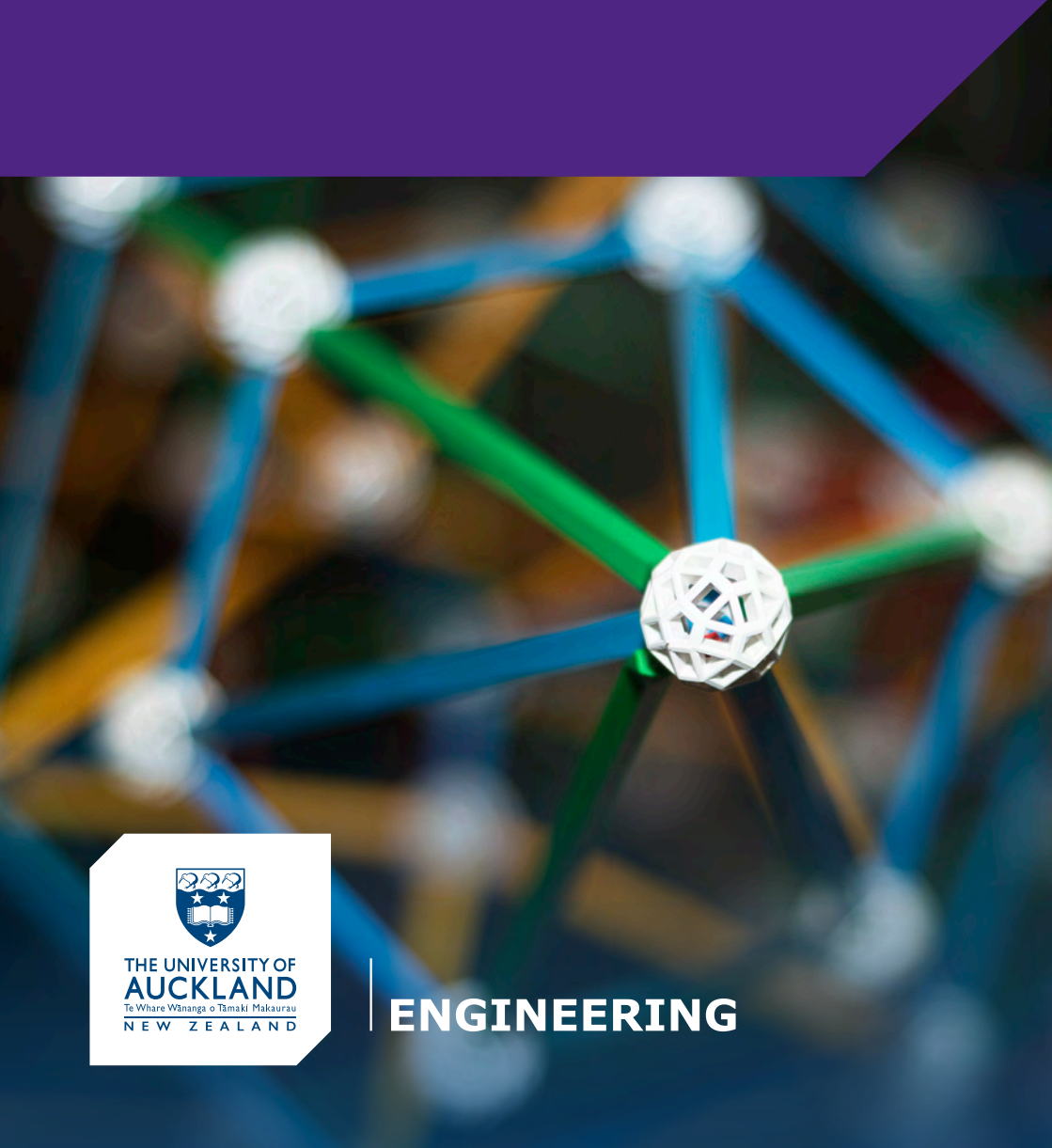
Faculty of Engineering

Undergraduate Handbook 2017



THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

ENGINEERING

Disclaimer

This publication intends to guide you through your time at the Faculty of Engineering. All information, including locations, hyperlinks and courses, are accurate at the time of print. Please regularly check **www.engineering.auckland.ac.nz** and our social media pages for any important updates.

All students at the University of Auckland are additionally advised to consult its official docume , the *University of Auckland Calendar*, to ensure that they are fully aware of, and can comply with all academic regulations, requirements and policies. This is available at **www.calendar.auckland.ac.nz.**

Contents

Essential links

Frequently used web portals

Faculty of Engineering pages

We regularly post important updates regarding academic matters and what's happening around campus on the web. This includes news, event listings and scholarship notices.

· Website: **www.engineering.auckland.ac.nz**

· Facebook: **www.facebook.com/uoaengineering**

· Twitter: **www.twitter.com/uoaengineering**

AskAuckland

www.askauckland.ac.nz
The University's AskAuckland web portal is your fi st point of contact for any questions. Search the pool of useful information, or email the team if your query isn't resolved.

MyAucklandUni

www.myaucklanduni.ac.nz
Designed for all enrolled University of Auckland students, this student portal shows all your essential information in one place. Features include a personalised calendar, alerts, and access to library and learning resources.

Canvas

canvas.auckland.ac.nz
The online-based learning platform utilised throughout University, allowing course coordinators to provide a single space for essential class updates, assignment deadlines, course information and more.

Getting here

Before you arrive

www.auckland.ac.nz/admission
Familiarise yourself with the 'before you arrive' page as soon as possible. This contains information on student cards, username and passwords, online Orientation, and campus tours.

Managing your enrolment

www.studentservices.auckland.ac.nz
Academic requirements, course advice and selection, concession issues, timetabling, and more. For in-person assistance, visit the Faculty of Engineering's Student Centre on Level 4, 20 Symonds Street.

Resources for students

For a more comprehensive list of support services, turn to the 'help and advice' chapter.

General information for engineering students

You may find useful lin s to essential services and academic information on our website.

· Undergraduates:
www.engineering.ac.nz/undergrad

· Postgraduates:
www.engineering.ac.nz/postgrads

Student life

www.auckland.ac.nz/life-at-auckland
The University's repository of resources, including maps, transportation, events, volunteering opportunities and more.

Support for engineering students

foe-engagement@auckland.ac.nz
Our student engagement team provides support – from academic to personal – and links you to services around campus.

Auckland University Students' Association

www.ausa.org.nz

The AUSA is student-run, and committed to representing and advocating for students at the University. Membership is free for all University students, and gives you access to a range of support services, as well as entry to social events.

iSPACE

www.auckland.ac.nz/iSPACE
A lounge at Level 4 of the Kate Edgar Student commons dedicated to student activities, including regular coffee s ssions. A free Justice of the Peace service is also provided on site for witnessing signatures and certifying documents.

Career development and employment services

www.cdes.auckland.ac.nz
CDES, located at the University's ClockTower, provides students with career and employment advice, opportunities, and help with CVs and interviews.

Academic resources and learning support

The University's Library and Learning Services offe s a range of resources to help students of all disciplines and levels.

· Study skills and workshops at the University:
www.library.auckland.ac.nz/study-skills

· Engineering subject guides:
www.library.auckland.ac.nz/guides/engineering

· English Language Enrichment (ELE):
www.library.auckland.ac.nz/ele

Postgraduate students can additionally find resources via CLeaR, the University's hub for higher education learning and research. CLeaR offe s development courses and workshops for research students, tutors and teaching assistants, and early career academics. Visit **www.clear.auckland.ac.nz**.

Health and counselling services

www.auckland.ac.nz/health
The University provides a range of services, including emergency healthcare and counselling sessions. Some of these services are free.
You may also call +64 9 923 7681 to make appointments. For a New Zealand-based mental health crisis line that provides 24/7 help, call 0800 800 717.

Contact numbers for personal safety and emergencies

- **University Security:** +64 9 373 7599 ext. 85000
- **Police emergency:** 111
- **Auckland Central Police Station:** + 64 9 302 6400
- **Non-emergency/injury traffic incident** 555

General information and facilities

Changes to class locations

The University is currently undergoing an ongoing building and facilities improvement programme. As a result, locations provided are subject to change.

MyAucklandUni student portal

MyAucklandUni gives you access to all important, and personalised information in one place, including your calendar, timetables, email notific tions, course updates, library information, financial info mation and personal details. Once enrolled, you can sign in with your username and password at **www.myaucklanduni.ac.nz.**

Timetables

Class timetables for the following year are usually available from mid-December on Student Services Online (**www.studentservices.auckland.ac.nz**) or in your Class Schedule on the University website. Room allocations, and occasionally class times may change before the start of semester and during the fi st two weeks of semester.

Building access

Newmarket Campus is open to students with access cards between 7am and 11pm seven days a week. All engineering students are allowed to enter the Central Engineering building (20 Symonds Street) between 7am and midnight seven days a week. These hours also apply to all study areas and computer labs. The following rules also apply:

- The main doors to the building will be open between 7.30am-6.30pm.
- You will need your access card to enter and exit the building between 7-7.30am and 6.30pm-midnight. During these times, you may only enter and exit the building via door 401.3.00L1/1 (Level 3 leading in from the underpass).
- You are required to start packing up their belongings and vacate the building by 11:45pm, as doors will lock at midnight. Security will ensure that the buildings are clear of occupants.
- Access cards will not open any internal or external doors after midnight. If you are in the building at this time, you must call Security. A guard will establish why you are still in the building, take your ID number, and report you to the Faculty. This could result in your after-hours access being suspended.

Access to the labs is based on your specialisation and year of study. You are required to have permission from lab managers to gain access. Always carry your valid access card and ID card with you. Do not lend your access card to anyone – this is considered as a breach of the University Security Policy and may result in immediate deactivation of your card until further notice.

