowledge required in the discipline of food and water process engineering systems, this unit provides an overview of the key units of operation in industrial processes, which involve mixing, separation, reaction and product handling. These are arranged in flowsheets that can range from simple single units, to complex highly integrated units, in order to achieve a desired food or water product goal. These goals include producing, removing, purifying and/or concentrating a desired product or contaminant to meet market or environmental standards. In addition this unit shows how a desired process can be conceptualised into a series of unit operations and drawn into professional process flow diagrams and piping and instrumentation diagrams. The unit explores how to set up heat and mass balances for the unit operations, calculate piping sizes, draft equipment plans and undertake capital and operating cost estimations that would be an expected task in a professional engineering context. These are followed by the understanding and setup of control loops and instruments widely used in foods and water processes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conceptually map the most recent theoretical developments in designing functional process engineering units and justify their application in various contemporary and emerging professional contexts; 2. Contribute to the discourse and practice around 'engineering sustainability' and elaborate the links between effective foods and water engineering processes and innovation; 3. Critically apply knowledge and skills relevant to both the process engineering specialisation and the broader discipline of Engineering to new and uncertain professional practice scenarios, exhibiting a high level of personal autonomy and accountability; 4. Design, implement and evaluate food or water process projects or research which address complex issues and transmit subsequent findings to specialist and non-specialist audiences; and 5. Be competent in understanding, conceptualising, designing and evaluating a foods or water process to support the ability to formulate and strategise project management plans which accurately meet stakeholder needs and expectations.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr

Required Reading: McCabe, W., Smith, J. and Harriott, P. (2004) 7th ed. Unit operations of chemical engineering New York: McGraw-Hill Recommended reading: Ulrich, G. D. (1984) A guide to chemical engineering process design and economics New York: Wiley Silla, H. (2003) Chemical process engineering design and economics Boca Raton: CRC Press Perry, R. H. (2008) Perry's chemical engineers' handbook 8th ed. New York: McGraw-Hill Smith, R. (1995) Chemical process design New York: McGraw-Hill

Assessment: Assignment, One (1) individual written research assignment (2000 words), 15%. Project, Group process design project (report - 3000 words), 50%. Examination, Final Examination (3 hours - equivalent to 3000 words), 35%. Total combined assessment word equivalence is approximately 8,000 words.

NNP7006 Industrial Biotechnology

Locations: Werribee, Footscray Park.

Prerequisites: NNP7003 - Process Chemistry

Description: This unit will explore the application and impact of current innovative and often controversial biotechnology processes to the food and water processing industries. Students will gain knowledge of the current principles and application of biotechnology and genetic engineering techniques to food and water processing. In addition, students will gain an understanding of the ethical, social and legislative issues related to the use of biotechnology in food production and in the environmental context. This unit will focus on enzymology, bio separations, biotransformation, industrial microbiology, fermentation technology, and the production and application of enzymes in food production and water and waste water treatment.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Elaborate the factors and conditions influencing enzyme action, and identify and explain the process used in bio separations; 2. Apply theoretical knowledge of biochemical mechanisms involved in bio-transformation in a practical and real settings; 3. Conceptually map biotransformation processes involved in food and water processing; 4. Critically synthesis and apply knowledge in the production and use of enzymes in food and water processing as well as interrogate production and use of genetically modified microorganisms; 5. Critically review the legislative, ethical and social issues related to biotechnology in food and water processing.

Class Contact: Lab 3.0 hrs Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Pometto, A., Shetty K., Palivath, G., Levin R., (2008) 3rd ed.

Food Biotechnology Boca Raton : CRC press Evans, G.M., and Furlnog, J.C. (2011) 2nd ed. Environmental Biotechnology: Theory and Application Hoboken: John Wiley & Sons Recommended reading: Shuler, M.L. and Kargi, F., (2002) Bioprocess Engineering: Basic Concepts 2nd ed. New Jersey: Prentice-Hall Inc

Assessment: Research Paper, Individual written research assignment (1500 words) on the application of biotechnology and ethical/social implications, 20%. Laboratory Work, Four Lab reports (750 words each; total = 3000 words), 40%. Examination, 2 hour examination with short answer and long answer question (2000 words equivalent), 40%. Total combined assessment word equivalence is approximately 6,500 words.

NNR6001 Research Project A

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit of study together with NNR6002 provides an advanced program of research training and requires students to apply advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigate and resolve a complex problem inherent in a specified application with a high level of autonomy and present findings to professional and non-specialist audiences demonstrating advanced professional practice and scholarship. The unit provides students with a firm foundation from which they can undertake a research problem. For the duration of the semester guidance will be given to students for the identification of a research problem. The requirements of this unit have been developed to enhance students' theoretical application in problem solving, communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. Each student will undertake an individual research project under the guidance of an academic staff on a suitable topic, over the duration of a semester. Lectures, seminars, and regular meetings will be held collectively to expose students to research related matters such as Research Methodology, Literature Reviews, Feasibility Studies, Experiment Design, Modelling and Simulation Techniques and Tools, Results Validation and Decision Making, Report Writing, Structured Documentation, and Scientific Presentation. Accordingly, students are expected to develop a defensible research proposal. This proposal will be the basis of the research study the student will conduct in NNR6002.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review, analyse and critique discipline-based knowledge in engineering to identify and interrogate ill-defined and complex problems and develop a discipline-related research project within one or more sub-disciplines demonstrating a high level of personal autonomy; 2. Critically review basic research construction and evaluation and demonstrate discipline-appropriate application of research terminology and contribute to the discourse and practice around 'engineering sustainability' and the links between Engineering and innovation in contemporary life'. 3. Conceptually map the research process, identifying researchable problems and develop a defensible conceptual framework for research, justifying the selected research methodologies as relevant to the topic under investigation; and 4. Prepare and critically evaluate research proposals and plan the research process by formulating and strategising project management plans.

Class Contact: Forty-eight (48) hours or equivalent for one semester comprising group seminars, group meetings and discussions with fellow researchers and project supervisors.

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

Assessment: A Pass must be achieved in each assessment item to complete the unit. Presentation, Progress presentations (2 seminars each of 15 min. duration), 30%. Report, Final report (approx. 10,000 words), 50%. Presentation, Final presentation (30 min. duration), 20%.

NNR6002 Research Project B

Locations: Footscray Park.

Prerequisites: NNR6001 - Research Project A

Description: NNR6002 builds on the work carried out through NNR6001. The individual research project proposal developed in NNR6001 will be carried out under the guidance and supervision of an appropriate academic staff. Students will analyse results, and interpret evidence with regard to different bodies of knowledge and practice. The unit also requires students to communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply theoretical knowledge, technical and creative skills to systematically investigate, analyse and synthesise complex information with a high level of personal autonomy and independence; 2. Plan and manage a large project, including managing multiple stakeholders; 3. Analyse and interpret evidence with regard to different bodies of knowledge and practice with creativity and initiative; and 4. Communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Class Contact: Forty-eight (48) hours or equivalent for one semester comprising group seminars, group meetings and discussions with fellow researchers and project supervisors.

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

Assessment: A Pass must be achieved in each assessment item to complete the unit. Presentation, Progress presentations (2 seminars, each of 15 min. duration), 20%. Thesis, Final Report (approximately 15,000 words),, 50%. Presentation, Final presentation and demonstration, 30%.

NNR6500 Research Project

Locations: Footscray Park.

Prerequisites: NNT6510 - Communication Theory

Description: This unit is designed to provide students with an advanced program of research training where students will demonstrate a high degree of autonomy, accountability, creativity and initiative. The unit requires students to acquire advanced theoretical knowledge, practical and analytical skills to investigate and resolve complex problems in specified applications and present findings to professional and non-professional audiences. Students will demonstrate advanced professional practice and scholarship by undertaking an individual research project on a suitable topic over the duration of a semester under the guidance of an academic staff. In general this unit provides students with a firm foundation from which they can identify, conceptualise and methodically investigate a substantial research problem, analyse results, and interpret evidence with regard to different bodies of knowledge and practice. The unit also requires students to communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Credit Points: 48

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and analyse discipline-based knowledge in engineering to identify and interrogate ill-defined and complex problems and develop a discipline-related

research project within one or more sub-disciplines demonstrating a high level of personal autonomy and independence; 2. Apply theoretical knowledge, technical and creative skills to systematically investigate, analyse and synthesise complex information; 3. Critically review basic research construction and evaluation and demonstrate discipline-appropriate application of research terminology and contribute to the discourse and practice around 'engineering sustainability' and the links between Engineering and innovation in contemporary life'; 4. Conceptually map the research process, identifying researchable problems and develop a defensible conceptual framework for research, justifying the selected research methodologies as relevant to the topic under investigation; 5. Plan and manage a large research project by formulating and strategising the process, project management plans, including managing multiple stakeholders; 6. Analyse and interpret evidence with regard to different bodies of knowledge and practice with creativity and initiative; and 7. Communicate these theoretical propositions to specialist and non-specialist audiences both orally and in writing in a scholarly manner as a professional.

Class Contact: Forty-eight (48) hours of face-to-face contact with the supervisor. In addition, ninety-six (96) hours recommended for one semester or eight (8) hours per week, comprising of four (4) hours per week group seminar, four (4) hours per week (on average) individual meetings, discussions, etc.

Required Reading: To be advised by the supervisor of the project.Since this unit is research project based, information pertaining to the work involved is provided by the supervising academic.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Presentation, Regular seminar presentations (3 seminars, each of 20 min. duration), 30%. Thesis, Final report (Approximately 15,000 words), 50%. Presentation, Final presentation (of duration 40 min.), 20%. Final report is to be examined by an external examiner (who could also be present at the final presentation).

NNT6501 Advanced Communication System Design 1

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. The material taught introduces students to simulation procedures inherent in system modelling. All students are expected to master MATLAB's more advanced algorithms and its application in the design and simulation of communication subsystems such as the handling of RF signals in a communication channel and the use of complex envelope representation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply engineering skills to a given task; 2. Apply in-depth technical design of wireless sub-systems and optimise the physical layer; 3. Identify system issues and develop methodologies applicable to a given scenario; 4. Utilise a systems approach to analysis, simulation and design; 5. Gather, collate and evaluate data in a professional manner; and 6. Use modelling and simulation skills as an individual and as a team player.

Class Contact: Seminar3.0 hrsForty eight (48) hours for one semester comprising of lectures and practicals.

Required Reading: Attaway, T, (2009) 2nd Matlab-A practical introduction to programming and problem solving' Canada: Elsevier. Jeruchip, Balaban and Shanmugan (2000) 2nd Simulation of communications Systems New York: Kluwer.

Assessment: Project, Individual modelling project in Matlab (1.5 hours), 30%. Test, Individual practical simulation tests x 2 (2 hours), 40%. Test, Group modelling and simulation test (1.5 hours), 30%. Although there is a group modelling and simulation test, each individual is awarded a mark that reflects what her/his contribution is to the final submission.

NNT6502 Advanced Communication System Design 2

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Network Engineer. The material taught introduces students to simulation procedures inherent in Network modelling. All students are expected to master MATLAB's more advanced algorithms and its application in the design and simulation of vertical as well as horizontal structured networks. At a more advanced level, students will be expected to master and use OPNET and other industry standard simulation tools and their general application in all types of network configurations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply in-depth technical development of traffic activities in telecommunications networks; 2. Gather and collate data to establish statistical trends for a given network scenario; 3. Interpret the relationship between capacity demand and supply; 4. Utilise a systems approach to analysis, design and operational performance of a communications system; and 5. Distinguish classes of traffic and other quality of service measures.

Class Contact: Forty-eight (48) hours for one semester comprising of lectures and practicals.

Required Reading: To be advised by lecturer.

Assessment: A pass in all items is required to complete the unit Assignment, Preliminary Assignments x 4 (1500 words each), 40%. Test, In-Class Simulation Test (2 hours), 30%. Examination, Final Written Exam (2 hours), 30%.

NNT6510 Communication Theory

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in communication systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. In order to enhance and extend specialist knowledge required in the discipline of electrical and electronic communication system, this unit provides an overview of Telecommunication systems and introduces information theory (including self-information, channel matrix, trans-information source coding, redundancy, system configuration and entropy). In addition this unit reviews analysis techniques such as Fourier series, properties and transforms applicable to signals in a given communication link. The unit explores Power and energy signals, power spectral density, auto and cross-correlation analysis outcomes that modern network designers need to use in practical applications. These are followed by a review of Modulation Techniques commonly used in many telecommunication scenarios.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine and critically evaluate the design needs for a given communication link; 2. Exhibit requisite specialist technical competence in telecommunications system performance and implementation to a given scenario; 3. Generate appropriate solutions to complex problems in telecommunication contexts; 4. Utilise and critique the value of a systems approach to analysis, design and operational performance of a communication system; 5. Distinguish between modulation schemes applicable to a given application in order to design an optimal communication link; and 6. Determine and critically evaluate system performance in terms of signal-to-noise ratio to enhance grade of service and reliability.

Class Contact: Seminar5.0 hrsForty-eight (48) hours for one semester, comprising of lectures, tutorials, hardware and computer based labs.

Required Reading: Ziemer, R & Tranter, W (2009). 6th edition Principles of Communications NY: John Wiley & Sons Haykin, S (2005). 5th edition Modern Wireless Communications CH: Pearson Prentice Hall N. Benvenuto et al, (2007). 4th edition Communication Systems NY: Wiley Haykin, S and Moher, M. (2009). 5th edition Communication Systems NY: John Wiley & Sons Latest editions of the prescribed text books are encouraged. There are a number of other text books that can be used in parallel with the prescribed listed above.

Assessment: A pass must be achieved for each assessment item in order to complete the unit. Test, Four (4) In Class Tests (1000 words - 1 hour each), 60%. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%.

NNT6531 Radio Frequency Engineering

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in modern 21st century wireless communication subsystems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to a practising Engineer.
This unit provides students with a theoretical and practical understanding of general wireless communication systems and the subsystems involved in them. It provides an overview of existing wireless systems with special reference to hardware implementation. Unit material has been developed to include Noise and Distortion, Duplexing methods and Propagation modelling at UHF with emphasis on Path loss, free space and plane earth models. In particular, Okumura's model will be used in Radio link design. Students are expected to take into account Shadowing, Rayleigh multipath fading, fade duration and level crossing rate and Delay spread when developing a link budget. In addition, coherence bandwidth, Antenna parameters, Diversity systems, Multiple-Input-Multiple- Output (MIMO), Interference cancellation, Modulation and coding for the mobile channel are topics that will be taught.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Determine and critically evaluate appropriate radio hardware components to meet a specified dynamic range (noise and third order distortion) specification for wireless equipment; 2. Utilise and critique the difference between different duplexing methods and discriminate the relevant performance trade-offs; 3. Apply high level technical competence to perform basic path loss estimation and radio link design, using calculations or specialised prediction software; 4. Analyse the causes of radio frequency fading and identify the most appropriate diversity countermeasure to this fading; and 5. Utilise and critique different MIMO modes of operation.

Class Contact: Seminar2.0 hrsForty-eight (48) hours for one semester comprising lectures, labs and tutorials.

Required Reading: Other relevant textbooks will be recommended by the unit coordinator.Wong, D. K. (2012) 5th edition Fundamentals of wireless Communications Hoboken: Wiley Rappaport T,S. (2007). 2nd edition Wireless Communications. New Jersey:Prentice-Hall. Molisch, A. F. (2005). 2nd edition Wireless Communications. Chichester:Wiley.

Assessment: A pass must be achieved in each assessment item to complete the unit. Examination, Final Examination (3 hours - equivalent to 3000 words), 40%. Laboratory Work, Laboratory Reports x 2 (1000 words each report), 30%. Test, Written Tests x 2 (1 Hour each - equivalent to 1000 words), 30%. The total combined assessment word equivalence is approximately 7,000 words.