Access cards

You can get an access card at the Information Hub on level 5. Your fi st card is free and you should keep it as long as you are enrolled as a student in the Faculty of Engineering. You need to return it when you complete your degree.

You must activate the card by completing the online application form on the Engineering website under 'Quick Links'. It may take around fi e business days before the card is activated. Your card must be renewed at the beginning of every year. To renew it, follow the same process as your initial application.

Access cards are not transferable under any circumstances. Please report loss or theft to the Security Office on xtension 85000. You will need to buy a replacement card at a cost of $25 once you have reported the loss. This is not a deposit and there are no refunds.

Libraries and Learning Services

Libraries and Learning Services helps to meet the research, teaching and learning needs of the University. The resources cover all aspects of engineering, including Chemical and Materials Engineering, Civil and Environmental Engineering, Electrical and Electronic Engineering,

Engineering Science, Mechanical Engineering, and Bioengineering.

- Use your University ID card to borrow books. Find out more about your library account, borrowing, requesting and recalling books at **www.library.auckland.ac.nz/borrowing.**
- Log in anywhere, at any time with your username and password to search the catalogue or databases to access journal articles, e-books, patents and standards at **www.library.auckland.ac.nz.**
- Access subject guides for suggestions on where to start your research via **www.library.auckland.ac.nz/guides/engineering.**
- Contact an Engineering Subject Librarian for advice on identifying relevant information resources, improving search strategies and managing references via **www.library.auckland.ac.nz/contacts/subject-librarian.**
- Improve your academic and study skills by browsing the online resources at **www.library.auckland.ac.nz/study-skills** or attending a workshop listed on **www.library.auckland.ac.nz/workshops.**

Computing and I.T.

Computer labs

There are a number of general computing labs available for use by engineering students:

- Four teaching labs (401-307, 401-311, 401-312 and 439.G08) available to students when classes are not running
- Student drop-in work area (401-301)
- PC work area (301.1062)

Please do not unplug any of the devices in the labs for any reason. There are usually spare power outlets available for powering any personal devices. Please also remember that the University's computing facilities are provided exclusively for educational and study purposes.

Opening hours

Student drop-in work areas are open 8am-7pm on Monday to Friday during semesters (except public holidays) and 8am-5pm at other times.

- Teaching labs may not be available outside 8.30am-5pm Monday to Friday
- Card access is required after-hours for all lab areas, and permanently for some
- Teaching labs are unavailable for general student use when classes are scheduled

Internet

All students with authentication to the University network have free and unlimited intranet and internet access. There is broad wireless coverage in all areas of the faculty, providing network connectivity for laptop and other mobile users. This includes the main lecture theatres, atrium, cafe, Leech study area and the Engineering library.

Saving documents to the network

All students are allocated an amount of individual network disk space for the storage of coursework-related material and software confi uration fi es. This is referred to as the H drive (or Home Directory) and is backed up regularly. We recommend that you save documents to your H drive rather than a USB flash-memory s orage device, as these can be unreliable. We also recommend that you make a backup of your H drive at the end of each year. Other network-based storage areas, including Google Apps for Education's Google Drive, are also provided as shared spaces to allow use of shared work and materials.

Printing, copying and scanning

Printing is provided through the University's Copy and Print Service (CAPS). You will be given CAPS annual credit to photocopy or print on any CAPS printers in the faculty, University libraries or Information Commons. If you exceed your printing entitlements, can buy extra credit from the Information Commons Helpdesk or terminals in the library. Scanning is free and available if you have a positive CAPS balance. Your free printing entitlements are:

- Undergraduate (BE/BE(Hons)): 30 pages per course/year
- ME (Studies): 100 pages per studies course/year
- ME (Thesis): 750 pages per thesis paper/year
- PhD: 1,500 pages per year

University IT Policy

To use any University IT equipment, you must comply with current University IT Policy. Any policy breach, for example, for copyright infringement, exposes both you and the University to a serious risk of legal action. It also presents a serious IT/IP security threat to you and the University. Those involved may face disciplinary action for the inappropriate use of University computer resources in breach of our statutory obligations and our policies. You can further details and other IT best-practice information in the 'safe computing' section of **www.engineering.auckland.ac.nz/engineering-IT.**

Further information and IT help

In the fi st instance, please refer to the faculty's IT information at **www.engineering.auckland.ac.nz/engineering-IT.** If you cannot find the a swer you're looking for and need help, visit the IC Helpdesk in the Information Commons or email **ichelpdesk@auckland.ac.nz.**

Laboratories

Students may only use the laboratories where they have been given specific uthority to work by their supervisor. No other student may use the laboratories, except when carrying out any laboratory programme for which the student is enrolled.

Chemical and Materials Engineering students will need to wear a protective laboratory coat (boiler suit/overall or similar protective clothing are also acceptable) for all their laboratory classes.

Because there are safety hazards and valuable equipment in the laboratories, there are rules around their use:

1 If you are alone in a laboratory, you should only carry out non-hazardous work you are familiar with. Hazardous operations include (but are not limited to):
   - Handling or mixing chemicals
   - Wiring up electrical equipment
   - Using machine tools other than battery powered ones
   - Using equipment designated by the technicians in charge of the laboratory as hazardous
   - Using welding or oxy-acetylene equipment

2 When leaving the laboratory, students and staff a e responsible for making sure that all equipment and services are in a safe condition. This means, for example, turning off a y electricity, gas and water that have been used.

Health and safety

Please read the following health and safety information carefully. This is intended for all students within the Faculty of Engineering. It is not a complete guide to safety matters but details basic safety practices and procedures that need to be followed to ensure the health and safety of everyone within the faculty.

The University's health and safety policy and the faculty's safety information are available at **www.engineering.auckland.ac.nz/safety.**

Essential safety personnel

Your fi st point of contact is your academic leader, lecturer, tutor or supervisor. If they cannot address your concerns, you may contact the Faculty's Health, Safety and Wellbeing Manager, Robert Powell at **r.powell@auckland.ac.nz.**

Your responsibilities

The University is committed to providing a safe and healthy environment for you to work and study in. As a student, you have the following responsibilities:

- Look after yourself and others
- Stop activities that are dangerous to you and others
- Follow health and safety instructions. If you are unsure or in doubt of what to do, you must seek help from your lecturer, tutor or supervisor
- Speak to your lecturer, tutor or supervisor as soon as possible about any personal health and safety concerns
- Report all accidents, ill health, near misses and building/equipment damage
- Complete any required health and safety training
- Where required, wear personal protective clothing, personal protective equipment, and use provided safety equipment
- Familiarise yourself with the procedures for working alone
- Do not interfere with health and safety equipment, devices or signage

Please note that it is a *condition of your enrolment* to cooperate with the University in regards to health and safety. Failure or refusal to carry out your responsibilities may have consequences for your further study.

Risk Assessments

As you advance in your studies and in your future engineering career, you will be required to participate in the risk assessment process. You will initially be obliged just to follow risk assessments, but will later be required to write them. Risk assessment training and guidance will be provided to you as the need arises.

Right of refusal to participate in dangerous activities

Some activities performed by the faculty will possess a high health and safety risk if they are not properly managed. In the vast majority of cases, risks will be identified and app opriately controlled to an acceptable level and you will be informed of what you need to do to remain safe before you start any activity.

You have the right to not proceed with any activity if you feel, on reasonable and objective grounds, that it poses a danger to yourself or others. You must then immediately raise your concerns with your academic leader or the health and safety manager so that we can address the issues before any activity begins.

Faculty safety rules

In order to manage risks, we need to limit your access to equipment, labs and workshops until you have been provided with information about the possible hazards you may encounter, and the safe methods of work you must follow.

The following rules apply to all students:

1 If you create a risk, you own the risk. If your research or work could potentially cause harm or damage, you must work with your

supervisor or academic leader to reduce risk as far as it is reasonably practicable before you start.

2 You must not enter a laboratory, workshop or storeroom unless given specific uthorisation, or are escorted by an authorised person. In either case, you should seek advice on any hazards you may encounter before you enter. **Note:** Having access card or a key *does not* mean you are authorised to access a facility.

3 Where access to a facility is restricted, such as by access card or lock, you are not authorised to allow entry to anyone who do not have access to that facility. This means that you are not allowed to unlock a facility for someone else.

4 You must not attempt to operate any equipment or apparatus unless you have been shown how to use it safely. In some cases, you must be specifical y authorised to use complex equipment such as fi ed machinery, lasers and height access equipment. You must also comply with any displayed Safe Work Instructions.

5 You must not attempt to modify or repair any equipment or apparatus. If you find dama e or if there is a malfunction, immediately inform your supervisor or academic leader.

6 When working, keep your work area clean and tidy, and make sure your bags and personal gear do not cause trip hazards.

7 When you have finished for the d y, make sure all tools and equipment are returned to their proper storage, the area is tidy, and equipment is properly shut down. Wash your hands if you need to.

8 You must not eat or drink while you are in workshops and laboratories.

9 You must wear suitable clothing and enclosed footwear in laboratories and workshops. Other personal protective equipment such as safety glasses or hearing protection may also be required. Staff will ask ou to leave the area if your clothing does not provide the protection required, such as if your trousers have the knees torn out, or your shoes do not cover the top of your feet.

Smoking is prohibited in all Faculty of Engineering campuses, outdoor spaces and buildings, in accordance with the University's smoke-free policy.

Inductions

Areas such as lecture theatres and many teaching spaces are considered low risk, and you may only need a quick brief to know where the emergency exits and toilets are.

Staff will in uct you into labs or workshops where there are increased risks. Before starting work in these areas, you should be able to answer the following questions:

- Who are my academic leaders or supervisors?
- How do I get out of the building in the event of an evacuation?
- What are the likely emergencies I will encounter and what will I need to do?
- Where is the nearest fi e alarm, fi st aid kit and defib illator?
- Where are the isolation controls/emergency shut-off p ocedures for the equipment I am going to use?
- Do I need specific t aining to use items, equipment or machinery?
- What protective or safety equipment do I need to use to do my work safely?
- What other work is being performed nearby? Will it interfere with my work? Will my work affect othe s?
- Am I allowed to perform low risk work alone, or do I need a supervisor while I am working?
- Can I do my work after normal working hours, or do I need to leave when the staff o home?

If you can't answer these questions, please see your academic leader or supervisor.

What to do if you have an accident or incident

All accidents and incidents must be reported to your academic leader or supervisor without delay so they can make sure you are looked after, and that things are made safe. They will also be responsible for any paperwork.

Note: An accident is where someone has been hurt or something has been damaged; an incident may also be known as a near-accident, near-miss, near-hit, or close call.

We constantly do our best to make sure things are safe, but accidents and incidents can, and do happen. We need to learn from them to prevent similar occurrences, so it is the University's policy to avoid blaming someone for a genuine mistake.

Please note that if someone is seriously hurt, or if an incident very nearly caused serious harm, the person must be treated, and the accident/incident scene must be preserved for an investigation. Therefore, *do not* move or touch anything associated with the accident/incident. Your academic leader or supervisor has a legal responsibility to contact the health and safety manager as soon as possible, so they in turn can notify WorksafeNZ.

Safety on campus

In the event of a fi e, crime or serious accident, phone the NZ emergency services on the free number 111.

If you witness, or are involved in, an on-campus incident, Unisafe Offic s will be on-site to provide an immediate response. Contact Unisafe on +64 9 373 7599 ext 85000 (we recommend you save this number to your mobile), or via emergency telephones around the campus. There is an emergency telephone located in the main atrium of the Faculty of Engineering, opposite the Student Centre.

If you experience any other incident or bereavement that might affect our studies, please contact a member of the Student Development and Engagement team, or the Student Centre Manager.

Help and advice

We recognise that there are various factors that will have impact on your studies. The Faculty of Engineering and University offer a ange of support mechanisms in place for you in the event of, for example, mental health concerns. This includes anxiety and stress, learning needs, financial st ess, and unforeseen events.

Faculty support services

Course planning and enrolment advice

The Engineering Student Centre may be your fi st point of contact for all engineering programme enquiries, including course planning and enrolment advice. Email **foe-enquiries@auckland.ac.nz** or visit us at:

Location: Level 4, Faculty of Engineering Building, City Campus, 20 Symonds Street

Opening hours: 8:30am-4:30pm, Monday-Friday (excluding University holidays)

Personal guidance

The Student Engagement team provides academic and pastoral services, and links you to key support services such as health and counselling, Career Development Services, and library and learning services. Support is available from Orientation through to employment.

Our experienced staff work c osely with the faculty's student clubs and associations to provide a range of social, professional and academic opportunities for students. The many initiatives that the we support and operate include Orientation, the Part I Assistance Centre, wellbeing resources, student clubs, SPIES, Tuakana tutoring and mentoring for Maori and Pacific students, the Women in Engineering and Rainbow Engineering networks, recruitment evenings with prospective employers, and special support for international students, students with disabilities and refugee students.

Role	Contact
Student Development and Engagement Manager	**Catherine Dunphy** Room 402.403, 20 Symonds Street +64 9 923 7881 **c.dunphy@auckland.ac.nz**
Employer Liaison Manager Facilitates employer networking, fosters industry relationships and can give you advice on practical work experience and graduate job applications.	Room 402.410, 20 Symonds Street +64 9 923 9521 **foe-engagement@auckland.ac.nz**
Women in Engineering Adviser Leads the development of strategies to support the success of Women in Engineering. Coordinates the Women in Engineering Network and provides individual advice and support.	**Amanda Clinton** Room 402.414, 20 Symonds Street +64 9 923 8606 **a.clinton@auckland.ac.nz**
Student Experience Adviser Provides a range of development and engagement activities for all students, and supports Campus Life and the faculty's student clubs.	**Chris McClymont** Room 402.402, 20 Symonds Street + 64 9 923 2927 **c.mcclymont@auckland.ac.nz**

Role	Contact
Student Support Adviser: Equity Offe s wellbeing, pastoral care and learning support to all students, coordinates the Rainbow Engineering group, manages the Part One Assistance Centre, and supports students at academic risk.	**Alćione Fagundes** Room 402.412, 20 Symonds Street +64 9 923 2990 **a.fagundes@auckland.ac.nz**
Student Support Adviser: Māori and Pacifi Offe s wellbeing, pastoral care and learning support to all students – in particular Māori and Pacific students, and organises the Tuākana Programme for fi st-year Māori and Pacific students	**Steve Roberts** Room 402.412, 20 Symonds Street +64 9 923 4538 **s.roberts@auckland.ac.nz**

The Student Engagement team provides individual support if you are struggling, stressed, or have experienced a traumatic event that will have impact on your study. Feel free to drop in and see us, or email **foe-engagement@auckland.ac.nz.**

Academic issues

If matters arise that affect our study, you should feel confident discussing them with our Lecturer, Course Organiser or Course Coordinator. You may also like to speak with the relevant Course Adviser and/or the Deputy Head of Department. If the situation is not dealt with to your satisfaction, these may then be referred to your Head of Department.

For issues of a more general nature, or if ever there is an occasion when you wish to dispute how a matter has been handled by a department, you may bring these to the attention of the following people:

Role	Contact
Associate Dean (Undergraduate) Provides academic oversight for admissions, advising and specialisations for undergraduates.	**Dr Michael Hodgson** Room 401.803, 20 Symonds Street +64 9 923 8218 **ma.hodgson@auckland.ac.nz**
Associate Dean (Students) Chairs the Faculty's Staff tudent Consultative Committee (SSCC) to resolve issues of importance to students.	**Dr Keri Moyle** Room 439.413, 70 Symonds Street +64 9 923 4672 **k.moyle@auckland.ac.nz**
Associate Dean (Postgraduate – Research) Provides academic oversight for admissions, advising and research specialisations for all engineering postgraduate research students.	**Associate Professor Piaras Kelly** Room 439.337, 70 Symonds Street +64 9 923 7225 **foe-postgrad-dean@auckland.ac.nz**
Associate Dean (Postgraduate – Taught) Provides academic oversight for admissions, advising and specialisations for all engineering postgraduate taught students.	**Associate Professor Rolando Orense** Room 401.1103, 20 Symonds Street +64 9 923 8437 **foe-postgrad-dean@auckland.ac.nz**

Faculty Staff-Student Consultative Committee

The Faculty Staff-Student Consultative Committee (SSCC) contains two student representatives nominated from each department's SSCC, representatives from major student groups, administrative staff and cademics. The Faculty SSCC addresses faculty-wide issues affecting academic life, resources and services. The Chair of the Faculty SSCC serves as a liaison between the students and the faculty.

Two meetings are usually held per semester, but urgent issues may be brought to the attention of the Chair at any time. You are encouraged to talk to your class representatives to bring matters to the attention of the SSCC. You can email them at: **(code)-rep(year of study)@auckland.ac.nz,** where 'code' refers to the relevant course, such as 'chemmat'. Part I students may be able to contact their representative at **eng-rep1@auckland.ac.nz.**

University support services

AUSA Student Advice Hub

The AUSA Student Advice Hub provides free, confidential and quality dvice to students who encounter problems both within and outside the university setting. They can help you with academic grievances, enrolment issues, assessments and compassionate consideration, employment disputes, financial issu s, allegations of misconduct, tenancy/rent issues, bullying and more.

www.ausa.org.nz/support/student-advice-hub

Career Development and Employment Services (CDES)

CDES has a designated Engineering Career Development Consultant and specialist team who provide services – such as support towards securing relevant work experience – tailored to meet your career development need. It hosts MyCDES, an online portal that allows you to self-manage access to career tools, workshops, events and more.

www.cdes.auckland.ac.nz

English Language Enrichment (ELE)

If you lack confidence or our DELNA diagnosis indicates you need some assistance, ELE offe s a number of language skill development programmes. These services are free to all students enrolled at the University. ELE provides advice, resources and links to language learning groups.

www.library.auckland.ac.nz/ele

Equity Offi

Offe s personal and learning support for students' individual or community needs in accordance with the University's commitment to remaining a safe, inclusive place. Support is available to international students, Māori and Pacific students, pa ents, LGBTI students, students with disabilities, students from refugee backgrounds, students from low socio-economic backgrounds, and more.

www.equity.auckland.ac.nz

Hardship grants

If you need help with food, accommodation, travel or medical costs you can apply for an AUSA Hardship Financial Assistance Grant. The Welfare Officer als provides emergency food parcels for students in need.

welfare@ausa.org.nz

Harassment and disputes

If you encounter problems with unwanted, unacceptable or offe sive staff or student beh viour, it may be harassment. University policy states that harassment on any grounds – including, but not restricted to, sexual, racial, religious and academic – is unacceptable. For informal and confidential help in dealing with harassment problems, you may approach any member of the Resolve Network (a list of their names can be found on posters displayed around campus) or the University Proctor, in Room G40, Old Choral Hall.

International Offi

The primary contact point for international students, especially for support services such as visa services, international student advisers, language help and more. An International Student Handbook is also available.

www.international.auckland.ac.nz

Parent spaces

The Faculty of Engineering is committed to supporting staff and students who a e parents, and we offer p ivate areas and breastfeeding facilities. No bookings are required; you can collect a key from the reception desks to Rooms 401.402 (City Campus) and 903.266 (Newmarket Campus).