NNT6532 Satellite Network Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to investigation and resolution of complex problem solving scenarios inherent in microwave and satellite communication systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. This unit has been developed to cover principles of modern microwave systems planning and design. Students will study Microwave propagation, Beam bending, K-factor and Fresnel zone clearance and are expected to critique and implement Free space loss calculation methodologies. In addition this unit is comprised of: Component characterisation, Microwave antennas, oscillators, amplifiers, mixers, filters and isolators. Modulation schemes for analog and digital radio systems will be covered together with Multiplexing techniques, access techniques and system loading effects. This will lead into Microwave link planning and design techniques taking into account Noise budget calculations and Reliability calculations for uplink and downlink. In general, Satellite orbits, Elevation angles, Polarisation and frequency re-use techniques will be studied including System EIRP and figure of merit Effects of system non-linearity. Mastering these topics will enhance a student's employability with a service provider company or a private company that owns or deploys microwave and satellite communication systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. To determine and critically evaluate the technical fundamentals to design microwave links; 2. Apply high level technical competence in developing link budgets for a given microwave/satellite link; 3. Generate appropriate solutions to the design requirements for a low earth orbit satellite and a geostationary satellite; 4. Solve and implement techniques to guard against problems in satellite communications; and 5. Critically appraise the limits of the link performance for both microwave and satellite links.

Class Contact: Seminar3.0 hrsForty-eight (48) hours for one semester comprising of two (2) hour lectures and one (1) hour tutorial/laboratory.

Required Reading: Any text book that covers satellite communication systems engineering is highly recommended.Pritchard, W, 1993 Satellite communication system Engineering Prentice Hall Elbert, B., 1992, Introduction to Satellite Communication, Artech House. Latest edition by Pritchard et al is highly recommended

Assessment: A pass must be achieved in each assessment item to complete the unit. Test, Written Test (1.5 Hours - equivalent to 1500 words), 20%. Assignment, Lab

simulation report (2500 words), 40%. Examination, Written examination (3 hours - equivalent to 3000 words), 40%.

NNT6542 Mobile Network Design

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, critical analytical and practical skills which can be applied to investigation and resolution of complex problem solving scenarios. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as a Mobile and Personal communication engineer. This unit gives an overview of cellular Network design where students are taught Capacity calculations, Cell site engineering, Cell splitting and sectoring. Cellular network access mechanisms such as FDMA, TDMA and CDMA are analysed. Topics of interest such as Simplex, Half Duplex, Full Duplex, DSSS and Frequency Hopping are also taught. The unit further explores Spectral efficiency, Air link interface, Radio resource management, Mobility management, Handover and general Cellular traffic. In addition, Cellular networking, Micro and macro cellular systems, GSM, WCDMA, LTE systems and Mobile data networks are topics the unit covers. The wireless enterprise, PMR, Simulcast, Trunking, Standardisation, Security issues, Regulatory environment, Emerging and Future Standards are also covered to enhance student employability on graduation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply specialised technical cell planning for a specific wireless communication system; 2. Utilise a systems approach to evaluate wireless system performance in terms of quality of service and grade of service; 3. Critically review and implement radio cell planning software tools; 4. Survey and investigate the operation of the key wireless standards, GSM, WCDMA LTE and dimension networks accordingly; and 5. Propose procedures for the operation and identification of strengths and weaknesses of popular wireless multiple access techniques.

Class Contact: Seminar3.0 hrsForty-eight (48) hours for one semester comprising lectures, tutorials. Additional self-directed learning comprising assignments, projects and laboratory work.

Required Reading: Holma, H., & Toskala, A. (2009). ISBN 978-0-470-99401-6. LTE for UMTS, OFDMA and SC-FDMA Based Radio Access. Chichester:Wiley. Holma, H., & Toskala, A. (2007). (4th ed.). WCDMA for UMTS - HSPA Evolution and LTE. Chichester:Wiley. Molisch, Andreas F. (2005). ISBN 13 978-0-480-84888-3. Wireless Communications. Chichester:Wiley.

Assessment: A Pass must be achieved in each assessment item to complete the unit. Examination, Final examination (3 Hours - equivalent to 3000 words), 40%. Test, Class Tests x 2 (equivalent to 2000 words), 30%. Laboratory Work, Laboratory Practicals x 2 (equivalent to 2000 words), 30%.

NNT6562 Digital Signal Processing

Locations: Footscray Park.

Prerequisites: NEE2201 - Linear Systems with Matlab Applications

Description: In this unit students will acquire advanced theoretical knowledge, analytical and practical skills that are effective in the investigation and resolution of complex problem solving scenarios. The unit has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities that are important to practising DSP engineers. The unit will provide an understanding of digital signal processing principles and techniques. The processing of deterministic signals and random signals will be emphasized equally, In deterministic signal processing, the topics cover include Discrete-time Fourier transform, Fast Fourier transform, IIR digital filter design via bilinear transformation and FIR digital filter design via windowing. Other topics of interest include frequency-sampling filters and linear-phase filters. In random signal processing, the emphasis will be placed on Linear Least Mean Squared Error estimators. In addition, adaptive filtering and the LMS algorithm will be introduced. Telecommunication engineering applications like channel equalizers and antenna-array beam formers are other topics of interest the unit covers.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Interpret and apply digital signal processing principles and techniques; 2. Apply DSP applications in telecommunication systems and sub-systems; 3. Critically examine and analyse aliasing, quantisation, signal reconstruction filters. Design IIR digital filters and FIR digital filters; 4. Analyse and design Linear Least Mean Squared Error estimators; and 5. Apply in-depth random signal processing principles to channel equalisers and antenna-array beam formers.

Class Contact: Forty-eight (48) hours for one semester comprising lectures, tutorials and laboratory.

Required Reading: Other textbooks may be recommended by the unit coordinator.Ifeachor, E.C. & B.W. Jervis, 2002 edition or later, Digital Signal Processing - A Practical Approach, Addison-Wesley

Assessment: A pass must be achieved in each assessment item in order to pass the unit. Assignment, Design Assignment (1500 word report), 20%. Test, Mid-semester test (2 hours), 30%. Examination, Final Examination (3 hours), 50%.

NNW7001 Surface Water Planning

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire knowledge of surface water planning, covering water resources development (including river basin planning, multiple objectives, multiple purposes; conjunctive use of surface and groundwater); sustainability in water resource planning (economic, environmental and social evaluation); reservoir design (critical period methods and simulation); streamflow analysis; climate variability; stochastic data generation; water demand (urban, irrigation, environmental); single/multiple objective optimization and applications in water resources; conventional optimisation methods; evolutionary optimisation methods; climate change; GCM models; downscaling of GCM outputs to hydrologic variables; effect of climate change on hydrology and water resources; multi-criteria decision analysis and applications in water resources.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct quantitative analysis of water resources and their conjunctive use; 2. Evaluate sustainability in water resource planning; 3. Conduct streamflow analysis and reservoir design; 4. Evaluate stochastic generated climate and stream flow data ; 5. Conduct analysis using single and multiple objective optimisation including their application in water resources; and 6. Evaluate the climate change effect on hydrology and water resources.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: There is no single required text book for this unit. The unit material will be covered from various reference books and journals. The following reference books are recommended for this unit: Dzurik, A. (2003) Water Resources Planning, Rowman & Littlefield Publications, INC., USA. McMahon, T. A. and Adeloye, A. J. (2005) Water Resources Yield, Water Resources Publications, LLC, USA. Grafton, R. Q. and Hussey, K. (2011) Water Resources Planning and Management, Cambridge

University Press. Mays, L.W. (2005) Water Resource Systems Management Tools, McGraw Hill Professional Engineering Publication. Linsley, R. K., Franzini, J. B., Freyberg, DL., and Tchobanoglous, G. (1992) Water Resources Engineering, McGraw Hill Publication.

Assessment: Assignment, Scientific review of water resources development and sustainability factors in water resources. (1500 words), 15%. Project, Project associated with reservoir design, stream flow analysis, water demand and optimization method application (2000 words), 30%. Research Paper, Research paper and presentation on the prescribed topics (2000 words), 25%. Examination, Final examination based on unit content (3hrs), 30%.

NNW7002 Water, Society and Economics

Locations: Footscray Park.

Prerequisites: Nil.

Description: Water is the key limiting resource for human development in many parts of the world. Growing population, intense agricultural and industrial activities, and increasing attention to river health are resulting in an increased demand for water not just in Australian cities, but in other cities around the world. Yet the security of water supplies in meeting increasing demand is fragile and uncertain. It is believed that climate change will have adverse effects on both supply and demand aspects of water systems and also on water quality of rivers and streams. This unit covers not just the scientific aspect of water management, but also the policies and laws governing the management of water resources. The topics covered include climate change impacts on water supply and demand, security of water supply in terms of quality and quantity, relationship between water and energy systems, social response to climate adaptation measures, policies that help the society adapt to new climatic conditions and trans-boundary water resources management. Also covered are topics related to the economics of water management, estimating the value of water, and economic tools needed to explain and solve water-related problems. The unit is a good preparation for those interested in working with water management agencies, relevant government departments, and industries that intensively use water, such as mining, smelting, and power generation. This unit also aims to hone oral and written skills needed to communicate with decision makers; conduct and understand scientific research; prepare research reports, policy evaluations; and give effective public presentations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the drivers of water supply and demand and impact of climate change 2. Critically review and propose alternate options that are available to adapt to the changing climate 3. Articulate the basic principles of social science and policy that are necessary to properly inform decision making for management of water resources. 4. Evaluate and apply economic concepts and tools needed to explain and solve water-related problems 5. Formulate evidence-based research reports and effective oral presentations to communicate with decision makers and other professionals.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

Required Reading: The following textbooks are recommended for this unit: Tvedt, T. (2015) Water and Society, I.B. Tauris & Co Ltd Publications. Hussey, K and Dovers, S.' (2007). Managing water for Australia: the social and institutional challenges, CSIRO Publishing, Melbourne. Butler, D and Memon, F.A. (2005). Water Demand Management, IWA Publishing. Spulber, N. and Sabbaghi, A. (1998). Economics of Water Resources From Regulation to Privatization, Kluwer Academic Publications.

Assessment: The following assessments will be undertaken in this unit. Assignment, Literature review on the relationship between water and society, and associated economic factors (2000 words)., 20%. Case Study, A group case study report based on a site visit (1500 words)., 10%. Presentation, An oral presentation (20 minutes), 20%. Examination, An end of the semester final examination (3 hours)., 50%.

NNW7003 Ground Water

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to acquire knowledge of groundwater. This subject is being delivered by leading groundwater professionals, hydro-geologists and specialists in both public and private practice from the Australia's leading professional body for groundwater hydrology - The National Centre for Groundwater Research and Training (NCGRT). The School was first established in 1965 and has become Australia's leading course for training groundwater professionals. This subject introduces students with a broad introduction to groundwater and hydrogeology. Subjects covered include: hydrogeology, hydraulics, environmental isotopes in groundwater, recharge / discharge determination, dryland salinity and waterlogging, groundwater conceptual modelling, drilling methods, piezometer and bore design, an array of monitoring and sampling methods, groundwater microbiology, groundwater geophysics, groundwater pollution, groundwater and soil remediation, surface water groundwater interaction, ecosystem dependence on groundwater, groundwater management issues including resource allocation, quality protection and sustainability.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review and assess case studies and devise solutions through applying relevant scientific concepts and tools; 2. Evaluate current groundwater management issue and make recommendations of possible solutions; 3. Evaluate and interpret physical properties of aquifers; 4. Investigate the interaction between groundwater, surface water and land-surface water systems.

Class Contact: Lecture2.0 hrsPC Lab1.0 hrWorkshop1.0 hr

Required Reading: There are no specific texts for this unit.

Assessment: Assignment, Research case study (2000 words), 15%. Presentation, Presentation on case studies (10 minutes), 15%. Research Paper, Project investigation (3000 words), 40%. Examination, End of semester exam (2 hours), 30%.

NNW7004 Integrated Urban Water Management

Locations: Footscray Park.

Prerequisites: Nil.

Description: In this unit students will acquire advanced theoretical knowledge, practical and critical analytical skills which can be applied to implement integrated urban water management (IUWM) and water sensitive urban design (WSUD) approaches, and decentralised and communal water, wastewater and stormwater systems. The unit material has been developed to enhance students' communication skills, individual and group project participation and other professional capabilities important to practice as an Engineer. In order to enhance and extend specialist knowledge required in the discipline of IUWM, this unit provides an overview of integrated urban water systems incorporating centralised, decentralised, hybrid and water sensitive urban design approaches/systems. The unit will include the application of fit for purpose alternative water resources; sustainability assessment of IUWM approaches covering economic, environmental and social criteria; application of multi-criteria decision approaches. The students will apply these approaches in greenfield, infill and existing developments. The students will learn the application of AQUACUCLE, MUSIC, Urban Volume and Quality and Tank models for the

quantitative assessment of IUWM approaches. In addition this unit covers conceptual water infrastructure design approaches, life cycle costing and the application of life cycle assessment outcomes for the quantitative assessment of IUWM. The students will also learn about the role of decentralised systems in the transition of current centralised systems to a more sustainable state with the application of IUWM.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct qualitative and quantitative analysis of various water, wastewater and stormwater servicing options; 2. Evaluate alternative water servicing options using multi-criteria decision assessment methods; 3. Develop the operational and maintenance requirements of planned systems; 4. Contribute to the planning and design guidelines and methods of systems at various scales; 5. Critically apply knowledge skills to apply local planning guidelines, policies and regulations; 6. Design integrated urban water management systems (IUWM).

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Tutorial 1.0 hr

Required Reading: The unit material will be covered from various reference books, journals and technical reports. The following reference books are recommended for this unit: Maheepala, S., Blackmore, Jane, Diaper C., Moglia, M., Sharma A., and Kenway, S. (2010) Integrated Water Management Planning Manual, Water Research Foundation. Hormoz, P. (2016) Urban Storm Water Management, CRC Press. WSUD Engineering Procedures: Stormwater, Melbourne Water , CSIRO Publishing 2005. Argue, J.R. (2004) WSUD: basic Procedures for Source Control of Stormwater, A handbook of Australian Practice, Urban Water Resource Centre, UniSA Adelaide. Sharma, A.K., Begbie, D. and Gardner, T. (2015) Rainwater Tank Systems for Urban Water Supply - Design, Yield, Energy, Health risks, Economics and Community perceptions, IWA Publishing. Memon F.A., Ward, S. (2015) Alternative Water supply Systems, IWA Publishing. Mays, L. W. (2001) Stormwater Collection System Design, McGraw Hill Publication.

Assessment: Assignment, Literature review on the adoption of IUWM to address climate change and urbanisation impacts at different scale (1500 words)., 15%. Project, Planning and design of water services in a greenfield urban development with IUWM approaches (2000 words) and associated presentation (20 minutes), 35%. Assignment, Planning, design and implementation of specified decentralised and WSUD tools in urban developments (1500 words)., 15%. Examination, Final Examination (3 hours), 35%.

NNW7005 Flood Hydrology and Hydraulics

Locations: Footscray Park.

Prerequisites: Nil.

Description: Floods are one of the costliest and the most common natural disasters which have significant hydrological, social and economic impacts. Civil and water resources engineers play a critical role in minimising flood risk, and identifying infrastructure and planning solutions to manage the adverse consequences of flooding. This unit focuses on teaching the key fundamentals of hydrology and hydraulics involved in minimising flood risk and mitigating the adverse impacts of floods. This unit mainly covers the topics such as hydrologic concepts used in flood modelling, probabilistic treatment of flood data, streamflow routing program used to calculate flood hydrographs, structural and non-structural methods for flood mitigation, design of stormwater and wastewater infrastructure used to manage floods, one and two dimensional flood modelling and calculation of flood profiles. Students will undertake projects demonstrating real world problems using industry standard computer software.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Propose solutions for managing and minimising flood risk by apply basic principles of hydrology and hydraulics; 2. Calculate interception, infiltration and base flow, and the unit hydrograph, and differentiate between alternative methods for estimating runoff; 3. Implement 1D and 2D hydraulic modelling for minimising the adverse impacts of floods, and explicate the theoretical basis of each model; 4. Use the software packages 'HEC-RAS' and 'RORB' to understand the concepts and methods used in flood management. Analyse and design various hydraulic structures used in management of floods. 5. Produce high quality professional engineering reports and build experience with real-world flood management projects.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: There are no specific texts for this unit. The following textbooks are recommended for this unit: V. T. Chow, D. R. Maidment, L. W. Mays (1988) Applied Hydrology, McGraw-Hill Book Company, New York. J. E. Gribbin (2014) Introduction to Hydraulics and Hydrology, 4th ed., Delmar Cengage Learning.

Assessment: The following assessments will be undertaken in this unit. Project, Undertake a project using RORB software for hydrologic analysis (2000words), 20%. Project, Use HEC-RAS software for 1D hydraulic modelling (2000words, 20%. Project, Use HEC-RAS software to undertake a project on 2D flood modelling (2000words), 20%. Examination, End of semester final Examination (3 hours), 40%.

NNW7006 Water quantity and quality modelling using SOURCE

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit is designed to enable students to acquire an understanding of both the theoretical and practical principles in applying a specific software - SOURCE, to simulate management strategies in managing water resources. SOURCE is a water resources software tool that is recognised by the Council of Australia and is used widely in Australia and internationally. This unit is delivered in 6 parts: Introduction to SOURCE using both schematic and geographic settings; River system management - which covers water sharing and environmental demand; Urban demand which covers climate dependent model and regression modelling; Optimisation module which covers formulation of objective functions both single and multi-objectives; Groundwater modelling looking at the interaction of groundwater and surface water and setting up the model; and catchment model covers simulation of catchment water quality. In each of the above part, students will develop case study models and undertake scenarios runs.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Simulate and critically assess supply and demand management strategies; 2. Plan and design urban water saving management strategies; 3. Develop river and catchment networks using both schematic and geographical methods; 4. Formulate objective functions to optimise sharing of water supply.

Class Contact: Lecture 2.0 hrs PC Lab 1.0 hr Workshop 1.0 hr

Required Reading: There are no specific texts for this unit.

Assessment: Assignment, Case Study (1500 - 2000 words), 25%. Assignment, Case Study (1500 - 2000 words), 25%. Assignment, Case Study (1500 - 2000 words), 25%. Assignment, Case Study (1500 - 2000 words), 25%.

NPU2101 Analytical Methods 1

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: RCS1110 or RCS1601 and RCS1120 or RCS1602

Description: Analytical Methods 1 builds upon the fundamental principles introduced in first year Chemistry studies and introduces students to instrumental analytical

chemistry. This unit provides basic training in modern spectroscopic (Infra-Red, UV/Vis, Atomic Absorption and Nuclear magnetic Resonance), chromatographic (Liquid and Gas Chromatography) and spectrometric (Electron impact Mass Spectrometry) methods of analysis as currently used in the chemical and pharmaceutical industry. Lectures and complementary laboratory exercises will link theory with practice and students gain 'hands-on' experience with modern analytical instruments and associated analytical and physiochemical techniques. Laboratory work includes statistical analysis of analytical data and interpretation of spectroscopic, spectrometric and chromatographic data. For students interested in teaching chemistry, taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Methods 1 and Organic Synthesis adequately prepares students to deliver units 1, 2, 3 and of the VCE chemistry curriculum.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning quantitative and qualitative instrumental chemical analysis; 2. Discuss fundamental principles behind chromatography, spectroscopy and spectrometry and diagrammatically present their basic operating principles, clearly expressing ideas and perspectives; 3. Interpret various analytical data including chromatographic (liquid and gas), spectroscopic (absorption, emission, infra-red and nuclear magnetic resonance) and spectrometric (electron-impact mass spectrometry) as relevant to given problems; 4. Apply standard methodology to the analysis of various real samples (food, pharmaceutical and environmental) including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific instrumental competency in collaboration with peers; and 5. Evaluate the quality of own analytical data and review team members data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

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

Assessment: Assignment, Written report (1000 words), 20%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 40%. Examination, Written Exam (2 hours), 40%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (4,5) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU2102 Analytical Methods 2

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: NPU2101 - Analytical Methods 1

Description: Analytical Methods 2 builds upon the concepts studied in Analytical Methods 1 and provides advanced studies in instrumental chemical analysis with training in modern hyphenated techniques. Topics covered include gas chromatography-mass spectrometry and liquid chromatography-mass spectrometry. Studies also include an introduction to capillary electrophoresis, X-Ray crystallography and Carbon 13 NMR. Lectures and complimentary laboratory exercises link theory with practice and students gain 'hands-on' experience with state-of-the-art instruments to determine the identity, structure and physical properties of an unknown pharmaceutical product. Assessment includes report writing according to industry standards and interpretation of spectroscopic, spectrometric and chromatographic data.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate the fundamental principles behind hyphenated techniques including GC/MS. LC/MS and MS/MS; 2. Devise methods of analysis for pharmaceutical samples adopting the analytical process and using modern analytical techniques; 3. Interpret various analytical data including that from LC/MS, GC/MS and 1H and 13CNMR; and 4. Evaluate the quality of their own analytical data and review team members' data and communicate the findings to peers and demonstrators with responsibility and accountability.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs

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

Assessment: Assignment, Initial data analysis on laboratory work (1000 words), 10%. Laboratory Work, Written Report (1500 words), 30%. Presentation, Oral Presentation (on laboratory work) (20 min), 20%. Examination, Final Exam (2 hours), 40%.

NPU2103 Organic Synthesis

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: RCS1120 - Chemistry for Biological Sciences B or RCS1602 - Chemistry 1B

Description: This unit builds upon the fundamental Organic Chemistry covered in first year chemistry studies and introduces students to some of the theoretical and practical aspects of synthetic organic chemistry and their use in pharmaceutical applications. The theoretical material is presented with an emphasis on understanding the mechanism of reactions to enable students to predict a range of reaction outcomes. Industrially important reactions such as electrophilic substitution reactions and the preparation and properties of common polymers are integral to this unit. Spectroscopic and spectrometric techniques introduced in Analytical Methods 1 are utilised and further explored in this unit. For students interested in teaching chemistry taking the four unit sequence Chemistry 1A, Chemistry 1B, Analytical Methods 1 and Organic Synthesis adequately prepares students to deliver units 1, 2, 3 and 4 of the VCE chemistry program.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning synthetic organic chemistry and polymer science based upon modern reaction processes to given problems; 2. Employ chemical mechanisms to explain simple organic chemical reactions and explain the factors which influence reactivity in given situations; 3. Discuss aromaticity and the common reactions of aromatic compounds, clearly expressing ideas and perspectives; 4. Discuss the preparation and properties of common polymers; 5. Adapt common practical organic chemistry manipulations and interpret various analytical data including infra-red and nuclear magnetic resonance spectra, in collaboration with others and with responsibility for own output; and 6. Evaluate the quality of their own synthesised products and related analytical data and report the findings to peers and demonstrators with initiative and judgement.

Class Contact: Sixty (60) hours per semester comprising of two (2) hours of lectures and three (3) hours of Laboratory work each week.

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

Assessment: Assignment, Short problem solving exercise (200 words equivalent), 10%. Laboratory Work, Portfolio of laboratory work with summary addressing criteria (1500 words), 45%. Examination, Final Exam (2 hours), 45%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (specifically Learning Outcome 5) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU2104 Drug Discovery and Development

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: Nil.
Description: This unit is an introduction to the processes involved in the discovery and development of pharmaceutical products. Through a series of case studies, students will investigate the often serendipitous discovery of biologically active products and their chemical manipulation to become modern pharmaceutical products. The role traditional remedies (Western, Asian and Indigenous, for example) have played in discovering new drugs will also be examined.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the historical and scientific context from which modern pharmaceutical products have been discovered and developed; 2. Research and evaluate various literature relevant to drug discovery and development; 3. Report research data to peers and demonstrators with initiative and judgement; and 4. Critically review research data and present findings in written format.
Class Contact: Lecture 2.0 hrs Sixty (60) hours per semester, consisting of two (2) hours of lectures per week. Students are expected to undertake prescribed reading and research of up to three (3) hours per week.
Required Reading: Fischer, J., (2015) Successful Drug Discovery Wiley
Assessment: Assignment, Initial Report on pharmaceutical discovery (1,000 words), 20%. Project, Report on drug discovery (2,000 words), 40%. Presentation, Oral presentation on project (20 minutes), 40%.

NPU2110 Australian Landscapes and Biota

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: This unit introduces students to both the range of environments and landscapes present across the Australian continent and the nature of the plants and animals that inhabit these landscapes. This will be achieved by: 1) discussing the factors that have shaped the various Australian environments, including geomorphological and climatic processes, and historical factors; 2) introducing the distinctive flora and fauna of Australia and the evolutionary pressures that have shaped the Australian biota; and 3) reviewing relationships between the biota and the environment. The unit also provides foundational knowledge on the Australian environment for students not continuing in the biological sciences.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Utilise practical and computer-based tools to identify, describe and demonstrate how various factors, including geomorphological, climatic, historical and evolutionary, have shaped present Australian landscapes and the various environments contained within; 2. Demonstrate and elaborate the relationships between biotic (living) elements in the Australian environment and how these interact with various abiotic (non-living) elements; 3. Analyse a range of environmental data with practical and computer-based tools; 4. Communicate individually and collectively, in written, oral and visual forms, complex inter-relationships between organisms and their environments; and 5. Contextualise the influence of humans and various 'cultures' to the Australian landscape and biota from both historical and present day perspectives.
Class Contact: Field Trip 8.0 hrs Lecture 2.0 hrs Students undertake two (2) field trips equating to eight (8) hours each.
Required Reading: Attiwill, P., (2007) Ecology: An Australian Perspective Oxford
Assessment: Assignment, Assignments (2,000 words), 20%. Report, Field Work Report #1 (1,300 words), 20%. Report, Field Work Report #2 (1,300 words), 20%. Presentation, Oral (20 minutes) and written presentation (3,000 words), 40%.

NPU3101 Pharmaceutical Regulatory Processes

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: NPU2102 - Analytical Methods 2
Description: Pharmaceutical Regulatory Processes has as its foundation the fundamental chemical principles introduced in Chemistry 1A and 1B and underlying basics of instrumental chemical analysis and synthetic organic chemistry studied in Analytical Methods 1 and Organic Synthesis, respectively. The Unit provides students with training in Pharmaceutical Laboratory management and presents an overview of current pharmaceutical laboratory practice. Topics covered include occupational health and safety; quality systems including GLP, GMP and accreditation of laboratories; analytical methods and reliability of scientific data; familiarisation with international standards (ICH and FDA) and official methods of analysis (British and US Pharmacopeia). Assessment includes report writing according to industry standards. For students interested in teaching chemistry this unit along with Drug Testing and Analysis extends the minimum requirements (see four units mentioned above) and gives a working insight into more advanced chemistry and industry specific practice.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the industry standards in pharmaceutical laboratory management and practice both locally and globally; 2. Develop risk assessments on laboratory practice including the identification of physical/chemical hazards and proposing methods of minimising risk; 3. Review industry quality systems both locally and globally and initiate good laboratory practice (GLP) and good manufacturing practice (GMP) in own context; 4. Devise an analytical protocol incorporating method selection, method verification, method validation and measurement uncertainty; 5. Apply standard methodology to the analysis of various pharmaceutical samples including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific instrumental competency; and 6. Review and present data to peers and demonstrators with responsibility and accountability.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: Skoog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) 9th ed. Fundamentals of Analytical Chemistry Brooks/Cole, Cengage learning
Assessment: Assignment, Written Risk Assessment (500 words), 10%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 40%. Project, Written Assignment (3000 words), 50%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (4,5) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU3102 Drug Design

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: NPU2103 - Organic Synthesis NPU2104 - Drug Discovery and Development
Description: This Unit follows on from NPU2104 Drug discovery and Development and examines the modern techniques used to design pharmaceutical products. Students will undertake studies in Structure-based (SBDD) and ligand-based (LBDD) drug design, computer-aided drug design and subsequent synthetic pathway design.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to:

1. Review pharmaceutical methodology for the design of new drugs and propose synthetic pathways for their preparation; 2. Devise appropriate methodology for the design of new drugs; 3. Apply drug design methodology, including computer-aided and related techniques to the design of a new drug; and 4. Review and present data to peers and demonstrators with responsibility and accountability.
Class Contact: Lecture 1.5 hrs PC Lab 1.5 hrs
Required Reading: Kristian Stromgaard, K., Krogsgaard-Larsen, P., Madsen, U., (2009) 4th ed. Textbook of Drug Design and Discovery CRC Press
Assessment: Assignment, Written Assignment (1000 words), 20%. Assignment, Written Assignment involving computer-aided drug design (1500 words), 40%. Examination, Final Exam (2 hours), 40%.

NPU3103 Techniques in Pharmaceutical Synthesis

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: NPU2103 - Organic Synthesis
Description: This unit builds upon the basic synthetic chemistry covered in NPU2103 Organic Synthesis with a clear focus on the techniques used in the synthesis of modern pharmaceutical products. Important synthetic methodologies for the preparation of chiral compounds are emphasised including an introduction to bio-catalysis. Modern spectroscopic and spectrometric techniques are further utilised in this unit.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply and explain the principles of various organic synthetic procedures to drug synthesis; 2. Categorise the different classes of protecting groups and describe their role in organic synthesis; 3. Evaluate various chiral synthetic methodologies, including bio-catalysis, and their application to drug synthesis; 4. Articulate the principles and application of combinatorial synthesis; 5. Adapt common practical organic chemistry manipulations and interpret various analytical data including infra-red and nuclear magnetic resonance spectra, in collaboration with others and with responsibility for own output; and 6. Evaluate the quality of their own synthesised products and related analytical data and report the findings to peers and demonstrators with initiative and judgement.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: McMurry, J.E., (2016) 9th ed. Organic Chemistry Cengage
Assessment: Assignment, Short Answer Assignment (1000 word equivalent), 10%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 45%. Examination, Final Exam (2 hours), 45%. Laboratory work and the development of practical skills are a critical component of this Unit. Students must therefore attend all of the laboratory sessions and as the laboratory sessions are a critical part of the Learning Outcomes (5,6) of this Unit, a student MUST pass the laboratory component in order to pass the Unit.

NPU3104 Drug Testing and Analysis

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: NPU2101 - Analytical Methods 1
Description: Drug Testing and Analysis builds upon the concepts studied in Analytical Methods 2. This Unit is focussed upon modern and topical aspects of Drug Testing (workplace, sport, clinical and forensic) and Drug analysis (trace component and impurity profiling). Lectures and complimentary laboratory exercises link theory with practice and students gain 'hands-on' experience with state-of-the-art instruments and techniques including sample preparation and the investigation of complex samples including pharmaceutical products and drugs and metabolites in biological fluids.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review modern advanced methods of analysis as currently used in the Drug Testing and Analysis industry in Australia and globally; 2. Devise methods of analysis for drugs in complex samples and review the suitability of their method to a range of situations; 3. Interpret various analytical data relating to drug testing and analysis, adapting information to diverse contexts; and 4. Evaluate the quality of their own analytical data and review team members' data and communicate the findings to peers and demonstrators with responsibility and accountability.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: Skoog, D. A., West. D. M., Holler, F. J. and Crouch, S. R., (2014) 9th ed. Fundamentals of Analytical Chemistry Brooks/Cole, Cengage learning
Assessment: Literature Review, Written Report (1000 words), 10%. Project, Written Report (2000 words), 25%. Presentation, Oral Presentation on Project (20 mins), 25%. Laboratory Work, Portfolio of Laboratory work with summary addressing criteria (1500 words), 40%.

NPU3105 Project

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: Nil.
Description: This Unit of Study provides third year students with an opportunity to select and undertake either (a) a brief research project in an area of interest with staff members of the Biomedical Sciences or Chemical Sciences or an established research institution; or (b) a work-based placement in the industry he/she intends to enter. Both the research and work-based placements enable the student to undertake a structured work experience program as an integral part of their degree course. Gaining practical experience in their chosen field enables students to test interest and ability in these areas.
Credit Points: 24
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and solve problems with intellectual independence and demonstrate time management and project-related organisational skills in a work-based or laboratory project; 2. Articulate and justify research questions/project objectives and methods; 3. Critically report on a research/work-based project demonstrating appropriate scholarly and discipline based practices. 4. Communicate clear, coherent findings and ideas of a research/work-based project to peers and supervisors.
Class Contact: Projects will involve work conducted at Victoria University or within industry, the community or both. Projects can range from reports or practical work to fieldwork or industry placements. Contact hours are dependent on the type of project undertaken and will be arranged by negotiation with the student's approved Industry Project unit supervisor(s).
Required Reading: Material appropriate to the students project will be provided by the supervisor
Assessment: Report, Written Report on Project (5000 - 7000 words), 70%. Presentation, Oral Presentation (15 minutes), 30%.