The University also provides Parent Space, a dedicated kitchen and study area for you to use, with or without your children, at AUSA House, 4 Alfred Street. Resources include port-a-cot, high chair, change table, TV, computer and printer, children's toys and books, and kitchen facilities.

parentspace@ausa.org.nz

School of Graduate Studies

Provides administrative services, and advice on policies and procedures for postgraduate students throughout the University. Doctoral students may also seek specific dvice beyond standard policy content.

www.auckland.ac.nz/sgs

Student Learning Services (Tā te Ākonga)

Tā te Ākonga caters for the learning needs of all students, hosting workshops on learning and self-management skills, and facilitating successful transitions into university, and on to postgraduate studies and research. Students with learning disabilities can access the Learning Disabilities Programme that provides learning assessments, recommendations for special exam conditions and academic development opportunities.

www.library.auckland.ac.nz/student-learning

The University of Auckland English Language Academy (ELA)

If you do not meet the University's English language requirements for acceptance into the BE(Hons), the ELA offe s two suitable direct entry pathway programmes: the Foundation Certific te in English for Academic Purposes (FCertEAP) and the English Pathway for Undergraduate Studies (EPUS). The ELA is also an accredited IELTS testing centre, offe ing IELTS preparation courses and examinations.

www.ela.auckland.ac.nz

Textbooks

If you are interested in buying or selling second-hand textbooks, check the notice boards throughout University. The University's bookshop and other outlets also sell second-hand textbooks. AUSA and UBS provide textbook grants to AUSA members with significant on going commitments to academic study despite facing adverse circumstances beyond their control. You can find application forms and further information on the AUSA website.

www.ausa.org.nz

University Health and Counselling Service

The University Counselling Service, located in the Kate Edger Information Commons, is free and confidential for a y member of the University community. Anyone using the service (including prospective students) may discuss any issue of a personal, social, or academic nature without fear of judgment or criticism, or pressure to adopt any particular course of action.

www.auckland.ac.nz/health

Central administrative services

The ClockTower building houses the University's central student administrative centres (otherwise known as 'Academic Services'). They include: Admissions and Enrolment Office, cashi s, Disability Services, Examinations Office, the I Card Centre, Scholarships and Financial Support, Student Financials and Tuition Fees Office, th Student Information Centre, Student Records, and University Careers Services.

For general enquiries, you can email **studentinfo@auckland.ac.nz,** phone 0800 61 62 63, or visit the Student Information Centre (Room 112, ClockTower, 22 Princes Street) or Student Central (Main Quad, 32 Princes Street) during business hours.

Clubs, networks and associations

Architects and Civil Engineers (ACE)

A student-run organisation that provides collaborative experiences and development for Civil Engineering and Architecture students.

www.aceuoa.org.nz

Auckland University Engineers' Association (AUEA)

Our alumni association maintains strong links between graduates, the faculty and industry. Membership is free and open to all engineering alumni.

www.engineering.auckland.ac.nz/auea

Auckland University Engineering Society (AUES)

An independent student body that provides engineering students with events and opportunities to build networks with faculty members and industry.

www.facebook.com/AUESociety

Auckland University Robotics Association (AURA)

A student-run club that aims to encourage participation in robotics-related activities and competitions.

www.aura.org.nz.

Auckland University Students Association (AUSA)

An independent student body that represents the interests of all students. It also provides support services and social events, and is free to join.

www.ausa.org.nz

Civil Engineering Students' Association

Provides civil engineering students with opportunities to develop networks with each other and professionals in the industry.

www.facebook.com/UoACESA

Engineers Without Borders

A group of professional and student engineers throughout New Zealand who use their technical skills to help developing communities.

www.ewb.org.nz

Engineering Postgraduate Society (EPS)

A student society dedicated to supporting postgraduate engineering students via social and professional events.

www.facebook.com/EPS.UoA

Engineering Revue

A comedy show involving sketches, songs and dances staged every year, and performed exclusively by engineering students.

www.facebook.com/EngineeringRevue

Engineering – Seeking Truth on Campus

An engineering students' forum to engage in open discussions in the interesting concepts and challenges of the Christian faith. All opinions are welcomed.

www.facebook.com/engineering.stoc

Faculty of Engineering Postgraduate Buddy Programme

A network of engineering postgraduate students who want to stay connected, support each other, and help new students to settle in.

foe-engagement@auckland.ac.nz

Faculty of Engineering Rainbow Network

The Faculty of Engineering Rainbow Network aims to provide support for lesbian, gay, bisexual, transgender and intersex students and staff.

a.fagundes@auckland.ac.nz

The Institute of Electrical and Electronics Engineers (IEEE)

The world's largest technical association, with more than 400,000 members in over 160 countries. It offe s events for students in electrical engineering, electronics, and computing.

www.facebook.com/UOAIEEESB

The Institution of Engineering and Technology

The local Auckland network aims to further strategies, directions and objectives of this institution within New Zealand.

www.communities.theiet.org

Institution of Professional Engineers New Zealand (IPENZ)

The professional body representing engineers in New Zealand. It provides information and engagement opportunities with the industry. Student membership is free if you're studying towards a BE(Hons).

www.ipenz.nz

Robogals Auckland

A student-run organisation that aims to increase female participation in engineering, science and technology.

www.robogals.org

Software Engineering Students' Association (SESA)

Offer social and professional events for software engineering students, such as industry seminars, LAN parties and movie nights.

www.sesa.org.nz.

South Pacific Indi enous Engineering Students (SPIES)

A support group for Māori and Pacific Enginee ing students. Also provides a study space, an annual retreats for members, and mentoring and tutoring via the MAPTES programme.

spies@auckland.ac.nz

The University of Auckland Formula SAE Team Inc

A group of engineering and business students who build a formula-style race car from scratch to compete in the annual Australasian competition.

www.fsae.co.nz

Women in Engineering Network (WEN)

Provides social activities, professional development opportunities and forums for academic support. All engineering students who identify as women are welcome and encouraged to join.

www.engineering.auckland.ac.nz/wie

Academic information

Course details and requirements

You will receive a detailed course outline in Canvas describing the material covered, how it will be assessed, the percentage assessments contribute to your final g ades, and assessment due dates. This information may also be provided as a handout in your fi st lecture or in your coursebook, if one is provided. Be sure to put any assessment dates in your diary.

Student Services Stall

There are various methods of collecting and returning assignments, and you will be informed of the right procedure. Many courses use the Student Services Stall on Level 3, Central Campus to collect and return coursework. You need to produce your ID card before collecting assignments. Any assignments not collected within two weeks are returned to the relevant department offic

Scholarships

Internally and externally-funded scholarships, opportunities, and awards are available for engineering students of all levels. Visit **www.engineering.auckland.ac.nz/scholarships** for more information. Regular updates are also posted to the faculty's website and social media accounts.

Academic misconduct, cheating and plagiarism

The University of Auckland and the Faculty of Engineering view cheating as a serious offence. Penalties for cheating in examinations are administered by the Discipline Committee of the Senate and may include suspension or expulsion from the University.

Cheating in on-course work is usually handled within the faculty or department, and may result in the assignment being marked as zero or a course being failed. The student's name and details of the case may be added to the University's Register of Academic Misconduct.

Learn more about how to avoid various forms of cheating in the Exam Regulations of the *University of Auckland Calendar* and the compulsory Academic Integrity course in Part I of the BE(Hons). The full guidelines on procedures and penalties for academic dishonesty are available at **www.auckland.ac.nz/academic_honesty**.

Grading and Honours

For each Part of the BE(Hons) degree, your Grade Point Average (GPA) is calculated using the following formula:

$$\text{GPA} = \frac{\sum_i g_i . P_i}{\sum_i P_i}$$

Where p_i is the points for course i and g_i is the numerical value of the grade awarded in course i. The numerical values for the grades are:

A+	9
A	8
A-	7
B+	6
B	5

B-	4
C+	3
C	2
C-	1
Fail	0

It should be noted that failing grades as well as grades for repeated courses are included in the GPA. If all courses are worth 15 points, the GPA can be calculated easily as the average of the grade values for all courses (including failed courses).

Examinations

Examinations take place at the end of each semester. Students can access their examination timetable on Student Services Online after it is published during the semester. Final exams are administered by the University's Examinations Office This is located at Room 108 of the ClockTower, City Campus. See **www.auckland.ac.nz/exams** for more information on common criteria, application procedures, and further information.

Restricted Calculators

There are specific egulations about the type of calculator you may use during tests and exams. If your exam specifi s a "Restricted Calculator" the following defin s the type permitted for engineering courses:

- Your calculator must comply with the general calculator requirements in the University of Auckland Calendar
- No alphanumeric calculators. Your calculator must not have the full alphabet on or available from the keyboard
- No graphing ability
- Your calculator must not have wireless/wired communication capability to another calculator or computer
- Your department may have further requirements for calculator specific tions
- A typical complying calculator is the Casio FX82 or equivalent

If in doubt, check with your department course adviser well in advance of exams. If you bring a suspect or non-complying calculator into a test or exam, it will be removed and held for checking, and your name will be recorded in case further action is necessary.

Illness, injury, or misfortune that affects your exams

If you are absent from an examination you may be eligible for an aegrotat pass or compassionate consideration, if you:

- Attempted the examination(s) if at all possible.
- Suffe ed illness or other misfortune which affec ed examination preparation or performance.
- Saw a medical practitioner on the day of the examination, or, if preparation was impaired, within the two weeks before the examination, and you obtained a medical certific te providing full details of your condition. For compassionate consideration, please see the counsellor at the University Health and Counselling Service.
- Complete the AS-50 (for medical reasons) or AS-51 (for Compassionate Consideration) application form available for $30 from the University Health and Counselling Service. Submit it within one week of your last affec ed examination.

An aegrotat or compassionate pass may be awarded if medical or other evidence makes it clear that you were either unable to attend the examination(s) or your performance was affec ed at the time of the examination(s). Your academic performance throughout the course may also be taken into consideration. The final decision on an aegrotat is determined by the University Senate.

Missed exams

If you arrive too late to be admitted to an exam, you will need to report in person to the Examinations Office o apply for a missed exam.

Missing a test

Tests that contribute to your final g ade and are held under examination conditions are subject to the same rules for aegrotat and compassionate consideration as examinations. If you miss a test, you should complete Form AS-46 and submit it within seven days of the test. The application costs $10 and is available at the Student Information Centre in the ClockTower building, or at **www.engineering.auckland.ac.nz/exams.**

Missing an on-course assessment

For on-course assessments or coursework other than a test, you should fi st request an extension of the due date from the Course Organiser. If an extension is not given or is considered inappropriate, you may submit an exemption through the "Application for Exemption from On-course Assessment" form. Keep in mind that:

- This form is available from the Engineering Student Centre or online.
- You must submit it within seven days of the due date of the assessment affec ed.
- You must have been prevented from presenting the assessment, or consider your performance seriously impaired because of illness, injury, or other misfortune beyond your control. This form cannot be used for other circumstances outside these predicaments.

- You can visit the Engineering Student Centre or contact the Engineering Student Engagement team for further help.

Conceded passes (for undergraduates)

If you fail a course, you may be eligible for a conceded pass. You cannot apply for a conceded pass; eligible students will be automatically considered and conceded passes will be confi med at the end of each year. If granted, you will see a 'CP' on your academic record. No more than two courses can be conceded, to a maximum of 30 points, in any one degree.

You will only be considered for a conceded pass if:

- The award of the conceded pass allows you to complete a Part.
- You have a D+ grade in the failed course(s). Note: "Withdraw", "Did Not Complete" and "Did Not Sit" constitute failures and are not considered for conceded passes.
- Your overall GPA (grade point average) for the year, including the failed courses, is 2 .5 or greater (C = 2, C+ = 3).
- The failed course(s) belong to Parts I, II or III of the BE(Hons) degree.
- The total points conceded per Part or academic year is not above 20 points.
- No more than two courses are conceded, to a maximum of 30 points, in any one degree.

Alternative exam arrangements

- **Special exam conditions**
  If you need support for an ongoing condition, including temporary or permanent disabilities while sitting an examination, you can apply for special exam conditions. This will require an application via University Health Services or Student Learning Services.
- **Out-of-time or out-of-centre exams**
  If you are going to be away over the exam period, you be able to organise for some or all of your exams to be sat out-of-time or out-of-centre. Criteria do apply so be sure to contact the Examinations Office bef e making travel plans.
- **Late deletion**
  Late deletion is available to students who are unable to continue studying due to exceptional circumstances such as illness, injury, or events beyond control. The deadline to submit a late deletion is on the final d y of lectures. If you are considering this option, consider seeking support from the University's Counselling Service or student advisors fi st. Contact the Engineering Student Centre for more information.

Admission

Closing dates for 2017 admissions

- **MAPTES:** 20 November 2016
- **BE(Hons) Semester One entry:** 8 December 2016
- **BE(Hons) Semester Two entry:** 4 July 2017

Admission to Part I

There are 900 places available in Part I (first year) of the BE(Hons). Places are strictly limited and subject to selection. Successful candidates require a strong background in calculus, physics and/or engineering studies. In all cases, selection is based upon your most recent and highest level of academic study.

For detailed admission information, including entry requirements to the BE(Hons) and alternative pathways, visit **www.engineering.auckland.ac.nz/entry.**

Admission to Part II

Part II of the BE(Hons) programme is divided into nine specialisations. Entry into each specialisation is strictly limited; the faculty will not exceed the University Council's approved limitations on entry into Part II specialisations, as stated in the *University of Auckland Calendar.*

The 2017 limits are:

- Biomedical Engineering: 30 places
- Chemical and Materials Engineering: 80 places
- Civil and Environmental Engineering: 240 places
- Computer Systems Engineering: 65 places
- Electrical and Electronic Engineering: 110 places
- Engineering Science: 48 places
- Mechanical Engineering: 130 places
- Mechatronics Engineering: 80 places
- Software Engineering: 90 places

Priority placement is given to current University of Auckland students who have recently completed Part I of the BE(Hons).

Subject to availability of places, students who have completed the first year of a BE programme at another tertiary institution may also be considered for admission directly into Part II, dependent on their academic performance (at least a B average) and the equivalence and relevance of their prior study. There is no automatic acceptance or transfer of credit for engineering qualifications and each case will be considered individually. Students wishing to transfer need to complete an application via Student Services Online and indicate the specialisation for which they wish to be considered under "Academic Plan", eg, Engineering – Civil.

The prior completion of certain qualifications may also provide direct entry into Part II, subject to a Grade Point Average (GPA) of at least 5.0 and places remaining available. Such qualifications include a completed New Zealand Diploma of Engineering, Bachelor of Science, Bachelor of Technology or Bachelor of Surveying with appropriate subjects.

Students who are offered direct entry into Part II from another degree and/or institution must still complete the requirements for ENGGEN 199 English Language Competency and ACADINT A01 Academic Integrity Course without exemption. International applicants must also meet certain English language requirements as per University policy. Further information can be found at **www.auckland.ac.nz/english-language-requirements.**

The faculty will not permit entry into Part II of the BE(Hons) in Semester Two, unless students have prior study elsewhere, which can be substituted for the courses they have missed in Semester One.

Part II selection criteria

Current Part I students will nominate their preferred five specialisations before the end of Semester Two. The faculty offers a variety resources to help you consider your specialisation of choice, including editorials written by current students at **www.engineering.auckland.ac.nz/student-editorials.**

To be considered for admission into your preferred specialisation, you must have:

- Completed a minimum of 90 points of Part I, including ENGSCI 111 (or ENGGEN 150 for a conjoint degree)
- Completed or received credit for any specified Part I course regarded as a prerequisite for your preferred specialisation (e.g. CHEMMAT 121 for Chemical and Materials; ELECTENG 101 for Computer Systems Engineering and Electrical and Electronic; and ENGGEN 121 for Civil, Mechanical and Mechatronics)
- Completed requirements for ENGGEN 199
- Completed requirements for ACADINT A01

Places in your preferred specialisation are not guaranteed and you may be offe ed a place in another specialisation if places are no longer available in your fi st (or lower) choice.

If demand exceeds the number of places available in a specialisation, all students will be ranked according to their GPA in Part I BE(Hons) courses (excluding their General Education course). Students will not ranked unless they complete ENGGEN 199 and ACADINT A01. Students with a GPA below the minimum cut-off for their ch sen specialisation will be offe ed another specialisation with places remaining, if they meet the requirements. For example, having completed ENGGEN 121 for Mechanical Engineering.

If you fail up to 30 points of courses in Part I, you are advised to repeat them at Summer School. Similarly, if you only began the BE(Hons) in Semester Two (and have only completed 60 points of Part I) you are required to make up your remaining 30 points for Part I at Summer School, in order to be considered for entry into Part II the following year.

If you are admitted to Part II in Semester One, 2017 before you have completed all of Part I, you will be required to complete any outstanding Part I courses in Summer School, 2017 (except students admitted via Bachelor of Science (BSc alternative pathways). You will not normally be permitted to enrol in the outstanding Part I courses during Semester One or Two of 2017. The requirements for ENGGEN 199 and ACADINT A01 must also be completed BEFORE your place in Part II can be confi med.

Any student who does not complete Part I within two years of initial enrolment may not be permitted to continue in the BE(Hons). If you fail a paper required for the completion of the BE(Hons) twice, you may not be permitted to continue in the BE(Hons).

Enrolment

Dates to remember	
Enrolment opens for Part I 2017	Monday, 7 November 2016
Enrolment opens for Parts II-IV 2017	Tuesday, 13 December 2016
Last day to change Summer School courses	Wednesday, 11 January 2017
Recommended date for enrolment completion	Tuesday, 14 February 2017
Last day to change Semester One courses	Friday, 17 March 2017
Last day to change double Semester (A and B) courses	Friday, 31 March 2017
Last day to change Semester Two courses	Friday, 4 August 2017

Part I students in 2017

After your application into the BE(Hons) programme is received and you have accepted your offer of pl ce, you will be sent documents detailing how to enrol.

Enrol in your courses through Student Services Online. If any of your pre-selected lecture, tutorial or lab streams are already full, you will need to re-plan your schedule before completing your online enrolment.

It is highly recommended that you complete your enrolment by **Friday, 17 February 2017** as classes fill up quic ly. If you haven't completed your enrolment by this date, your place in the BE(Hons) may be withdrawn.

Conjoint students

It is advised that you prioritise enrolment in your BE(Hons) courses, as these course schedules can be inflexible and places fill quic ly.

MAX (MATHS 153) students

Students from the MAX programme usually enrol in Mathematical Modelling 2 (ENGSCI 211) in their fi st year of engineering. However, those intending to complete a conjoint degree or with a low pass in MATHS 153 should consider other options. MAX students can contact Peter Bier by emailing **p.bier@auckland.ac.nz** for advice on mathematics courses.

Parts II, III and IV students in 2017

Before enrolling, read our guidelines for returning students under the specified h ading at **http://www.engineering.auckland.ac.nz/enrolment.** You should also consider the guidelines on the main University website at **www.auckland.ac.nz/enrolment.**

If you failed a course in 2017, you will only be able to enrol in the courses you have yet to complete in that Part. If you need to enrol in a course at a higher level, you will need to apply for an enrolment concession via Student Services Online. If approved, Student Centre staff will en ol you in the appropriate course(s). Only in exceptional circumstances will a student be permitted to enrol for Part III unless Part I has been completed, or to enrol for Part IV unless Part II has been completed.