NPU3106 Conservation Genetics

Locations: Werribee, Footscray Park.
Prerequisites: RBF1310 - Biology 1R BF1320 - Biology 2R BF2610 - Fundamentals of Ecology
Description: This unit focuses on the practical applications of genetics of the individual and population as it relates to the conservation of Australian plants and animals. Particularly, this unit examines the genetic basis for management decisions and the formulation of conservation-based breeding programs. Applications of genetics and

formulation of management plans based on genetics form a major area of study in this unit. Some specific topics involve genetic structuring of populations, gene flow and fragmentation, hybridization and retaining genetic diversity in limited populations.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe and elucidate the role and importance of genetics to the management of species and populations and its application to the field of natural resource management as a whole, including the limitations of genetic data; 2. Formulate and argue a theoretical basis on which to base management decisions aimed at long-term conservation of genetic resources in a population; 3. Construct and exhibit a practical understanding of the methods used in modern genetics and how these tools can be applied to the management of species and populations; 4. Critically analyse published data relating to taxonomy and phylogenetic relationships and their implications for conservation and reproductive interventions such as manual pollination or selective breeding.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Sixty (60) hours per semester, comprising of five (5) hours per week consisting of two (2) hour lectures per week and the equivalent of three (3) hours per week of practical work including laboratory sessions, field trips and computer sessions.

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

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

NSC2101 Physics 2A

Locations: Werribee, Footscray Park.

Prerequisites: NEF1102 - Engineering Physics 1

Description: This unit of study aims to provide a basic understanding in the two broad areas of electrical circuit fundamentals and of optics. The various topics covered in these two areas are: Electrical Fundamentals: charge and electrical current leading to Ohm's and Kirchhoff's laws. Series and parallel resistor circuits are analysed and their equivalent resistive circuits are developed. DC sources are studied. Analysis of single and multiple loop circuits as well as voltage dividers. The Principle of Superposition, Thevenin's Theorem, Norton's Theorem, the Nodal Voltage method, and equivalent circuits will be emphasised. Introduction to diodes and voltage amplification in electrical networks. Optics: Spherical mirrors, lenses, ray tracing, thin lens and mirror formulae for image position, lateral magnification. Wave nature of light, interference and diffraction, resolving power. Polarisation, methods of producing polarised light, double refraction and interference, applications of polarisation. Introduction to lasers.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply Ohm's law and Kirchhoff's laws in single and multiple loop circuits; 2. Analyse DC circuits by Nodal Voltage Method, the Principle of Superposition, Thevenin's Theorem, and Norton's theorem; 3. Calculate voltage amplification in electrical circuits; 4. Calculate the behaviour of optical systems involving mirrors or lenses; 5. Analyse single and multiple slit diffraction gratings; 6. Apply knowledge of light to explain polarisation phenomena such as polarisation by reflection; and 7. To provide practical experience in these topics through a range of experiments.

Class Contact: Lab 1.5 hrs Lecture 2.0 hrs Tutorial 1.0 hr

Required Reading: Halliday and Resnick, 2013 10th Fundamentals of Physics Wiley

Assessment: Laboratory Work, Laboratory experiments and reports, 20%. Assignment, Regular submitted assignments, 20%. Examination, End-of-semester (3 hour written exam), 60%. End of semester examination, assignments as advised by lecturer and laboratory reports.

NSC2102 Physics 2B

Locations: Werribee, Footscray Park.

Prerequisites: NEF1202 - Engineering Physics 2

Description: This unit of study aims to provide a basic understanding in the broad areas of the physics of quanta leading to an introduction to atomic, nuclear and particle physics: Planck's hypothesis, photons and the photoelectric effect, Compton effect, pair production, de Broglie Waves and wave-particle duality, Bohr model of the atom, quantum numbers, Heisenberg uncertainty principle. Schrodinger equation: wave functions, expectation values, eigenfunctions, zero potential, potential steps and barriers, tunnelling, particle in a box, simple harmonic oscillator. One-Electron Atoms: eigenfunctions and eigenvalues, probability densities, orbital angular momentum, electron spin, orbital and spin magnetic dipole moments, spin-orbit interaction, total angular momentum. Multielectron atoms: exclusion principle and periodic table of the elements. Production and absorption of x-rays. Nuclear & Particle Physics: Properties of the nucleus - binding energy, radioactive decay, half-life, radioactive dating, fission and fusion, nuclear structure and nuclear models. Nuclear decay schemes. Nuclear reactors, particle accelerators, interaction of radiation with matter. Overview of the standard model of particle physics.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain how quantum physics arose through the inability of classical physics to explain certain experiments satisfactorily; 2. Apply quantum mechanics to atomic, nuclear and particle physics; 3. Provide an overview of nuclear properties including ionising radiation; 4. Describe current knowledge in particle physics; and 5. Provide practical experiences in physics through a range of experiments and visits to appropriate facilities, e.g. synchrotron.

Class Contact: Lab 2.0 hrs Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Halliday and Resnick, 2013 10th Fundamentals of Physics Wiley Recommended Reading: Eisberg, R., and Resnick, R., 1985, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles", 2nd Edition, John Wiley, USA.

Assessment: Laboratory Work, Laboratory experiments, reports and oral presentations, 20%. Assignment, Regular submitted assignments, 20%. Examination, End-of-semester exam (3 hours), 60%. End of semester examination, assignments as advised by lecturer, laboratory reports and oral presentations.

NSC3010 Biotechnology Applications

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1R BF1320 - Biology 2R CS1601 - Chemistry 1A

Description: Biotechnology Applications is a capstone unit of the Biotechnology major that builds upon the concepts studied throughout this major. This unit is focussed upon the applications of biotechnology across a number of industries, including pharmaceutical, food, agriculture, forensic, environmental management and medical fields. Lectures that outline the methods and applications of biotechnology using specific, real-world examples are complemented by hands-on practical experience in techniques used in biotechnology industries and field trips to companies in these industries. This allows students to link theoretical concepts and frameworks in biology to applications and practice.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Deduce the key steps in protein and enzyme production in pharmaceutical

production, demonstrate these in a laboratory setting and critically assess the outcome of these techniques; 2. Evaluate the techniques used in fermentation technologies and analyse and critically interpret the results of ethanol fermentation in a laboratory setting; 3. Critically evaluate and summarise the applications of biotechnology in the medical, pharmaceutical, food, agriculture and forensic industries; 4. Contrast the methods used to produce and applications of transgenic plant and animals in biotechnology and evaluate the potential ethical implications of these technologies; and 5. Summarise the basis of common genetic diseases, devise methods of diagnosis and evaluate current gene therapy strategies.

Class Contact: Lecture3.0 hrsSixty (60) hours per semester comprising of three (3) hours of lectures per week and six (6) x four (4) hour practical/field trip sessions.

Required Reading: Lesk, A.M., (2013) 4th ed. Introduction to Bioinformatics Oxford University Press Nawin C. Mishra (2010) Introduction to Proteomics: Principles and Applications Wiley

Assessment: Report, Industry field trip report (1500 words), 20%. Laboratory Work, Two reports (2000 words in total), 30%. Presentation, Presentation on a modern biotechnology application (10 minutes), 20%. Review, Review of a modern biotechnology application (2000 words), 30%. Students must attend at least 80% of the practical classes/field trips and pass the laboratory work assessment to pass this unit.

NSC3020 Biotechnology Project

Locations: Werribee, Footscray Park.

Prerequisites: RBF2520 - Biochemistry 1RBF2390 - Molecular GeneticsRBF2330 - Cell BiologyRBF2300 - Microbiology 1

Description: This Unit of Study provides third year students undertaking a major in Biotechnology an opportunity to select and undertake either (a) a brief research project in an area of interest under the supervision of staff members in Biotechnology or an established research institution; or (b) a work-based placement in the industry he/she intends to enter. Both the research and work-based placements enable the student to undertake a structured work experience program as an integral part of their degree course. Undertaking a project in their chosen field enables students to gain experience in their chosen industry and provides an introduction to further study and research at the postgraduate level.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and solve problems with intellectual independence and demonstrate time management and project-related organisational skills in a work-based or laboratory project; 2. Articulate and justify research questions/project objectives and methods; 3. Demonstrate proficiency in critical thinking in writing a research/work-based project final report, including a rationale, quantitative analysis of data and a depth of biotechnology knowledge in the elected project area; 4. Elucidate clear, coherent findings and future implications of a research/work-based project to peers and supervisors; and 5. Identify, assess and devise strategies for ameliorating risks in industry and research settings.

Class Contact: Projects will involve work conducted at Victoria University or within industry, the community or both. Projects can range from reports or practical work to fieldwork or industry placements. Contact hours are dependent on the type of project undertaken and will be arranged by negotiation with the student's approved Industry Project unit supervisor(s).

Required Reading: Material appropriate to the students project will be provided by the supervisor.

Assessment: Literature Review, Proposal on Project or Industry Placement (1500-2000 words), 20%. Report, Final Report on Project (3000-4000 words), 60%. Presentation, Oral Presentation (10 minutes), 20%.

NSC3030 Molecular & Systems Biology

Locations: Werribee.

Prerequisites: RBF2520 - Biochemistry 1RBF2390 - Molecular Genetics

Description: This unit provides students with knowledge of and experience in using many of the techniques that facilitate research and diagnostics in modern molecular biological laboratories. This unit provides a structured overview and practical experience in modern nucleic acid and protein analysis, from the level of individual gene analysis, through system-wide analytical techniques in genomics, transcriptomics, proteomics and metabolomics. This unit utilises the theoretical foundations established in the units RBF2520 Biochemistry 1 and RBF2390 Molecular Genetics to provide students with knowledge of the research methods used in genetic engineering and molecular biology and how these have been developed from studying individual gene function to whole genome analysis, to cellular networks of RNA and protein expression and metabolite profiling. Major topics to be explored include recombinant DNA technologies and vectors, the polymerase chain reaction and its variations and uses, DNA sequencing technologies, genome sequencing projects, methods to assess global gene expression profiles at the RNA and protein level and metabolite profiling. Students will receive practical experience in nucleic acid purification, plasmid cloning, PCR, DNA sequence analysis and protein analysis in the laboratory setting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contrast the methods and vectors used in recombinant DNA technology, demonstrate the technique of plasmid cloning and assess the outcome of this technique in a laboratory setting; 2. Analyse the steps and applications of the polymerase chain reaction, design and perform this technique in a laboratory setting and critically assess the results of this methodology; 3. Investigate the evolution of DNA sequencing technologies and how genome projects have been improved as a result and critically analyse DNA sequence data using bioinformatics tools and databases; 4. Distil and critically synthesise the relevant scientific literature on emerging technologies in the fields of molecular and systems biology and weigh the risks and benefits of these technologies in a broader societal context; and 5. Deduce and discriminate the methods used to study the genome, transcriptome, proteome and metabolome and how these approaches are utilised to gain insight into cellular function.

Class Contact: Three (3) hours of lectures per week and eight (8) x three (3) hour practical sessions during the semester.

Required Reading: Lecturer will provide a list of notes and readings for the students.

Assessment: Laboratory Work, 2 Reports (total 2000 words), 30%. Assignment, 1500 words, 20%. Test, Mid-semester test on molecular techniques, 15%. Examination, 2 hours, 35%. Students must attend at least 80% of the practical classes and pass the laboratory work assessment to pass this unit.

RBF2300 Microbiology 1

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 Biology 1.

Description: In this unit, students will be introduced to the theory and practical applications of bacteria, protozoans, fungi and viruses within the environmental, clinical and industrial setting. Topics include: microbial cell morphology and the structure and function of cell components; growth, reproduction and enumeration of micro-organisms; control of microbial growth: the effect of physical and chemical environments on growth; and microbial metabolism and genetics. Students will gain

practical skills in the isolation, culture and identification of a range of microbiological species.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Compare and contrast the characteristics of virus, bacteria, fungi and protozoa and understand how each group impacts on the community; 2. Demonstrate competency in aseptic technique and methods for isolation, enumeration and identification of key micro-organisms; 3. Appraise and synthesise relevant scientific literature; and 4. Investigate the principles of biosafety and bioethics within the context of microbiology practice.

Class Contact: Lab 3.0 hrs Lecture 2.0 hrs Lectures will be held at Footscray Park Campus and Lab classes will be located at Werribee Campus.

Required Reading: Readings and other literature will be advised by lecturer.

Assessment: Assignment, Written Assignment (1000 words), 20%. Laboratory Work, Written Laboratory Reports x 4 (500 words each), 25%. Examination, Written Examination (3 hours), 55%.

RBF2330 Cell Biology

Locations: Werribee, Footscray Park, St Albans.

Prerequisites: RBF1310 Biology 1 or RBM1528 Human Physiology 2.

Description: This unit provides a strong foundation for students moving into areas such as: biotechnology, molecular biology, medical sciences and environmental sciences. Topics include: Eukaryotic cell organisation (covering all of the major organelles) and compartmentalisation; membranes and transport mechanisms; the cell surface; intracellular targeting of proteins including co-translational and post-translational pathways; transport and docking of vesicles; motor proteins, movement and the cytoskeleton; communication between cells including receptors and signal transduction pathways; cell cycle and its regulation; apoptosis; the molecular basis of cancer. Students will gain practical skills in plant and mammalian cell culture in the laboratory setting.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review how eukaryotic cell structures relate to their respective functions; 2. Map the pathways of signal transduction and the cell cycle in normal and cancerous cells and identify targets for novel cancer therapies; 3. Determine mechanisms of intracellular transport and apply this knowledge to the design and delivery of anticancer therapies; 4. Appraise and synthesise relevant scientific literature; 5. Investigate the principles of biosafety and bioethics within the context of cell biology practice; and 6. Demonstrate competency in plant and mammalian cell culture techniques.

Class Contact: Lab 3.0 hrs Lecture 3.0 hrs

Required Reading: Becker, W., Kleinsmith, L.J., & Hardin, J. 8th ed The world of the cell Benjamin Cummings

Assessment: Assignment, Assignment (approx. 1500 words), 20%. Examination, Written Examination (3 hours), 50%. Practicum, Practical Reports, 30%. In order to obtain a pass or higher in this graded unit, all components of assessment must be passed.

RBF2390 Molecular Genetics

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2

Description: This unit provides an introduction to developments at the forefront of molecular biology of gene and genome structure/function and molecular genetics. The unit explores the structure of eukaryotic genomes and the function of various sequences that make up these genomes. Mechanisms that lead to change and evolution of eukaryotic genomes and the maintenance and regulation of individual genes within them will also be covered. These concepts will also be linked to the laws of Mendelian genetics covered in RBF1320 Biology 2. The content of this unit provides students with an important theoretical framework and underlying concepts that are essential for studies in biotechnology, molecular biology and science education.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review the organisation, maintenance and evolution of eukaryotic genomes including repetitive and non-repetitive DNA sequences; 2. Collaborate and connect known mechanisms of genomic rearrangement to observed features of eukaryotic genomes; 3. Collaborate and connect the replication of DNA at the telomeres to problems associated with the maintenance of linear chromosomes, cancer and cellular aging; 4. Investigate the mechanisms of regulation of gene expression in eukaryotic organisms; 5. Articulate epigenetic mechanisms of gene regulation including the methylation and imprinting of DNA; and 6. Analyse the scientific literature on a genetic mechanism in a eukaryotic organism(s) and critically evaluate and present that information to peers and relevant audiences.

Class Contact: Lecture 3.0 hrs Tutorial 1.0 hr

Required Reading: Krebs JE et al. (2012) Genes XI Jones & Bartlett

Assessment: Assignment, Group, peer-reviewed assignment (~1500 words), 20%. Assignment, Individual assignment (~1500 words), 20%. Examination, 3 hour duration, 60%.

RBF2520 Biochemistry 1

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1 RCS1601 - Chemistry 1A or equivalent

Description: This unit provides a general introduction to the field of biochemistry, providing fundamental knowledge of the molecules of life and principles of metabolic processes that underpin life. This unit builds upon knowledge from RBF1310 Biology 1, providing further detail on the structure and function of the biological macromolecules: carbohydrates, lipids, proteins and nucleic acids. The link between the structure of these molecules and fundamental biological processes, including membrane function, enzyme catalysis, how nucleic acids underpin genetics and heredity will be explored. Key concepts in bioenergetics, enzyme kinetics and how these link to the function and regulation of metabolic pathways in the cell will also be described. This content will be supported by laboratory-based work, wherein key techniques in spectrophotometry, carbohydrate analysis, enzyme assay and protein analysis, as well as the analysis and presentation of scientific data, will be undertaken. This will provide key skills for further study and careers in biological-based research.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Classify the major biological macromolecules and summarise their general structures and functions; 2. Review the mechanisms that underpin enzyme function and calculate the kinetic properties of an enzyme; 3. Elaborate on the function of nucleic acids, focusing on DNA replication, transcription, the genetic code and protein translation in relation to cellular function; 4. Summarise the energy producing pathways of cells, focussing on central metabolism and photosynthesis, evaluating the function of these pathways and contrasting the mechanisms that regulate them; 5. Collect and analyse biochemical data, including protein analysis (SDS-PAGE) and quantitative UV/Vis spectrophotometry data in a laboratory setting; and 6. Assess the scientific literature and review this information to probe a

specific topic in biochemistry demonstrating accountability for personal learning.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs Tutorial 1.0 hr
Required Reading: Tymoczko, JL, Berg, JM & Stryer, L. (2011) 2nd Biochemistry: a short course WH Freeman and Company
Assessment: Laboratory Work, Eight (8) Lab Reports (total 2000 words), 30%. Examination, Final Exam (3 hours), 55%. Assignment, Assignment (1500 words), 15%.

RBF2610 Fundamentals of Ecology

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2 Or equivalents to be determined by Unit coordinator.
Description: This unit covers a range of topics related to the basic understanding of the nature of Ecology. The areas covered include the history and development of the philosophical underpinnings of our modern understanding of ecology and the evolutionary process. Included in this unit are the fundamentals of the responses of plants, animals and other organisms to their environment and the interaction of these organisms as they form communities and ecosystems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and clearly elucidate key ecological processes at population, community and ecosystem levels; 2. Relate ecological concepts to real-life field situations and environmental management; 3. Determine methods of studying and measuring species behaviour, interactions and dynamics; and 4. Critically examine and articulate complex ecological thought in both written and spoken form.
Class Contact: Lab 8.0 hrs Lecture 2.0 hrs Forty-eight (48) hours or equivalent for one semester comprising lectures and practicals (mainly field excursions).
Required Reading: Attiwill, P. & Wilson, B., (2006) Ecology: An Australian perspective Oxford University Press
Assessment: Assignment, Field Studies #1 (1000 words), 20%. Assignment, Field Studies #2 (1000 words), 20%. Assignment, Field Studies #3 (1000 words), 20%. Examination, Final Exam (2 hours), 40%.

RBF2620 Australian Plants

Locations: Werribee, Footscray Park.
Prerequisites: RBF1310 - Biology 1 RBF1320 - Biology 2 Or equivalents to be determined by Unit coordinator.
Description: There are approximately 250,000 plant species on the planet Earth. The importance of plants as the primary means of converting minerals and solar energy into 'life' is critical to the functioning of all other forms of life, including humans and the planet as a whole. This unit focuses on developing a fuller understanding of the diversity and evolution of plants (including fungi), particularly in the Australian context. This understanding helps us to come to a greater appreciation of the role plants play in our everyday life. More specifically, there is emphasis on the morphological characteristics and life histories of the various major plants groups, their evolution and relationships, systematics, nomenclature, identification and classification. Additionally, there is a focus on how the biogeography of Australian plants can be explained by their life history and the history of the continent and particularly, how and why Australia has evolved a diverse and highly endemic primarily sclerophyllous flora where the forests and woodlands are dominated by two tree genera, Eucalyptus and Acacia.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Distinguish and identify key morphological features and life history characteristics of plants; 2. Distinguish major families, genera and species of Australian plants with professional skill and judgement; 3. Devise tools for collecting and preserving plant specimens with creativity and initiative; 4. Use high-level identification guides to determine and differentiate a wide range of plant species; and 5. Articulate clearly, diagrammatically and in writing, complex information on the morphology, life cycles and relationships of various plant families and report on their evolutionary history to peer groups.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs
Required Reading: Knox, B., Ladiges, P., Evans, B., & Saint, R. (2010) 4th ed. Biology McGraw-Hill
Assessment: Laboratory Work, Practicals (6 x labelled illustrations, 100-150 words each), 20%. Assignment, Written Report (1000 words), 15%. Portfolio, Approximately 30 page Herbarium, 25%. Examination, Examination (2 hours), 40%.

RBF2640 Australian Animals

Locations: Werribee, Footscray Park, St Albans.
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 cladistic analysis, Bauple's, evolution and origin of biodiversity in marine and terrestrial environments and historical and ecological biogeography. The unit also analyse faunal regions and habitat types, and the 'uniqueness' of the Australian fauna.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyses and synthesise the characteristic features of major animal phyla; 2. Contextualise the principles of ecological biogeography in relation to the fauna of Australia; 3. Evaluate the features adopted by animals for living in either a marine, freshwater or terrestrial environment and appraise the uniqueness of Australian fauna; 4. Contextualise the evolution and origin of biodiversity in marine and terrestrial environments demonstrating conceptual and technical understanding in the area to colleagues and peer groups; 5. Articulate clearly, orally, diagrammatically and in writing, complex information on the morphology, life cycles and relationships of various animal families and report on their evolutionary history to peer groups.
Class Contact: Lecture 2.0 hrs Forty-eight (48) hours or equivalent for one semester comprising lectures and field excursions.
Required Reading: Hickman, C. (Jr); Keen, S.; Larson, A.; Eisenhour, D.; l'Anson, H. and Roberts, L. (2013) 16th ed. Integrated Principles of Zoology McGraw-Hill
Assessment: Assignment, Essay, 20%. Other, Practical Assessment, 40%. Examination, Final Examination (3 hours), 40%.

RBF3110 Marine & Freshwater Ecology

Locations: Werribee, 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 the Gippsland Lakes) and environmental degradation and repair of aquatic systems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Distinguish and evaluate marine and freshwater environments found in southern Australia in contrast to that found in other parts of Australia; 2. Adapt skills in biological techniques utilised in marine and freshwater ecology to solve complex problems in the area; 3. Assess forms of environmental degradation that occur in marine and freshwater environments and provide creative strategies to mitigate them; 4. Differentiate amongst different management strategies applied in marine and freshwater ecology and critique their effectiveness in application in wide ranging context; and 5. Articulate clearly, diagrammatically and in writing, complex information on a range of ecologically important concepts in relation to marine and freshwater ecosystems.

Class Contact: Lecture2.0 hrsForty-eight (48) hours or equivalent for one semester comprising lectures, tutorial/directed learning, and five (5) field excursions (two (2) whole day and three (3) half day).

Required Reading: Edgar, G.J., (2012) Australian Marine Life Reed New Holland

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

RBF3210 Environmental Rehabilitation

Locations: Werribee, Footscray Park.

Prerequisites: RBF1310 - Biology 1RBF1320 - Biology 2

Description: This unit Environmental Rehabilitation builds on Biology 1 and Biology 2 and introduces a range of tools that will assist in the rehabilitation of Victoria's terrestrial environments and communities. Topics include the ecological parameters and adaptations of organisms in diverse environments and the key ecological relationships amongst organisms. Rehabilitation projects based on approaches using ecological theory will be reviewed using contemporary case studies. Practicals will include hands-on experience in the use of the Native Vegetation Management Framework, the Habitat Hectare approach, development of land management plans, and specific threatened species rehabilitation programs.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Formulate and elucidate ecological principles to environmental rehabilitation practices with creativity and responsibility, contributing to local and global communities; 2. Create a land management plan collaboratively with accountability for own input; 3. Communicate in oral and written form to professionals and the general community, approaches to rehabilitation based on complex ecological principles; 4. Justify the selected methods of assessment and management of communities and specific species exercising professional judgements; and 5. Evaluate, argue and implement the principles of the Habitat Hectare approach and the Native Vegetation Management Framework to contemporary, environmental assessment issues and propose creative and sound solutions.

Class Contact: Lab8.0 hrsLecture2.0 hrsForty-eight (48) hours or equivalent for one semester comprising lectures, lab work and field excursions.

Required Reading: Williams, S.G., Marshall, A. (2015) Land of Sweeping Plains: Managing and Restoring the Native Grasslands of South-eastern Australia CSIRO

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

RBF3620 Conservation and Sustainability

Locations: Werribee, Footscray Park.

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

Description: This unit ties together, in both theoretical and practical ways, concepts and practices for maintaining biological diversity, and how these concepts and practices can be integrated with social and economic needs. The development of conservation theory and practice in Australia; extinction and its significance, including pathways to extinction; the meanings, levels and interpretation of concepts of biodiversity; ecological and adaptive management approaches to conservation and recovery, including design of reserves, setting priorities, off-reserve conservation and ex-situ (captive breeding, reintroduction and translocation). Practical field studies and site visits will investigate the contributions of zoo's, national and state parks, friends groups, councils and shires, other government agencies and private landholders to the conservation and recovery of plant and animal species, from insects to mammals, and from mushrooms to trees. The subject will also include practical appraisals of techniques used to determine integrity of ecosystems, landscapes and overall environment, the contributions made by biodiversity to ecosystem services and integrated methods for recovery and sustainable management of species and ecosystems.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Evaluate and implement ecologically and genetic principles to the conservation and management of plant and species and populations in an ethical and fact-based manner; 2. Work individually and collectively to critically assess and formulate conservation management actions as they apply to in-situ and ex-situ conservation programs; 3. Argue, debate and report in written and oral form, conservation programs and principles to a range of end-users groups; 4. Critically analyse a range of data types and published literature and data to support and justify sound decision-making processes in relation to conservation and sustainability; and 5. Formulate a theoretical basis on which to base conservation and sustainability management decisions.

Class Contact: Lecture2.0 hrsTutorial2.0 hrs

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

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

RBF4001 Science Honours

Locations: Werribee.

Prerequisites: Nil.

Description: The program will consist of a research project and a coursework component. The major focus of the course component is research methodology and subjects include experimental design, statistics in research, data analysis, computer applications and software, literature analysis and critical appraisal, ethics in research, scientific writing and data presentation. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.Required Reading To be advised by the lecturer.

Credit Points: 48

Class Contact: An average of 20 hours per week for one semester.

Required Reading: To be advised by the lecturer.
Assessment: The nature of the coursework assessment will vary and may be based on written assignments, seminar presentations and a written examination. The research project assessment will consist of an oral presentation and submission of a thesis.

RBF4002 Science Honours

Locations: Werribee.
Prerequisites: RBF4001 - Science Honours
Description: This subject, the aim of which is to enable students to competently research an area of study utilising knowledge and skills gained in previous studies, consists of a project carried out by students on an individual basis. The project is expected to be a scientific investigation of an approved topic, followed by the submission of a suitably formatted thesis in which the topic is introduced and formulated; the scientific investigation described in detail; results and conclusions from the study are elaborated; and an extended discussion presented. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.
Credit Points: 48
Class Contact: An average of 30 hours per week for one semester.
Required Reading: To be advised by the lecturer.
Assessment: The nature of the coursework assessment will vary and may be based on written assignments, seminar presentations and a written examination. The research project assessment will consist of an oral presentation and submission of a thesis.

RCM1613 Applied Statistics 1

Locations: Footscray Park.
Prerequisites: Nil
Description: This unit of study will introduce students to data analysis and statistical techniques used in the workplace and community to help make sense of the vast amounts of data collected in all fields. It will include displaying and describing data, sampling and population distributions, probability and combinatorics and inferential statistics and their use to make decisions.. This is an introductory unit in a mathematics major or minor unit set. It has been designed to be particularly useful for pre-service teachers, and students studying science.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate data collection methods, types of variables, types of data; 2. Present data using graphical and numerical methods; 3. Conduct elementary-level exploratory data analysis, to gain in particular, basic knowledge from real life data using basic statistical tools; 4. Explain the concepts of probability and combinatorics and calculate probability for various continuous and discrete variables; 5. Make various statistical inferences using Estimation and Hypothesis Testing;
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Learning material will be provided by Lecturers and Tutors
Assessment: Laboratory Work, Laboratory Assessment, 25%. Assignment, Two (2) Assignments 1. Descriptive Statistics 2. Inferential Statistics, 35%. Examination, Final Examination (2 hours) Limited Open Book, 40%.

RCM1614 Applied Statistics 2

Locations: Werribee, Footscray Park.
Prerequisites: Nil.
Description: This unit of study will introduce students to data analysis and statistical techniques used in the workplace and community to help make sense of the vast amounts of data collected in all fields. It will include displaying and describing data, sampling and population distributions, probability and combinatorics and inferential statistics and their use to make decisions.. This is an introductory unit in a mathematics major or minor unit set. It has been designed to be particularly useful for pre-service teachers, and students studying science.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Articulate data collection methods, types of variables, types of data; 2. Present data using graphical and numerical methods; 3. Conduct elementary-level exploratory data analysis, to gain in particular, basic knowledge from real life data using basic statistical tools; 4. Explain the concepts of probability and combinatorics and calculate probability for various continuous and discrete variables; 5. Make various statistical inferences using Estimation and Hypothesis Testing;
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs
Required Reading: Learning material will be provided by Lecturers and Tutors.
Assessment: Laboratory Work, Laboratory Assessment, 25%. Assignment, Two (2) Assignments 1. Descriptive Statistics 2. Inferential Statistics, 35%. Examination, Final Examination (2 Hours) Limited Open Book, 40%.

RCM1711 Mathematical Foundations 1

Locations: Footscray Park.
Prerequisites: Nil.
Description: The unit reviews and builds on fundamentals, including basic algebra, handling of functions, and some trigonometry. The rest of the unit is devoted to the algebra of matrices and vectors, and their application to geometry and linear systems.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Perform algebraic operations including the handling of indices and logarithms, factorisation and expansion of simple expressions and the simplification of fractions; 2. Solve linear and quadratic equations presented in a variety of forms and with different solution methods; 3. Graph straight lines in the plane and determine gradients and intersections; 4. Use trigonometric functions to analyse geometric figures; 5. Perform arithmetic on vectors and matrices; 6. Apply matrices to the geometric transformation of vectors; and 7. Solve simultaneous linear equations using matrix methods.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs
Required Reading: Learning material will be provided by lecturers and tutors.
Assessment: Test, Eight (8) small tests during class time., 20%. Test, Mid-semester test (1 hour), 30%. Examination, Final Examination (2 hours), 50%.

RCM1712 Mathematical Foundations 2

Locations: Footscray Park.
Prerequisites: Nil.
Description: Introduction to the use of modern computer algebra system calculators to solve mathematical problems. Manipulate and solve various algebraic expressions. Sketch various polynomials and other functions. Extension of the number system to include complex numbers: their definition and basic operations using rectangular, polar and exponential forms. The binomial theorem will be used in the expansion of algebraic forms. Introduction to calculus: solving rate of change problems using derivatives, using rules for differentiation, and the solution of equations. Concepts of integration: the relationship between integration and differentiation, area between curves. Integration methods: integration by substitution, integration by parts. Numerical integration: trapezoidal and Simpson's rule. First order differential equations: separation of variables method and application to growth/decay problems and Newton's law of cooling. This subject continues the stream that will allow

students to satisfy mathematics teacher registration.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Manipulate and solve various algebraic expressions, including the use of the binomial theorem for expansion; 2. Sketch polynomials and various other functions; 3. Perform arithmetic on complex numbers and plot them on an Argand diagram; 4. Differentiate standard algebraic and transcendental functions, using the product, quotient and chain rules and use these rules to solve simple differential equations taken from a variety of applications; 5. Perform indefinite and definite integration, using substitution and integration by parts; 6. Apply simple numerical methods to equation solving and quadrature problems; and

Class Contact: Lab 2.0 hrs Tutorial 2.0 hrs

Required Reading: Learning material will provided by Lecturers and Tutors

Assessment: Test, Mid-semester test (1 hour), 15%. Laboratory Work, Laboratory, 20%. Assignment, One (1) Assignment, 15%. Examination, Final Exam (2 Hours), 50%.

RCM2611 Linear Statistical Models

Locations: Werribee, Footscray Park.

Prerequisites: RCM1614 Applied Statistics 2

Description: This unit of study is the third unit of applied statistics following RCM1614: Applied Statistics 2. It will introduce students to simple and multiple linear regression models, general linear models with categorical data, ANOVA and simple experimental designs, simple logistic regression models for binary response. Students will learn how to build, diagnose and validate linear statistical models. Statistical software package R will be used to practise the techniques covered in this unit. This is a unit in a stream that will allow students to undertake a qualification to become a registered teacher.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Build general linear regression models; 2. Assess and diagnose general linear regression models by various numerical and graphical tools; 3. Perform ANOVA analysis and make simple experimental designs; 4. Build and diagnose simple linear models for binary responses; and 5. Present solutions in a comprehensible statistical fashion.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

Required Reading: Fuchun Huang (2014) Lecture notes for Linear Statistical Models Victoria University, College of Computer Science and Mathematics, Melbourne, Australia Recommended Text William Mendenhall and Terry Sincich (2013), A Second Course in Statistics: Regression Analysis (7e), Pearson Higher Education, USA.