Enrolling into a course for a third time requires permission from the Associate Dean (Undergraduate) to comply with University rules: *"A student who has twice enrolled in, but has failed to be credited with a pass in a course which is required for completion of, or continued enrolment in, a programme may have their enrolment for that programme discontinued."*

If you encounter a timetable clash with no alternative options, you must also apply for an enrolment concession via Student Services Online and wait for approval from the department's course adviser.

Enrolment help

If you do not have access to a computer or need help with your enrolment, Please visit the Faculty of Engineering student centre at Level 40, 20 Symonds Street on Mondays to Fridays from 9am to 4pm. You may also email **foe-enquiries@auckland.ac.nz.**

Changes to enrolment

Once you have enrolled in courses and paid your tuition fees, changes to courses can be made online only within the first five working days of Summer School and the first ten working days of the semester when the course is run. After this period, an attempt to delete a course is classified as a "Withdrawal" and will appear on your student record as such (Note that a "Withdrawal" (W) is regarded as a fail and remains on your academic transcript). Your fees cannot be refunded after these dates, apart for in exceptional circumstances.

If you fail to attend a final examination, and you did not "withdraw" from the course at least three weeks before lectures ended, your academic record will show "Did Not Sit" or "Did Not Complete". Note that "Withdrawn", "Did Not Sit" and "Did Not Complete" are all considered fail grades. For more information please visit **www.askauckland.ac.nz** or email **foe-enquiries@auckland.ac.nz.**

BE(Hons) degree information

Bachelor of Engineering (Honours) degree structure

The BE(Hons) degree at the University of Auckland is a four-year programme consisting of 480 points and divided into four Parts (equivalent to one year each). Each Part consists of courses totalling 120 points.

In general, each Part must be completed in chronological order – Part I must be completed before Part II, for example. Any exceptions must be approved by the Associate Dean (Undergraduate) on a semester-by-semester basis.

The BE(Hons) is awarded to those who achieve a sufficient A in Parts II, III and IV. Students who do not fulfill this equirement, but complete all of the course requirements for the BE(Hons), will be awarded the BE degree instead.

Calculation of the Honours GPA (HGPA)

The award of Honours is dependent on the value of your Honours GPA. This is calculated using the formula below and then rounded to one decimal place.

HGPA = 0 .1*PART II GPA + 0 .3*PART III

GPA + 0 .6*PART IV GPA

Award of Honours

Honours is awarded in three classes: First Class, Second Class (First Division) and Second Class (Second Division). Your class of Honours will depend upon you achieving the following GPA:

- **First Class Honours:** 7.0 ≤ HGPA
- **Second Class Honours (First Division):** 5.5 ≤ HGPA < 7.0
- **Second Class Honours (Second Division):** 4.0 ≤ HGPA < 5.5

A GPA of 4.0 is equivalent to a B- and a GPA of 7.0 is equivalent to an A-, so First Class Honours can be recognised as being in the A grade range while Second Class honours can be recognised as being in the B grade range.

Students with HGPA < 4.0 will be awarded the BE degree without honours.

If you were enrolled in Part II prior to 2010, your Honours GPA will be calculated using only your GPAs from Parts III and IV, as per the following formula:

HGPA = 0 .4*PART III GPA + 0 .6*PART IV GPA

In calculating the GPA,"withdrawals", "did not sit" and "did not complete" results are counted as zero and contribute to the overall Honours Grade Point Average.

Part I

Part I is a common year – all students take the same courses. You gain exposure to each of the nine diffe ent engineering specialisations and study a broad base of Engineering and professional fundamentals.

Part I of the BE(Hons) consists of 120 points comprising:

Semester One			Semester Two		
ENGGEN 121	Engineering Mechanics	15	CHEMMAT 121	Materials Science	15
ENGGEN 140	Engineering Biology and Chemistry	15	ELECTENG 101	Electrical and Digital Systems	15
ENGSCI 111	Mathematical Modelling 1	15	ENGGEN 131	Engineering Computation and Software Development	15
ENGGEN 115 Principles of Engineering Design (Semester One or Two)					15
General Education (Semester One or Two)					15
ENGGEN 199 English Language Competency					0
ACADINT A01 Academic Integrity Course					0

General Education courses

General Education courses are designed to broaden your education. They give you an opportunity to mix with students from diffe ent disciplines and develop your awareness of interdisciplinary research.

You must pass one General Education course (15 points) in Part I of your degree. Special arrangements may apply for conjoint students or students who have transferred from another tertiary institution with credit.

You can choose from a range of subjects, including a course from either the "General Education Open Schedule" or the "Engineering, Medical and Health Sciences, and Science Schedule (EMHSS)". Refer to **www.auckland.ac.nz/generaleducation** for more details.

In some cases, courses are available both as part of the General Education programme and as part of regular degree programmes. If you choose such a course, you MUST enrol in the G version of the course (e.g. HISTORY 103G). Enrolment in the "non-G" version may not be counted as fulfilling the General Education requirement.

Academic English Language Requirement (AELR)

In 2016, the University introduced an Academic English Language Requirement (AELR) into all its bachelors degree programmes. The AELR aims to ensure that you have a sufficient evel of competence in academic English to support your study at University. This will not affect whether ou are offe ed a place in a programme.

Applicants who have not met the AELR through their entrance qualific tion will be provided with advice at the time of enrolment. Students required to complete a course for AELR, may substitute one of the approved courses in the place of a General Education course. For further information, see **www.auckland.ac.nz/aelr**.

English Language Competency – ENGGEN 199

This is separate from AELR and all students entering the BE(Hons) programme, are required to undertake the "Diagnostic English Language Needs Assessment" (DELNA) to demonstrate that you have a level of proficien y in English that enables you to succeed in your studies and future career. This is a compulsory requirement for the degree, regardless of whether or not English is your fi st language. Visit **www.delna.auckland.ac.nz** for more information.

Academic Integrity Course – ACADINT A01

All new students are required to complete an online academic integrity course. More details are provided at **www.auckland.ac.nz/academic_honesty.**

Parts II-IV

You will choose to be allocated to one of these specialisations in Parts II-IV:

- Biomedical Engineering
- Chemical and Materials Engineering
- Civil and Environmental Engineering
- Computer Systems Engineering
- Electrical and Electronic Engineering
- Engineering Science
- Mechanical Engineering
- Mechatronics Engineering
- Software Engineering

Parts II–IV of each degree consist of specialist subjects, with a common core of mathematical modelling, technical communication and professional development courses studied by all students. Once your specialisation has been confi med, there is generally little choice in the actual courses taken, although most specialisations allow one or two approved electives.

Electives in Parts II and III

Most degree specialisations include one or two electives which can be chosen from within your specialisation's department or from other engineering departments. Electives from outside your department or the faculty require the approval of your departmental course adviser.

Electives in Part IV

Electives in Part IV allow you to specialise even further in some area of engineering. However, there is limited opportunity to take electives outside of your own department. You may be able to take fourth-year electives from other engineering specialisations, approved courses from Parts IV or V of the Bachelor of Architecture degree programme, or courses from another faculty, but all such cases require approval from your departmental course adviser.

Field trips

As part of your course, you may need to go on fie d trips to study engineering plants and works. You will be given details about these requirements as soon as they are available. Any fie d trips specified as compulsory form part of the requirements for obtaining your degree. For example:

- **Chemical and Materials Engineering** Part III students may be required to attend three or four half-day fie d trips. Part IV students will have three one-day or one three-day out of town plant visit(s).
- **Civil and Environmental Engineering** students may be required to attend fie d trips that complement relevant lecture material.
- **Engineering Science and Biomedical Engineering** Part II students will participate in a compulsory two to three-day fie d trip provisionally planned for early in Semester One. You will visit industries in the upper half of the North Island.
- **Mechanical Engineering** Part III students may be required to attend day trips to engineering and manufacturing companies to demonstrate the variety and scope of engineering activities in New Zealand industry.

Workshop Practice (ENGGEN 299)

Before enrolling in Part III, you must have completed a recognised course in Workshop Practice. You will not be permitted to enrol in Part III courses if this has not been completed in Part II of your studies. Part II students will receive registration details and course dates via email or at **www.engineering.auckland.ac.nz/workshop-practice.**

Approved courses are held at the Auckland University of Technology (AUT) throughout the year, and at the Manukau Institute of Technology (MIT) during semester breaks. Students must ensure that their workshop practice timetables do not clash with their other academic courses.

Any exemption requests must be supported by documentary evidence of having attended a similar course elsewhere.

Practical Work (ENGGEN 499)

As part of your BE(Hons) degree you are required to experience some of the trade and sub-professional skills relevant to your engineering specialisation. This complements your formal studies and contributes to your professional training, providing you with trade and sub-professional skills relevant to your engineering specialisation.

You must complete at least 800 hours of approved engineering employment before graduation. After each period of work, you will submit a report detailing your experience. Students will not be considered to have met the requirements to graduate until both Workshop Practice and Practical Work have been completed.

As it is a formal requirement of your degree, strict assessment criteria apply. You can find detai ed information about practical work requirements at **www.engineering.auckland.ac.nz/practical-work.**

Important points to note:

- **What:** To meet the requirements for the award of the BE or BE(Hons) degree, you must complete 800 hours of practical work (minimum 200 hours in general and sub-professional work respectively) AND write a practical work report that critically appraises your experience.
- **When:** Practical work experience will usually be undertaken during the study summer breaks following Parts II and III (400 hours in each).
- **Types of work:** Appropriate types of practical work are outlined in the following section. Non-engineering work will not be accepted. Concerns about the suitability of a particular type of work should be discussed with your department representative on the Practical Work Committee.