Assessment: Assignment, Data analysis report (15 to 20 pages including graphs), 25%. Test, One (1) hour test, 25%. Examination, Final Exam (3 hours), 50%. The assignment is to model and analyse a data set by using a statistical software package, and report the results in a PDF or Word document. Both the test and examination are open book, and any calculators are allowed.

RCM2713 Modelling for Decision Making

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit builds on first year mathematical units and is designed to provide an overview of the modelling process; including problem identification, factors and assumptions, formulation and solution, interpretation comparison of results with original problem. The unit also explores setting up models and the interpretation of mathematical models as well as interpolation, extrapolation, spectral decomposition and fitting models to data. Applications of continuous models via differential equations and data fitting, discrete versus continuous modelling and discrete/continuous combinations with examples of general interest in a variety of fields, are other topics explored in this unit. This is a core unit in a stream that will allow students to undertake a qualification to become a registered teacher.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review, analyse, consolidate and synthesise knowledge to identify a modelling process and provide solutions to complex problems with intellectual independence; 2. Adapt and use various ordinary differential equations, in the continuous case and interpolation methods, in the discrete case, for modelling common situations; 3. Develop simple models to solve real life problems with intellectual independence; 4. Solve differential equations that play an essential role in continuous models such as the velocity field of fluid in pipe flows, temperatures and stresses in a solid, and electric field that applies continuously over the entire model due to a point charge; and 5. Articulate a clear and coherent exposition of knowledge and ideas on continuous and discrete mathematical modelling to a variety of audiences.

Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs

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

Assessment: Assignment, Assignment #1 consisting of Mathematical problems (approx.1,000 words), 15%. Assignment, Assignment #2 consisting of Mathematical problems (approx.1,000 words), 25%. Examination, Final Exam (3 hours), 60%.

RCM2911 Linear Optimisation Modelling

Locations: Footscray Park.

Prerequisites: Nil.

Description: Introduction to linear programming; Mathematical models; Graphical solution; Maximisation and minimisation problems; Spreadsheet models. Sensitivity analysis for LP; Applications of LP. Transportation problems, Assignment and Transhipment problems. Simplex method, Hungarian method. Pure and mixed integer linear programming; Branch and bound method; Knapsack problems. This unit is part of a stream of units that will allow students pursuing an education qualification to satisfy the requirements of a VIT (Victorian Institute of Teaching) registered mathematics teacher.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse optimisation problems and formulate suitable linear programming (LP) models for them; 2. Implement graphical and other mathematical techniques (Simplex) to evaluate alternatives and determine the best alternative in a given situation; 3. Reflect on the underlying assumptions, and on the sensitivity of the LP models developed; 4. Formulate special LP models for transportation, assignment and transhipment problems, and determine their optimal solutions using Hungarian method and other methods; 5. Formulate integer linear programming problems, including knapsack problems, and determine their solutions using techniques like greedy heuristic, and branch and bound; and 6. Construct spreadsheet models for the LP models mentioned above and interpret the solutions obtained by MS EXCEL Solver.

Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs

Required Reading: Hillier, F. S. and Lieberman, G. J. (2015) 10th ed. Introduction to Operations Research McGraw-Hill, New York.

Assessment: Test, Class Test (closed book) 1 hour (approx. 1000 words), 20%.

Assignment, Individual task (approx. 1000 words), 20%. Examination, Final Exam (open book) 3 hours, 60%.

RCM3711 Computational Methods

Locations: Footscray Park.
Prerequisites: RCM2713 - Modelling for Decision MakingRCM2611 - Linear Statistical ModelsRCM2911 - Linear Optimisation ModellingAny one of the following: RCM2713 or RCM2611 or RCM2911
Description: This unit introduces students to numerical and approximate techniques to solving applied mathematical problems. Topics include: methods for solving non-linear equations methods for solving systems of linear equations interpolation and extrapolation numerical calculus including integration (quadrature) and differentiation methods for numerical solution of differential equations. The students will also be introduced to a modern computing environment, such as CAS calculators.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Analyse the errors inherent in numerical processes. 2. Select and evaluate computational techniques appropriate to solving a wide range of problems chosen from the field of numerical analysis. 3. Implement appropriate numerical techniques using a computer algebra system. 4. Critically review the use of technology in the secondary mathematics classroom.
Class Contact: Equivalent to forty-eight (48) hours of directed study for one semester.
Required Reading: No text is required; materials for the unit will be made available through the learning management system.
Assessment: Assignment, Five short assignments (roughly one page each) each covering one of the main topics., 80%. Essay, 500 words on a topic based on school mathematics and technology, 20%.

RCS1110 Chemistry for Biological Sciences A

Locations: Footscray Park, St Albans.
Prerequisites: Nil.
Description: This unit underpins studies in the biological sciences, including biochemistry and molecular biology. Students will learn about basic chemistry properties, actions and reactions. In particular, there will be emphasis on matter and energy, atomic theory and the periodic table, solutions and aqueous chemistry. Students will have the opportunity to conduct basic experiments utilizing a range of chemical formulas, reactions and equations, gas laws and the state of matter, solutions and aqueous chemistry in science labs. In this unit students will learn about basic chemistry including the topics which follow: Matter and energy, measurement, chemical and physical bonding, reactions and equations, solutions and aqueous chemistry.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Define basic chemical principles and practices; 2. Apply the principles of atomic theory, the periodic table and the mole concept to solve basic chemical problems; 3. Demonstrate the skills required to prepare solutions and solve chemical problems as a member of a laboratory team; and 4. Explain the types of bonds (ionic and covalent) using the concept of Lewis structure.
Class Contact: Lab 2.0 hrs Lecture 3.0 hrs Tutorial 1.0 hr
Required Reading: Seager, S. L. and Slabaugh, M. R., (2014) 8th ed. Chemistry for Today: General, Organic and Biochemistry Brooks/Cole, Cengage Learning
Assessment: Other, Three (3) On line tutorial tests (5% each), 15%. Laboratory Work, Ten (10) experiments and associated Laboratory Data Sheets, 30%. Examination, Final Exam (2 hours), 55%.

RCS1120 Chemistry for Biological Sciences B

Locations: Footscray Park, St Albans.
Prerequisites: Nil.
Description: This unit serves as an introduction to chemistry relevant to biological sciences and in particular biological systems. It will cover the principles of basic physical chemistry including chemical equilibrium and kinetics, acids and bases, thermochemistry and nuclear chemistry. The relationship between biological chemistry and organic chemistry will also be investigated.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply the principles of chemical kinetics and equilibrium to laboratory practices; 2. Determine the concentrations and pH of acids and bases; 3. Identify and understand the principles of organic chemistry, biological, nuclear, and thermo chemistry and how they interact with each other; 4. Apply the principles of organic and biological chemistry to solve problems in laboratory settings; and 5. Reflect on how knowledge and skills in chemistry adds value to career options in the biomedical sciences.
Class Contact: Lab 2.0 hrs Lecture 3.0 hrs Tutorial 1.0 hr
Required Reading: Seager, S. L. and Slabaugh, M. R., (2014) 8th ed. Chemistry for Today: General, Organic and Biochemistry Brooks/Cole, Cengage Learning
Assessment: Other, Three (3) Online tutorial tests (5% each), 15%. Laboratory Work, Ten (10) experiments and associated Laboratory Data Sheets, 30%. Examination, Final Examination (2 hours), 55%.

RCS2503 Forensic Chemistry 2

Locations: Werribee, Footscray Park.
Prerequisites: RCS1601 - Chemistry 1A
Description: Forensic Chemistry 2 builds upon the fundamentals of Chemistry introduced in first year chemistry studies and introduces students to forensic chemical techniques as applied to the analysis of physical evidence collected from crime scenes. Students receive training in routine applications in Forensic Chemistry including arson investigation, drug analysis and the examination of other types of physical evidence. Practical exercises provide 'hands-on' experience in a range of forensic chemical techniques.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply basic concepts underpinning qualitative and quantitative forensic analysis; 2. Interpret various data from the examination of physical evidence from a range of forensic scenarios and report findings and draw appropriate conclusions; 3. Articulate fundamental forensic principles behind the examination of physical evidence clearly expressing ideas and perspectives; 4. Apply standard methodology to the analysis of various forensic samples including method selection, sample preparation, instrumental operation and data analysis so as to develop current industry specific competency in collaboration with peers; and 5. Evaluate the quality of analytical data and review team members' data and report the findings to peers and demonstrators with initiative and judgement.
Class Contact: Lab 3.0 hrs Lecture 2.0 hrs Both Lectures and Lab classes will be held at Footscray Park Campus.
Required Reading: R. Saferstein, (2014) 11th ed. Criminalistics: An Introduction to Forensic Science Pearson Higher Ed USA P. White, J. Millington, B. Rankin, P Wiltshire and D. Gennard (2016) 4th ed. Crime Scene to Court: The Essentials of Forensic Science Cambridge, Royal Society of Chemistry A. Langford, J. Dean, R. Reed, D. Holmes, J. Weyers and A. Jones, (2010) 2nd ed. Practical Skills in Forensic Science Pearson Education, USA

Assessment: Assignment, Written Assignment (1000 words), 20%. Laboratory Work, Portfolio of laboratory work with summary addressing criteria (2000 words), 40%. Examination, Final Exam (2 hours), 40%.

RCS4201 Honours Coursework

Locations: Werribee.
Prerequisites: Nil.
Description: The major focus of the course component is research methodology and subjects include experimental design, statistics in research, data analysis, computer applications and software, literature analysis and critical appraisal, ethics in research, scientific writing and data presentation.
Credit Points: 24
Class Contact: An average of 10 hours per week
Required Reading: To be advised by the lecturer.
Assessment: The assessment will vary and may be based on written assignments, seminar presentations and a written examination.

RCS4601 Honours Project Part Time

Locations: Werribee.
Prerequisites: Nil.
Description: The program will consist of a research project and a coursework component. The major focus of the course component is research methodology and subjects include experimental design, statistics in research, data analysis, computer applications and software, literature analysis and critical appraisal, ethics in research, scientific writing and data presentation. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.Required Reading To be advised by the lecturer. Normally the coursework component will be conducted in the first two semesters and the research component in the third and fourth semester.
Credit Points: 24
Class Contact: An average of 10 hours per week for four semesters.
Required Reading: To be advised by the lecturer. Normally the coursework component will be conducted in the first two semesters and the research component in the third and fourth semester.
Assessment: The nature of the coursework assessment will vary and may be based on written assignments, seminar presentations and a written examination. The research project assessment will consist of an oral presentation and submission of a thesis.

RCS4602 Honours Project

Locations: Werribee.
Prerequisites: Nil.
Description: This subject, the aim of which is to enable students to competently research an area of study utilising knowledge and skills gained in previous studies, consists of a project carried out by students on an individual basis. The project is expected to be a scientific investigation of an approved topic, followed by the submission of a suitably formatted thesis in which the topic is introduced and formulated; the scientific investigation described in detail; results and conclusions from the study are elaborated; and an extended discussion presented. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.
Credit Points: 48
Class Contact: An average of 30 hours per week for one semester
Required Reading: To be advised by supervisor.
Assessment: The assessment will consist of an oral presentation and submission of a thesis.

RCS4610 Honours Project Part Time

Locations: Werribee.
Prerequisites: Nil.
Description: This subject, the aim of which is to enable students to competently research an area of study utilising knowledge and skills gained in previous studies, consists of a project carried out by students on an individual basis. The project is expected to be a scientific investigation of an approved topic, followed by the submission of a suitably formatted thesis in which the topic is introduced and formulated; the scientific investigation described in detail; results and conclusions from the study are elaborated; and an extended discussion presented. The research project will be undertaken in one of the research areas of the School and may, subject to approval, be undertaken at an external location.
Credit Points: 24
Class Contact: An average of 15 hours per week for one semester
Required Reading: To be advised by supervisor.
Assessment: The assessment will consist of an oral presentation and submission of a thesis.

RMS3113 Comparative Immunobiology

Locations: Werribee, Footscray Park.
Prerequisites: RBF2300 - Microbiology 1RBF2330 - Cell Biology
Description: This unit of study examines strategies of disease resistance and internal defence in prokaryotes and eukaryotes and their importance in the field of biotechnology. The specific aims of this unit of study are: to develop an understanding of the nature of immunity and resistance; to develop an understanding of the mechanisms underlying internal defence in organisms; to develop an understanding of the evolution of defence mechanisms in prokaryotes and eukaryotes. Topics covered include: the molecular and cellular components of the vertebrate immune system; innate and adaptive responses to pathogens; the evolution of metazoan immunity; the restriction modification system and other defence mechanisms of prokaryotes; hypersensitive response and systemic acquired resistance in plants; immunology-related advances in biotechnology.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Critically review the adaptive and innate immune response to pathogens in vertebrates; 2. Deduce and discriminate strategies of defence against pathogens in prokaryotes and eukaryotes; 3. Experiment with several immunology-based laboratory techniques including the ELISA assay, Western Blot and Immuno-diffusion assay; 4. Appraise and synthesise relevant scientific literature; 5. Investigate the principles of biosafety and bioethics within the context of cell biology practice.
Class Contact: Lab3.0 hrsLecture1.0 hr
Required Reading: Janeway, CA, Travers, P, Walport, M, Shlomchik, MJ. (2014) 8th Immunobiology: the immune system in health and disease. Blackwell.
Assessment: Assignment, Assignment, 20%. Practicum, Laboratory reports, 30%. Examination, Written Examination (3 hours duration), 50%.

RSS3000 Industry Project

Locations: Werribee, Footscray Park, St Albans.
Prerequisites: Successful completion of Years 1 and 2 of NBSC Bachelor of Science
Description: Industry Project provides third year students with an opportunity to select and undertake either (a) a brief research project in an area of interest with staff members of Chemical Sciences or an established research institution; or (b) a work-based placement in the industry he/she intends to enter. Both the research and work-based placements enable the student to undertake a structured work

experience program as an integral part of their degree course. Gaining practical experience in their chosen field enables students to test interest and ability in these areas.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Identify and solve problems with intellectual independence and demonstrate time management and project-related organisational skills in a work-based or laboratory project; 2. Articulate and justify research questions/project objectives and methods; 3. Demonstrate proficiency in writing a research/work-based project final report, including a rationale and a summary of strengths and limitations; and 4. Communicate clear, coherent findings and ideas of a research/work-based project to peers and supervisors.

Class Contact: Projects will involve work conducted at Victoria University or within industry, the community or both. Projects can range from reports or practical work to fieldwork or industry placements. Contact hours are dependent on the type of project undertaken and will be arranged by negotiation with the student's approved Industry Project unit supervisor(s).

Required Reading: Material appropriate to the students project will be provided by the supervisor

Assessment: Portfolio, e-Portfolio, 80%. Presentation, Oral presentation (20 min), 20%.

VAC4192 Structural Engineering Design 3

Locations: Footscray Park.

Prerequisites: Nil.

Description: This unit introduces the analysis and design of prestressed concrete structures. Topics include: introduction to prestressed concrete, deflections of prestressed concrete beams, loss of prestress, flexural strength, strength at transfer, design for shear, anchorage zones, continuous prestressed concrete beams, prestressed concrete slabs, strut-and-tie modelling of structural concrete, and reinforced concrete footings.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Design prestressed concrete beams for strength and serviceability; 2. Design prestressed concrete slabs for strength and serviceability; 3. Use the strut-and-tie model approach to design non-flexural concrete members 4. Design reinforced concrete footings.

Class Contact: Lecture 2.0 hrsTutorial 2.0 hrs

Required Reading: Warner, R. F., Rangan, B. V., Hall, A. S. and Faulkes, K. A. (1998). Concrete Structures, Melbourne: Longman. Recommended reading: Liang, Q. Q. (2005). Performance-Based Optimization of Structures: Theory and Applications, London and New York: Spon Press, Taylor and Francis Group. Gilbert, R. I., Mickleborough, N. C. and Ranzi, G.(2016). Design of Prestressed Concrete to AS3600-2009, Second Edition, Boca Raton and London: CRC Press, Taylor and Francis Group. AS 3600 (2009). Australian Standard for Concrete Structures, Sydney, NSW, Australia: Standards Australia.