- **Employers:** Except for work associated with scholarships or internships, each work experience period should be with a diffe ent employer.
- **Summer scholarships:** If you participate in a project for a University Summer Research Scholarship, you may count up to 400 hours of this towards your practical work experience.
- **Registration:** You must register your practical work employment online prior to, or during the fi st week of employment.
- **Certification** A Practical Work Certific te covering each work period must be completed, signed by your employer, and included with your report. Photocopies or scanned certific tes will not be accepted.
- **Report:** A practical work report of up to 25 pages detailing each work period must be submitted. Details of the report requirements can be found later in this section.
- **Due dates:** Hand in practical work reports to the Engineering Student Centre.
  - If you wish to participate in the September 2017 graduation ceremony, your final eport **should** be submitted between **8.30am on Monday, 6 March to 4.30pm on Friday, 10 March 2017.** If you wish to participate in the May 2018 graduation ceremony, your final report **should** be submitted between **8.30am on Monday, 7 August to 4.30pm on Friday, 11 August 2017.**
  - Accelerated Pathway students will be sent a separate email regarding due dates of reports.
- **Prize:** Three prizes of $1,500 are offe ed by the Association of Consulting Engineers New Zealand for the best practical report by a Part IV engineering student. If you work for a company that is an ACENZ member and you wish to apply for a prize, pick up the entry form from the Engineering Student Centre and include this in the front of the report, to be handed in by **4.30pm on Friday, 10 March 2017.**
- **Exemptions:** If you are a direct-entry student into Part III (from another tertiary institution, for example) or you have had substantial relevant work experience prior to entering the faculty, you may be required to complete only 400 hours of practical work experience. Any exemptions or exceptions to any of the aforementioned requirements are to be approved by the appropriate departmental representative of the Practical Work Committee or the Faculty Chair.

Types of practical work suitable for each department

Although most students will complete 400 hours during each of two summers for a 400 + 400 hour split, other hour splits are acceptable. A minimum of 200 hours in either of the following two categories (800 hours total) is required:

- **General engineering:** The fi st practical work period should allow you to become familiar with engineering processes and trade skills, particularly those appropriate to your specialisation.
- **Sub-professional engineering:** The second practical work period is to be of a sub-professional nature. This work is as a junior engineer with responsibilities, work level, and technical expertise which takes advantage of the academic training gained from earlier years in your engineering degree.

The following are meant as guidelines for types of acceptable work; other types may be acceptable. If in doubt, check with your departmental representative.

Specialisation	Type of work	Examples
Biomedical Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople or technicians, such as laboratory work, mechanical installation, equipment maintenance, data gathering or analysis, and assistance in software or website development.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, medical professionals, or medical researchers, involving product or instrument design, development and testing, medical imaging technology, CAD draughting, software development, database design or inventory control.
Chemical and Materials Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople, involving machining, structures, building construction, design, welding, quality control, production assembly or electronics.
	Sub-professional engineering (min. 200 hours)	Work associated with skilled tradespeople, involving machining, structures, building construction, design, welding, quality control, production assembly or electronics.
Civil and Environmental Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople, involving trade skills in the construction, earthmoving, mining, water and wastewater treatment, surveying, road, traffic an transportation, asset condition, minerals and resources, and environmental monitoring industries.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, including surveying, contract documentation, design and/or draughting, bore hole logging, construction supervision, engineering associated with buildings, structures, geotechnical, earthworks, construction, mining, road, traffic and ansportation, water/ wastewater, hydrology/hydraulics, and environmental engineering.

Computer Systems Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople, involving the fabrication, manufacture, installation, maintenance and confi uration of mechanical, electrical and computer systems.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, involving the installation, design, fabrication and testing of computer-based components; development, maintenance and support of software packages; application of computer-based systems to embedded and/or real-time problems, communication systems; installation and confi uration of networks.
Electrical and Electronic Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople, involving the use of hand tools and machine tools associated with the fabrication, manufacture and/or maintenance of electrical instruments, components or equipment.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, involving the installation of lines, trunking systems, switchboards and machines; design, fabrication and testing of electrical components; electrical draughting, computing; application of wiring regulations and electrical safety.
Engineering Science	General engineering (min. 200 hours)	Work associated with skilled tradespeople, including laboratory work, mechanical installation or maintenance, computer or instrumentation maintenance or testing, data gathering or analysis, assistance in software or website development, surveying or construction site work.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, involving product design, systems/applications analysis, analysis of optimisation and simulation models, or software development.
Mechanical Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople such as mechanical tradesmen and/or machine tool operators, involving the fabrication, manufacture, maintenance and repair of mechanical components or equipment.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, involving design, draughting, inventory control, production planning, administrative/managerial processes, or coordinating labour.

Mechatronics Engineering	General engineering (min. 200 hours)	Work associated with skilled tradespeople, involving hand tools and machine tools for metal cutting and forming; manufacturing and assembly of mechanical components or equipment; fabrication, manufacture and/or maintenance of electrical components or equipment; installation, maintenance and confi uration of computer systems.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, including mechanical design, draughting, inventory control, production planning, administrative/managerial processes, design, implementation and testing of electrical, computer or software systems.
Software Engineering	General Engineering (min. 200 hours)	Work associated with skilled tradespeople, involving the fabrication, manufacture, installation, maintenance and confi uration of mechanical, electrical and computer systems.
	Sub-professional engineering (min. 200 hours)	Work associated with professional engineers, involving the installation of software systems; design, implementation and testing of software systems; helpdesk, backup and system support; network confi uration; computer security services; information system support; web services.

Practical work reports

The practical work component of your degree requires you to:

- Complete 800 hours of practical work experience.
- Write and submit a practical work report for each period of employment.

Practical work reports must follow these specific tions:

- A separate report must be submitted for each period of practical work.
- Reports must be no more than 25 pages in length.
- All reports MUST contain:
  - **Title page:** including your name, department, the name and address of your employer, dates of the work period, date of the report.
  - **Summary:** a brief summary of the whole report. No more than 300 words including the nature of the organisation, type of work done, skills learned, conclusions drawn
  - **Acknowledgements:** to thank the people who have given you help in your work.
  - **Table of contents:** section headings with corresponding page numbers. May include a list of fi ures and a list of tables, with corresponding page numbers.
  - **Introduction:** outline of the nature of the enterprise and/or products of the employer.
  - **Early sections:** these sections could include information on the layout of works or plant, staff o ganisation structure, number of employees engaged in various work, general comments on buildings, plant layout, technical facilities and amenities for staff.

- **Central sections:** in these sections you should provide a full description of the work undertaken and any other activities observed.
- **Reflective appraisal:** in this section you should critically appraise or evaluate your learning or knowledge gained within the practical work period. This could include your impressions about the organisation and its performance. It would also be appropriate to comment on the skills you have developed and the lessons learned in relation to professional engineering practice.
- **Conclusions:** summary list of conclusions drawn and skills learned.
- **Bibliography:** if needed.
- **Appendices:** if needed.

The Practical Work Committee for 2017

- **Practical Work Committee Chair:** Dr Doug Wilson (dj.wilson@auckland.ac.nz)
- **Biomedical Engineering:** Dr Iain Anderson (i.anderson@auckland.ac.nz)
- **Chemical and Materials Engineering:** Dr Wei Yu (w.yu@auckland.ac.nz)
- **Civil and Environmental Engineering:** Dr Vicente Gonzalez (v.gonzalez@auckland.ac.nz)
- **Computer Systems, Electrical and Electronic, and Software Engineering:** Dr Nitish Patel (nd.patel@auckland.ac.nz)
- **Engineering Science:** Mr Jim Greenslade (j.greenslade@auckland.ac.nz)
- **Mechanical and Mechatronics Engineering:** Mr Stephen Elder (st.elder@auckland.ac.nz)
- **(ex officio) Student Cen e Manager:** Jamie Protheroe (j.protheroe@auckland.ac.nz)

Conjoint degree programmes

A conjoint degree enables you to complete a BE(Hons) and another degree at the same time, with a reduction in the total points required for each degree component. It can be an excellent choice if you know that the other degree will be beneficial in our proposed career, or if you are a capable student with skills in various areas. You should also consider the advantages of combining undergraduate and postgraduate study instead completing two undergraduate degrees.

Most BE(Hons) conjoint programmes can be completed in fi e years. They generally consist of 405 points' worth of courses in engineering, and 270 points from the other degree courses. An exception is the BE(Hons)/LLB, in which the LLB requires 390 points. The conjoint combinations currently available with Engineering are:

- BE(Hons)/Bachelor of Arts (BA)
- BE(Hons)/Bachelor of Commerce (BCom)
- BE(Hons)/Bachelor of Property (BProp)
- BE(Hons)/Bachelor of Laws (LLB)
- BE(Hons)/Bachelor of Music (BMus)
- BE(Hons)/Bachelor of Science (BSc)

The workload for a conjoint programme is higher than for a single degree (usually 135 points per year, compared to 120 points per year for a single degree). The BE(Hons) programme alone is considered to have a high workload, so keep in mind when considering a conjoint programme that:

- There are higher entry requirements for BE(Hons) conjoint programmes: A GPA of at least 5.5 in the last year of full-time study is required if entry to the conjoint is not obtained at Part I.
- You will be dropped from the conjoint programme if you fail to maintain at least a B- average (GPA of 4.0) across all courses for the duration of your conjoint degree.