Assessment: Assignment, Assignment 1 (Report maximum 35 A4 pages including design calculations and drawings), 25%. Assignment, Assignment 2 (Report maximum 35 A4 pages including design calculations and drawings), 25%. Examination, Final Exam (2 hour closed book exam), 50%. The assignments are undertaken by groups, and assess a student's ability to problem solve and interact in a team situation. The examination focuses upon the individual student's ability to demonstrate his or her in-depth understanding of specialist bodies of knowledge within the engineering discipline and apply established engineering methods to complex engineering problems, as defined in Engineers Australia competencies 1.3 and 2.1. As the examination is the one clear way by which these competencies can be assessed on an individual basis, a student must achieve a minimum mark of 40% in the examination and 50% in the overall unit assessment in order to pass the unit.

VAM4111 Advanced Mechanics 1

Locations: Footscray Park.

Prerequisites: Completion of at least half of all 3rd year units and any unit of study relevant to the selected topic (to be determined by the Topic Supervisor).

Description: Students will select one project from a list of advanced topics aligned with the engineering and research expertise of academic staff and learn in the PBL mode under advice of their academic mentors. The topics offered in this UoS will be of interest to local and/or international research community in fields such as: Automotive engines. Computational fluid dynamics. Energy, environment and sustainability. Design of distribution packaging. Design optimisation. Environmental shocks and random vibrations. Finite element analysis. Heat transfer. Manufacturing and polymer technologies. Modal analysis. Modelling and computer simulation. Signal analysis.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an established knowledge in a specialist aspect of a mechanical engineering discipline under the academic mentorship; 2. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; and 3. Produce technical reports and participate effectively in discussions and debates.

Class Contact: Lecture 2.0 hrsPC Lab 2.0 hrs

Required Reading: Journal and conference papers related to the literature review of projects.

Assessment: Report, Written report in Scientific Conference Paper format, 100%.

VAM4112 Advanced Mechanics 2

Locations: Footscray Park.

Prerequisites: COMPLETION OF ALL 3RD YEAR SUBJECTS

Description: Students will select one project from a list of advanced topics aligned with the engineering and research expertise of academic staff and learn in the PBL mode under advice of their academic mentors. The topics offered in this UoS will be of interest to local and/or international research community in fields such as: Automotive engines. Computational fluid dynamics. Energy, environment and sustainability. Design of distribution packaging. Design optimisation. Environmental shocks and random vibrations. Finite element analysis. Heat transfer. Manufacturing and polymer technologies. Modal analysis. Modelling and computer simulation. Signal analysis. Topic selection must differ from the selection made for Advanced Mechanics 1.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an established knowledge of a specialist aspect of a mechanical engineering discipline under the academic mentorship; 2. Work effectively as a member and/or leader of a team, and to time manage multiple tasks; 3. Produce technical reports and participate effectively in discussions and debates.

Class Contact: Lab 2.0 hrsLecture 2.0 hrs

Required Reading: Journal and conference papers related to the literature review of projects.

Assessment: Report, Written report in the format of a scientific conference paper, 100%.

VAM4121 Finite Element Analysis

Locations: Footscray Park.
Prerequisites: Nil.
Description: Finite element analysis is a numerical technique that was originally developed to find solutions related to the mechanics of solids. Today, it is widely used by engineers to predict the behaviour of a broad range of systems including structural components, fluid mechanics, heat transfer and electromagnetism. The unit will introduce students to the finite element method and use a commercial software application to allow students to create their own Finite Element Model and compute solutions. Topics to be studied will include: node-element generation, solid modelling, top-down and bottom up approach, Static stress analysis, solution convergence and stability, linear modal analysis, non-linear transient analysis, harmonic analysis, random vibration analysis, parametric design and optimisation.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Describe the fundamentals of Finite Element Method; 2. Model and solve static, dynamic and non-linear problems of Mechanical Engineering by Finite element; and 3. Apply Finite Element Method to advanced problems of design and optimisation and problems in other areas of Mechanical Engineering.
Class Contact: Lecture 2.0 hrs PC Lab 2.0 hrs
Required Reading: Notes to be provided by the Lecturer.
Assessment: Assignment, Assignment 1, 10%. Assignment, Assignment 2, 15%. Assignment, Assignments 3, 4 and 5, 75%.

VES2201 Design & Ergonomics

Locations: Footscray Park.
Prerequisites: NEF1204 - Introduction to Engineering Design NEM2102 - Introduction to Engineering Materials
Description: This unit is based on an engineering project to introduce students to the design of human based systems. It emphasizes the engineering design phases, from requirements analysis to prototype. Topics on mechanical design elements e.g. gears, belts, fasteners, bolts, will be covered with the major project as an application. Design uncertainties and reliability, load design calculations, anthropometry, human factors and ergonomic design will be covered for each mechanical element. Use of relevant design software such as computer-aided design and solid modelling will be introduced.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate an understanding of the concepts for static and dynamic actions; 2. Apply concepts in the determination of design loads to an introductory level; 3. Show ability within the context of the subject areas, to formulate and solve basic design problems; 4. Critically evaluate the sensibility of design outcomes; 5. Show a basic understanding of ergonomic design; 6. Present design outcomes both written and orally in a professional manner; 7. Demonstrate the ability to work both autonomously and as a member of a design team;
Class Contact: Lab 2.0 hrs Lecture 2.0 hrs
Required Reading: Reading material will be negotiated in consultation with the supervisor and will be appropriate to the topic under investigation.
Assessment: Presentation, Oral and project demonstration, 20%. Report, Two (2) Reports (1 individual report and 1 group report at 3000 words maximum each), 40%. Examination, Final Exam (3 hours), 40%.

VES3121 Sports Materials

Locations: Footscray Park.
Prerequisites: Nil.
Description: This unit is designed to give students a sound knowledge of various types of materials for use in sports engineering applications. Students will study the fundamentals of materials science (atomic structure and bonding). Material classes and their characteristics metals, polymers ceramics and biomaterials (including timber and human tissue). Engineering properties of materials (strength, elasticity, plasticity, hardness, toughness, dynamic cushioning and damping and thermal and electrical properties). Material selection and performance. Introduction to composite materials and their application. Students will undertake a series of informative laboratory and field experiments to assist in their understanding of the properties and behaviour of various engineering materials commonly used in sporting applications.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate a sound understanding of various engineering material types and their application to sports; 2. Predict the behaviour of materials under various sport loads such as static loads, impacts and collisions, and climatic fluctuations; 3. Undertake effective and practical material selection for the design of sports materials that enhance the performance of athletes; 4. Identify and select suitable materials that afford protection against injury, while optimising freedom of movement and comfort; and 5. Demonstrate the ability to justify their decisions on material selection.
Class Contact: Lecture 2.0 hrs Tutorial 2.0 hrs Sixty (60) hours for one semester comprising team workshops, including supporting lectures and labs.
Required Reading: Callister, W D Jr., (2004) Materials science and engineering - an introduction John Wiley and Sons Inc.
Assessment: Assignment, Team based assignments (three at 2000 words equivalent each), 30%. Portfolio, Individual portfolio, 30%. Examination, Final exam (three hours), 40%.

VES3131 Computer Aided Engineering Design

Locations: Footscray Park.
Prerequisites: VES2201 - Design & Ergonomics
Description: This unit is based on design tasks that address specific aspects of computer-aided mechanical design: 1. The modelling of solids. This will involve the generation of three-dimensional drawings using a suitable solids modelling software tools. The computer files will be used to compute various 3D properties of the design such as volume, centre of gravity, radius of gyration etc. 2. The estimation of stresses and deflections using finite element modelling and analysis. Students will analyse the engineering performance of their design using suitable Finite Element Analysis software tools. This will be supported by the fundamental theory of finite element analysis with respect to computing stresses and deflections. 3. Computer-aided kinematic and kinetic analysis of rigid-body systems and mechanisms using suitable software tools. Students will generate solutions for a variety of systems and mechanism.
Credit Points: 12
Learning Outcomes: On successful completion of this unit, students will be able to: 1. Demonstrate sound knowledge of computer-aided engineering tools in design; 2. Predict and evaluate the mechanical performance of their design using a range of computer-aided engineering tools to compute geometric characteristics, stress and deflection properties and kinetic and kinematic performance for rigid body systems; 3. Show the ability within the context of the subject areas, to formulate and solve basic design problems; 4. Critically evaluate the sensibility of design outcomes; 5. Present design outcomes both written and orally in a professional manner; 6. Demonstrate the ability to work both autonomously and as a member of a design

team; and

Class Contact: Lecture 2.0 hrs Tutorial 3.0 hrs

Required Reading: Benny Raphael and Ian F C Smith., (2003) Fundamentals of computer-aided engineering, Wiley.

Assessment: Presentation, Oral presentation, 10%. Portfolio, Design assessments, 35%. Report, Final Report, 40%. Examination, Practical Exam, 15%.

VES3212 Sports Engineering Project

Locations: Footscray Park.

Prerequisites: VES3131 - Computer Aided Engineering Design

Description: This unit is designed to consolidate engineering research, investigation or design experience by requiring each student to undertake an individual engineering project (Capstone), selected from a list of projects offered or proposed by the student and approved by an academic. Projects are sourced from industry and academia. Each student is supervised by a staff member with expertise in the area of the project. Oral presentation skill, and report writing are further developed from the previous years. The project must include a strong engineering theme relevant to sports engineering which may cover the broad spectrum of the topics studied in this course. Industry projects must be assessed by the subject coordinator and have an academic and industry supervisor.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Conduct research on a specific project topic using all available resources including books, internet journals, etc.; 2. Solve problems in a scientific manner and select the necessary components; and 3. Plan and manage a project using project management facilities such as Microsoft project manager.

Class Contact: Lab 3.0 hrs Lecture 1.0 hr Sixty (60) hours for one semester comprising student projects. Students will undertake projects while managing their own time under academic supervision.

Required Reading: The Lecturer will advise students which of the below texts are required and/or recommended in consultation with the student and their proposed project. Mukhopadhyay, (2008) Smart sensors and sensing technology Springer. Barlett, (2007) Introduction to sports biomechanics/analyzing human movement patterns 2 Routledge. Webster, (1999) The measurement, instrumentation and sensors handbook, Boca Raton CRC Press.

Assessment: Presentation, Weekly Progress presentation, 20%. Report, Final Report (1,500 words equivalent), 50%. Project, Evaluation of quality of project product or outcome, 30%.

VQB5611 Risk Assessment and Human Behaviour

Locations: Werribee, City Flinders.

Prerequisites: Nil.

Description: The unit introduces students to basic fire safety engineering design concepts and provides students with the necessary knowledge concerning occupant communication and response submodels and subsystems as a basis for assessing the necessary input data for a risk assessment model. An introduction to Building Code of Australia (BCA) and Fire Engineering Guidelines is provided. Important aspects of human behaviour during fire will also be introduced. Many assumptions generally held about the way humans respond to fire emergencies have been shaped by the media and provide a sensationalised view. In this unit, we will seek to clarify this view by presenting research to uncover what can truly be expected from people when a fire occurs. Statistics from coronial data will also be examined to provide an overview of who is at most risk when a fire starts. The focus will be on urban and residential structure fires, but human behaviour during bushfires will also be discussed. Other areas covered in this unit are: Fire statistics and statistical analysis of occurrence, death and injuries; Introduction to risk management including probability, reliability, fault trees, event trees. The initiation and development of fires, fire characterisation and design fires.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Contextualise basic concepts and alternative acceptable frameworks for performance-based codes, with an emphasis to fire safety engineering design; 2. Utilise basic concepts of risk management and probabilistic risk assessment; 3. Develop simple fault tree and event tree; 4. Interpret and analyse fire statistical data of various sorts; 5. Evaluate the occupant communication and response in relation to fire cues; and 6. Interpret physiological and psychological effects of fire, and construct tenability criteria for the life safety.

Class Contact: Over a one week period, there will be twenty-eight (28) hours of face-to-face learning. Students are also expected to complete an equivalent amount of structured self-directed studies.

Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material. Australian Building Codes Board, 2011, 2011 edn, Building code of Australia, Australian Building Codes Board. Australian Building Codes Board, 2005, 2005 edn, International fire engineering guidelines, Australian Building Codes Board. International fire engineering guidelines (2005) is the most recent edition.

Assessment: Assignment, Assignment 1 (1300 words), 25%. Report, Report (2500 words), 50%. Assignment, Assignment 2 (1300 words), 25%. There will be a Report and 2 Assignments and the content of this unit will be a part of the examination that will be conducted as part of VQB5642 assessment.

VQB5612 Scientific Principles for Fire Professionals

Locations: Werribee, City Flinders.

Prerequisites: Nil.

Description: The unit provides students with basic information on scientific principles for fire professionals such as combustion, products of combustion (heat and smoke), heat and mass transfer, response of structural elements to heat, visibility through smoke and smoke toxicity. The unit will cover basic chemical reactions and the fire triangle, ignition of solid and liquid fuels, combustion, fire plumes and fire behaviour of building contents and lining materials. The unit will also provide an introduction to pre and post flashover enclosure fires and mathematical modelling of enclosure fires (zone and field models).

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate an understanding of the basic chemical reactions and the fire triangle, with the ignition of solid and liquid fuels, combustion, and products of combustion (heat and smoke); 2. Evaluate fire properties of various materials and fire behaviour of building contents and lining materials; 3. Infer basic theories of heat transfer, fluid dynamics and fire dynamics; 4. Review visibility through smoke and smoke toxicity; 5. Infer basic concepts how structural elements are affected during fire; and 6. Review capabilities and limitations of a number of commonly used assessment tools.

Class Contact: Over a one week period, there will be twenty-four (24) hours of face-to-face learning and four (4) hours of laboratory demonstration. In addition students are expected to complete an additional twenty-four (24) hours of structured self-directed studies.

Required Reading: In addition to required texts, a very comprehensive set of course

notes will be available that cover most topics. These course notes will contain further references and reading material.Drysdale, D., (2011) 3rd ed. An introduction to fire dynamics John Wiley and Sons, London Holman, J.P., (2010) 10th ed. Heat transfer McGraw Hill Higher Education, Boston

Assessment: Assignment, Assignment 1 (1200 words), 20%. Assignment, Assignment 2 (3000 words), 60%. Assignment, Assignment 3 (1200 words), 20%. There will be three (3) Assignments and content of this unit will be a part of the examination that will be conducted as part of VQB5642 assessment.

VQB5641 Fire Safety Systems Design

Locations: Werribee, City Flinders.

Prerequisites: VQB5612 - Scientific Principles for Fire Professionals

Description: The unit provides students with an understanding of fire safety systems design principles and interaction between various submodels as described in fire engineering guidelines. It covers developing fire scenarios and design fires based on ignition probability, availability and effectiveness of suppression system and compartmentation and structural adequacy. It also covers basics of spread of smoke and fire in buildings, buoyancy of smoke, principles of smoke hazard management, structural performance in fire, detection and extinguishment and principles of evacuation. The unit will include an application of the Fire Brigade Intervention Model (FBIM) to fire situations, and emphasizes knowledge about the capabilities of fire brigade equipment including trucks, water pumps, scaffolding, and hoses. Students will be given hands-on-experience of operating the equipment during a field visit to the Metropolitan Fire and Emergency Services Board.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Review the interaction between various submodels described in the Fire Engineering Guidelines; 2. Infer the underlying basic physics of some assessment tools and when to refer designs to a more appropriately qualified assessor; 3. Evaluate various fire safety system options and analyse how these systems affect building fire safety; 4. Appraise the role and capabilities of fire brigade; and 5. Explain the importance of occupational health and safety issues related to fire fighting and rescue operation.

Class Contact: Over a one week period, there will be 22 hours of face-to-face learning. Students are also expected to complete an additional 22 hours of structured self directed studies. In addition, there will be a field visit.

Required Reading: In addition, a very comprehensive set of course notes will be available that cover most topics. These notes will contain further references and reading material.Australian Building Codes Board (2017) Building Code of Australia Australian Building Codes Board. Australian Building Codes Board (2005) International fire engineering guidelines Australian Building Codes Board. Drysdale, D., (2011) 3rd ed. An introduction to fire dynamics John Wiley and Sons, London. Australian Fire and Emergency Services Authorities Council Fire brigade intervention education (CD Version) Australian Fire and Emergency Services Authorities Council.

Assessment: Assignment, Assignment 1 (1500 words), 30%. Assignment, Assignment 2 (2200 words), 45%. Assignment, Assignment 3 (1300 words) (LiWC), 25%. There will be three (3) assignments and content of this unit will be a part of the examination that will be conducted as part of the assessment component in Performance Codes Methodology and Structure unit.

VQB5642 Performance Codes Methodology and Structure

Locations: Werribee, City Flinders.

Prerequisites: Nil.

Description: The unit introduces the student to the principles, methodology and scope of performance based building codes in light of Building Code of Australia, Australian Standards and State legislation (technical and administrative framework) and provides the student with an understanding of the structure of performance design and approval. The unit will also cover estimation of acceptance criteria based on performance requirements, introduction to quantitative risk assessment and expected risk to life (ERL) and fire cost expectation (FCE). The unit introduces to legal issues, documentation, joint and several kinds of tortfeasor liability. An introduction to Bushfire Regulations will also be covered in addition to thorough life performance and maintenance of fire safety equipment; quality assurance and the building permit/inspection process. In this unit students will have the opportunity to critically analyse a fire engineering report in reference to the above codes.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Explain the principles, methodology and scope of performance-based building codes; 2. Execute the approval process in relation to the structure of performance design; 3. Interpret the legal, statutory and design integrity requirements; 4. Critically assess a performance-based fire safety solution document and/or recognise when to refer designs onto a more appropriately qualified assessor; 5. Review the need for a compliance of the design assumptions throughout the operational life of the building.

Class Contact: Over a one week period, there will be twenty-eight (28) hours of face-to-face learning and students are expected to complete an equivalent amount of structured self-directed studies.

Required Reading: In addition to the texts below, a very comprehensive set of course notes will be available for most topics. These course notes will contain further references and reading material.Australian Building Codes Board (2017) Building code of Australia Australian Building Codes Board. Australian Building Codes Board (2005) International fire engineering guidelines Australian Building Codes Board. Drysdale, D., (2011) 3rd ed. An introduction to fire dynamics John Wiley and Sons, London.

Assessment: Assignment, Assignment 1 (800 words), 15%. Assignment, Assignment 2 (1600 words), 35%. Examination, Final Written Examination (3 hours) (Hurdle requirement), 50%. The written examination will cover contents from the following units: Risk Assessment and Human Behaviour, Scientific Principles for Fire Professionals and Fire Safety Systems Design. The examination is an open book test where the students will critically analyse a fire engineering design brief or report. To pass this unit a student must achieve a cumulative pass for the 2 Assignments and obtain a pass in the examination.

VQB5751 Fire Technology Modelling

Locations: Werribee, City Flinders.

Prerequisites: VQB5612 - Scientific Principles for Fire ProfessionalsVQB5641 - Fire Safety Systems Design

Description: The unit provides students with an understanding on the details of combustion process, flame characteristics, fire behaviour of materials, fire retardants and various test methods. It also covers, modelling of decomposition and combustion of fuels in various forms and associated heat transfer mechanisms during pre and post flashover stages. Details of two-zone models and computational fluid dynamics models (including underlying physics and numerical scheme); and model validation are an integral part of this unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate an advanced understanding of chemical decomposition, with the pyrolysis of solid and evaporation of liquid fuels, combustion, and modelling of these

reactions; 2. Articulate fire properties of various materials, fire behaviour of building contents, lining materials and fire retardant products, and various test methods; 3. Substantiate advanced heat transfer, fluid dynamics and fire dynamics theories; and 4. Evaluate a number of commonly used assessment tools for fire and smoke growth and propagation.

Class Contact: There will be one (1) week long session for this unit. Within this week the following will be conducted: Thirty (30) hours of Lectures (Fifteen (15) lectures of two (2) hours each, in a designated week) Two (2) hour Laboratory demonstration (two (2) hour session in the above week) Students are also expected to complete an equivalent amount of structured self-directed studies.

Required Reading: 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: Assignment, Assignment 1 (1500 words), 30%. Assignment, Assignment 2 (1500 words), 30%. Assignment, Assignment 3 (1000 words), 20%. Report, Report (1000 words), 20%.

VQB5761 Fire Safety Systems Modelling

Locations: Werribee, City Flinders.

Prerequisites: VQB5612 - Scientific Principles for Fire ProfessionalsVQB5641 - Fire Safety Systems Design

Description: The unit provides students with an understanding on the details of development of design fires with their likelihood of occurrence and modelling of active and passive building fire safety subsystems as well as the evacuation time. This will include detection and sprinkler operation predictions; suppression models and modelling of structure failure in various design fires. Smoke and flame spread and their management options, performance based detection and suppression system design and a fire brigade intervention model are also covered in the unit.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Develop possible fire scenarios and associated design fire with likelihood of occurrence; 2. Evaluate smoke hazards and appropriately use fire safety system options to reduce the risks; 3. Model active and passive fire safety systems, their interaction among themselves and with fire; 4. Model occupant evacuation during an emergency; and 5. Implement fire brigade intervention model.

Class Contact: There will be one (1) week long session for this unit. Within this week, thirty (30) of hours lectures consisting of fifteen (15) lectures of two (2) hours each) will be delivered. Students are also expected to complete an equivalent amount of structured self-directed studies.

Required Reading: 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: Report, Report (1500 words), 30%. Assignment, Assignment 1 (1300 words), 25%. Assignment, Assignment 2 (1000 words), 20%. Assignment, Assignment 3 (1300 words), 25%.

VQB5771 Fire Safety Engineering Application

Locations: Werribee, City Flinders.

Prerequisites: VQB5611 - Risk Assessment and Human BehaviourVQB5642 - Performance Codes Methodology and StructureVQB5751 - Fire Technology ModellingVQB5761 - Fire Safety Systems Modelling

Description: This 24 credit point unit serves as a capstone unit in which students will have the opportunity to integrate technical knowledge and skills from previous units and apply them in realistic work-related settings. The first part of this unit provides students with an understanding on the details of various approaches used for the analysis, design and management of fire safety systems in buildings, with particular emphasis placed on an absolute quantitative approach. This approach uses a probabilistic risk assessment methodology based on historical data to assess the expected risk to life (ERL), safety and the expected costs (and their benefits) to develop a performance based building design. The students will be introduced to fire investigation processes and project management techniques. In the second part of the unit Students will work in project teams to design and develop a Fire Safety System for a building project in the student's own workplace or that of a fellow student. In this project students will be required to employ quantitative and qualitative assessment techniques, performance based building designs, and demonstrate compliance with BCA standards. They will need to factor in fire insurance implications and general environmental, social and economic impacts. This approach of 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. Work independently to conduct probabilistic risk assessment of a real or simulated system; 2. As a member of a project team identify and analyse the BCA performance requirements and fire safety issues of a building and develop approaches to address them and formally present to peers and industry representatives; 3. As a member of a project team develop a framework for a fire engineering assessment including: trial concept design, methods of assessment/analysis, acceptance criteria, hazards, and occupant and building characteristics, taking into consideration environmental, social and economic impacts calling on national and international best practices and present in a formal report; 4. As a member of a project team undertake a quantitative and /or qualitative analysis of a range of real world concept designs, select the best with an accompanying rationale that complies with the BCA Performance Requirements and develop a strategy for implementation and present in a formal report and/or a poster; and 5. Reflect upon and evaluate own performance as an individual learner as well as a project team member in the context of own continuing professional development strategy and career goals.

Class Contact: There will be two (2) week long sessions for this unit. Within these two (2) weeks, twenty (20) hours of lectures (consisting of ten (10) lectures of two (2) hours each) will be delivered. Another forty (40) hours will be used for formative and summative presentations, tutorials and consultations. Students are also expected to complete an equivalent amount of structured self-directed studies.

Required Reading: In addition to required texts, a very comprehensive set of course notes will be available that cover most topics. These course notes will contain further references and reading material.Australian Building Codes Board (2011) 2016 Ed. Building Code of Australia Australian Building Codes Board Australian Building Codes Board (2005) 2005 Ed. International Fire Engineering Guidelines Australian Building Codes Board Hurley M.(ed) (2016) 5th Ed. SFPE Handbook of Fire Protection Engineering National Fire Protection Association

Assessment: Assignment, Assignment word Limit 1,000 words (individual work), 10%. Presentation, Summative Presentation 1 - 15 minutes (teamwork), 5%.

Report, Report 1 (Preliminary) - 3,000 words (teamwork), 10%. Report, Report 2 (Fire Engineering Brief)- 7,500 words (teamwork), 25%. Presentation, Summative Presentation 2 (Fire Engineering Brief) - 30 minutes (teamwork), 10%. Report, Report 3 (Fire Engineering Report) - 12,000 words (teamwork), 40%. Summative presentations will be given to the rest of the class and where possible to the industry representatives. This will assist the students to learn from each other and engage with industry through questions and answers.

VQB5773 Industrial Experience On Fire Safety

Locations: Werribee.

Prerequisites: Nil.

Description: This unit of study will serve as an industrial experience unit for the course in which students will undertake a substantial LiWC (Learning in Workplace and Community) experience for their employer or selected organization. Students will be asked to take part in a project agreed to by their workplace supervisor and Victoria University (VU) coordinator. The project will provide students with the opportunity to gain experience of a real world situation and where possible apply their academic learning (the key principles covered in the course) to those situations.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. As a member of a project team identify and analyse the performance requirements given in their national building code and fire safety issues related to a building and develop approaches to address them; 2. Gain experience of a real world situation; 3. Relate the key principles covered in the course to a building project; and 4. Reflect upon technical skills that they have developed throughout the industrial experience and what they aspire to develop in the rest of the course.

Class Contact: Aggregate at least six (6) weeks (consisting of thirty-five (35) hours per week) i.e. a total of two hundred and ten (210) hours of industrial experience is required.

Required Reading: Australian Building Codes Board, 2005 2005 Edition International Fire Engineering Guidelines Australian Building Codes Board

Assessment: Report, Report (8000 words), 80%. Report, Reflection (2000 words), 20%. The report will be independently assessed by the workplace supervisor and VU coordinator. The reflection report will be assessed by the VU coordinator.

VQB5781 Mathematics for Fire Safety Engineers

Locations: Werribee.

Prerequisites: VQB5612 - Scientific Principles for Fire Professionals

Description: Sound knowledge of mathematics is required for understanding the techniques and tools of analysis of fire safety designs. Core topics of this unit will include integration/ differentiation, vectors, matrices, linear equation, 1st and 2nd order linear differential equations and Taylor's series. Other topics will be chosen from numerical methods, vector calculus and partial differential equation.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Apply calculus method to problems in risk engineering; 2. Use matrices to solve simultaneous linear equations; 3. Apply first order and second order ordinary differential equations to problems in fire safety; 4. Perform numerical integration and differentiation in the applied context; and 5. Perform numerical methods of differential equations representing engineering systems.

Class Contact: This unit will be conducted on-line over the summer semester (12 weeks). There will be three (3) hours per week on-line lectures over the twelve (12) weeks period. Students are also expected to complete an equivalent amount of structured self directed studies.

Required Reading: Kreyszig, E., 2010. 10th Edn, Advanced Engineering Mathematics John Willey & Sons, NY. Thomas, G. B., Weir, M. D., Hass, J. and Giordano, F. R., 2009. 12th Edn. Thomas' Calculus Addison-Wesley. DuChateau, P. and Zachmann, D. W., 2011. Schaum's Outline of Partial Differential Equations McGraw-Hill.

Assessment: Assignment, Assignment 1 (1500 words), 25%. Assignment, Assignment 2 (1500 words), 25%. Assignment, Assignment 3 (3000 words), 50%. Assignment 1 covers Learning Outcome 1 & 2 and Graduate Capabilities 1 & 2 Assignment 2 covers Learning Outcomes 3 & 4 and Graduate Capabilities 1 & 2 Assignment 3 covers Learning Outcomes 3, 4 & 5 and all three Graduate Capabilities. .

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

Locations: Werribee.

Prerequisites: VQB5612 - Scientific Principles for Fire Professionals

Description: The unit provides students with a general understanding of fundamental and applied fluid dynamics, thermodynamics, combustion and mechanics of solids. Special emphasis is given to characterisation of fire dynamics and elucidation of structural behaviour (both elastic and inelastic) during a fire.

Credit Points: 12

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Integrate a sound understanding of fluid mechanics, thermodynamics, combustion and solid mechanics theories; 2. Develop and construct mathematical, physical and conceptual models of situations, systems and devices; 3. Utilise the above models (learning outcome 2) for purposes of analysis and design and understand their applicability and shortcomings; and 4. Design experiments and identify appropriate measurements required.

Class Contact: This unit will be conducted on-line over the summer semester (12 weeks). There will be three (3) hours per week on-line lectures over the twelve (12) weeks period. Students are also expected to complete an equivalent amount of structured self directed studies.

Required Reading: Drysdale, D., 2010 3rd Edition, An Introduction to Fire Dynamics, John Wiley and Sons, London. Hibbler R.C., 2011 8th Edition, Structural Analysis, Pearson International. White, F. M., 2011 7th Edition, Fluid Mechanics, McGraw-Hill Series in Mechanical Engineering, New Jersey. Cengel, Y. A. and Boles, M. A., 2011 7th Edition, Thermodynamics- An Engineering Approach McGraw Hill, New York.

Assessment: Assignment, Assignment 1 (1500 words), 25%. Assignment, Assignment 2 (1500 words), 25%. Assignment, Assignment 3 (3000 words), 50%. Assignment 1 covers Learning Outcome 1 and Graduate Capabilities 1 & 2 Assignment 2 covers Learning Outcomes 1 and Graduate Capabilities 1 & 2 Assignment 3 covers Learning Outcomes 2, 3 & 4 and all three Graduate Capabilities .

VQT6061 Building Fire Research A

Locations: Werribee.

Prerequisites: Students are normally expected to have a four-years degree in engineering or a three-years degree in science plus two years relevant work experience or have completed the Graduate Certificate in Performance-Based Building and Fire Codes with a distinction average.

Description: This unit provides students with opportunities for training in some key methodologies and research strategies for building fire research projects. Students have the opportunity to develop a range of skills in conceptualising and problematising research, to develop an understanding of various research tools and ability to plan an original research related to building fire safety. The project will be an engineering and/or scientific investigation of an approved topic developed

through a detailed literature search and review of the literature on the approved topic area. Selection of appropriate research tools for the project, proposing various parameters to analyse and presenting the research proposal and methodology in an effective way are other key elements of this unit.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Clearly define a problem by undertaking a detailed literature search and review the literature on the topic/problem area; 2. Select appropriate research method and tools for a project; 3. Propose different ways of using/analysing data/ information for research; and 4. Produce a review explaining research question and methodology including literature review.

Class Contact: The equivalent of 72 hours comprising discussion, self-directed studies and research work.

Required Reading: Texts and peer-reviewed literature related to the chosen topic.

Assessment: Assessment will be on the basis of approval of the supervisor to proceed to VQT6062. Review, Literature review and research proposal (the total effective word length is 5000 words)., Yes/No. The review covers all learning outcomes and graduate capabilities.

VQT6062 Building Fire Research B

Locations: Werribee.

Prerequisites: VQT6061 - Building Fire Research A

Description: This unit provides students with the opportunity to carry out an original research project related to building fire safety which is developed in VQT6061. Students will be expected to apply the knowledge and skills gained from the coursework component of the EMQB degree to this research project. In this unit the students are expected to conduct of analytical/ numerical/ experimental research and critical analysis, interpretation and presentation of results. The student shall, where appropriate, demonstrate both the ability to develop and/or apply models to study the problem together with appropriate data selection, collection and analysis. Students will normally be supervised by an academic member of staff.

Credit Points: 24

Learning Outcomes: On successful completion of this unit, students will be able to: 1. Adopt sound research methodologies and apply appropriate research tools in the investigations of building fire safety problems; 2. Objectively and critically analyse and discuss the results obtained; and 3. Prepare a scientific research report in a format suitable for publication in a scientific journal.

Class Contact: The equivalent of 72 hours comprising discussion, self-directed studies and research work.

Required Reading: Texts and peer-reviewed literature related to the chosen topic.

Assessment: Assessment will be on the basis of examination of the research thesis. The thesis will be assessed by an examiner (other than the supervisor) with expertise in the area of the research. Thesis, Research Thesis (15,000-25,000 words), 100%. The Research Thesis covers all learning outcomes and graduate capabilities.