As per the regulations of the University of Auckland, students cannot enrol for courses that have substantially similar content. Thus, certain BE(Hons)/BSc conjoint programmes (such as a BSc major in Computer Science, Physics, Applied Mathematics, or Statistics) must have formal prior approval from the Faculty of Engineering and may even be declined. Please note the following restrictions when planning your BE(Hons) conjoint:

Not permitted	
Software Engineering	BSC in Computer Science BCom in Information Systems BCom in Information Management
Approval from your BE(Hons) Specialisation Adviser required	
Biomedical Engineering	BSc in Physiology
Computer Systems Engineering	BSc in Computer Science
Electrical and Electronics Engineering	BSc in Physics
Engineering Science	BSc in Mathematics BSc in Applied Mathematics BSc in Physics BSc in Statistics BSc in Logic and Computation
Mechatronics Engineering	BSc in Computer Science BSc in Physics
Software Engineering	BA in Logic and Computation BSc in Logic and Computation

BE(Hons) conjoint degree regulations

The requirements of the BE(Hons) component of a conjoint degree are the same for all combinations.

You must pass at least 405 points' worth of courses made up of:

- 90 points at Part I: CHEMMAT 121, ELECTENG 101, ENGGEN 115, 131, 140, 150, 199, ACADINT A01
- 15 points: ENGGEN 204
- 95 points at Parts II and III from courses listed in the schedule of your chosen BE(Hons) specialisation +ENNGEN 299
- 105 points at Part IV (including ENGGEN 403) from courses listed in the schedule of your chosen BE(Hons) specialisation + ENGGEN 499

Note: If you pass all your courses and complete all other requirements for the BE(Hons) but your performance is deemed not to be of Honours standard, you will be awarded the conjoint degree with a BE.

There are specific egulations related to the other degree component of your conjoint programme. Please consult the Conjoint Degrees' Regulations in the *University of Auckland Calendar* and relevant faculty handbooks to ensure you fulfil the requirements.

Planning a conjoint programme

Planning a conjoint degree can be complex. Your timetable will be a major constraint when selecting your courses. You are advised to select your BE(Hons) courses fi st and then fill our points with courses from your other degree, as the latter usually provides more timetable flexibility. It is recommended that you discuss your courses each year with advisers from both faculties, as well as consulting your programme requirements in Student Services Online.

In general, the BE(Hons) component of a conjoint programme consists of 405 points. This is 75 points less than the full BE(Hons). This reduction in points is accounted for by:

- Replacing the combined 30 points of ENGSCI 111 and ENGGEN 121 with a single 15-point course, ENGGEN 150
- Not including the 15-point General Education course in the Engineering component of the conjoint degree
- Omitting 30 points from Part II or III of the BE(Hons) component that are essentially covered by courses with similar content in the other component of the conjoint degree
- Omitting 15 points from Part IV electives

Semester One			Semester Two		
ENGGEN 140	Engineering Biology and Chemistry	15	CHEMMAT 121	Materials Science	15
ENGGEN 150	Advanced Mechanics and Mathematical Modelling	15	ELECTENG 101	Electrical and Digital Systems	15
			ENGGEN 131	Engineering Computation and Software Development	15
ENGGEN 115 Principles of Engineering Design (Semester One or Two)					15
Conjoint course – General Education (Semester One or Two)					15
Conjoint course (Semester One or Two)					15
Conjoint course (Semester One or Two)					15
ENGGEN 199 English Language Competency					0
ACADINT A01 Academic Integrity Course					0

BCom/BE(Hons) students: Note that for Part I of the BCom, you are not required to complete MATHS 108 (General Mathematics 1), as ENGGEN 150 (Advanced Mechanics and Mathematical Modelling) covers the necessary material.

BMus/BE(hons) students: Please additionally consult with the Creative Arts and Industries by emailing **info-creative@auckland.ac.nz**

The BE(Hons) degree regulations specify that Part I be completed before Part II, which must be completed before Part III, and so forth. While this may not be possible for conjoint enrolments, you should try to follow the principle as closely as possible. When selecting your Engineering courses, discuss your courses with the departmental course adviser to ensure you are covering all necessary prerequisites for your chosen specialisation.

Detailed conjoint planners specific o each BE(Hons) specialisation are available at the Engineering Student Centre and on the Faculty of Engineering website. Information on the requirements of your other degree components can be found in the *University of Auckland Calendar*.

Part I of a conjoint degree

All students approved for a conjoint degree will be expected to have calculus and physics to a level which will enable them to take the course ENGGEN 150 (Advanced Mathematical Modelling and Mechanics) in place of the two courses, ENGSCI 111 and ENGGEN 121. For conjoint students, Part I will therefore be structured as above.

Parts II-IV of a conjoint degree

As a conjoint student you will also choose your preferred Engineering specialisation at the end of Part I. This choice will guide your course selection for Parts II- IV of your BE(Hons). Courses for your other degree will need to fit a ound your BE(Hons) requirements. Use our conjoint degree planners to plan your courses each year, before checking your proposed enrolment with course advisers from both faculties.

NOTE: Because conjoint students complete fewer points than a standard BE(Hons) student, we don't permit courses outside of the approved schedule.

Further opportunities for undergraduate students

Auckland Programme for Space Systems (APSS)

The APSS is designed for students of any area of study throughout the University to collaborate in teams to contribute broadly towards the fie d of space research. It features an annual student-led competition leading to the construction and launch of a satellite into low orbit. For more information, visit **apss.auckland.ac.nz**.

Dean's Leadership Programme (DLP)

This is the Faculty of Engineering's initiative for Part II and III students to develop non-academic skills relevant to an engineering career. It involves mentoring sessions, networking opportunities and internships. Former Vice Chancellor and Faculty of Engineering alumni Sir Colin Maiden is the patron of this programme. Interested students are encouraged to contact **foe-dlp@auckland.ac.nz**.

Study abroad

The University's 360° Auckland Abroad programme lets you complete part of your degree overseas, with a choice of more than 100 universities in 24 countries. As a University of Auckland student, you may be able to study at an overseas partner university of equal standing for a semester. You can enjoy the benefits of the xchange agreement – you'll pay tuition only to Auckland, be eligible to apply for scholarships, and bring credits you've earned to your BE(Hons).

- To study abroad, you must have a 5.0 GPA in your last 120 points of study and be approved by the faculty.
- Unless enrolled in a conjoint degree, BE(Hons) students will usually complete only a single semester of study abroad in Semester Two of Part II, or either semester during Part III of their degree.
- You can't study abroad during Part IV of a BE(Hons). The faculty will not sanction the omission of any points from your GPA at Part IV, as this counts highly for Honours. No Part IV courses are to be taken abroad.
- A maximum of 60 points of Engineering courses at Part II or Part III from an approved academic programme may be credited towards your BE(Hons) from Study Abroad (conjoint students may take points from the other degree in their conjoint).
- Courses taken on exchange are ungraded, they cannot contribute to your Honours GPA, but are recorded on the Student Transcript as "credit".

For more information visit **www.engineering.auckland.ac.nz/student-exchange** or **www.auckland.ac.nz/360.**

Beyond your degree

Graduation

Most students complete a BE(Hons) degree after four academic years (eight semesters) in the Faculty of Engineering. To be eligible to graduate you must have completed practical work requirements, workshop practice, the Academic Integrity course and English language competency requirements, in addition to the academic requirements of your chosen specialisation. You can attend your graduation ceremony and receive your degree in person, or have your degree conferred in absentia. See **www.auckland.ac.nz/graduation.**

Qualification as a professional engineer

To be a fully-qualified p ofessional engineer, you must meet two separate requirements. One of these relates to academic qualific tions and the other to subsequent work experience. Satisfying the academic requirements normally means holding a degree which has been approved by The Institution of Professional Engineers New Zealand (IPENZ), such as the University of Auckland BE(Hons) degree. After graduation you must demonstrate your competence as a practising engineer through work experience. This experience must be of an appropriate type and duration to enable you to apply for professional membership with IPENZ. Typically this membership requires a minimum of three years' experience in the workforce, including fie d, plant and design experience, and at least one year in a responsible position. For further information, visit **www.ipenz.org.nz.**

Preparing for Semester One

English language screening for ENGGEN 199

All students entering the BE(Hons) degree are required to complete ENGGEN 199 (English Language Competency) as a compulsory component of their Part I requirements, even if they are entering the degree at a Part II level.

In order to fulfil the equirements of ENGGEN 199, fi stly you must complete the 30-minute Diagnostic English Language Needs Assessment (DELNA) screening. For most students, the completion of this screening will be sufficie . Results are not graded, except for an indication of whether you have completed (CPL) the requirements for ENGGEN 199.

If a full assessment is requested by the DELNA team, you will be required to complete a two-hour diagnosis, which you must book before the semester's end. If this diagnosis indicates that you need to work on your academic language skills, you will need to do a programme of language skill development coordinated by the University's English Language Enrichment centre (ELE). You will not be permitted to enrol in any further courses until you have met all of the requirements for ENGGEN 199.

The DELNA screenings take place on campus in one of the University's computer labs. We strongly encourage you to book a screening during Orientation and complete this requirement early at **www.delnatask.com/booking.**

Academic Integrity Course – ACADINT A01

All new students are required to complete an academic integrity course, and BE(Hons) students MUST do so in their fi st year of study. We advise you to complete this early in the year before your workload increases. For more information, visit **www.auckland.ac.nz/academic_honesty.**

Academic assistance for undergraduates

Part I Assistance Centre

The faculty employs high-achieving Part II and III students to provide academic assistance to Part I students. The Part I Assistance mentors are trained and maintain close contact throughout the Semester with the Course Coordinators for all Part I courses.

The Part I Assistance Mentors are located in the Leech Study Area level 3 in building 401 from 2-5pm, Monday to Friday, during Semester One and Two. The service is also provided at O'Rorke Hall and University Hall for engineering students living there. For information, contact Alćione Fagundes at **a.fagundes@auckland.ac.nz.**

Tuākana Tutorial Programme

The faculty employs high-achieving Part II and Part III students to provide targeted tutorials and academic support programmes for Māori and Pacific Enginee ing students. Tutorials start in the second week of semester. You will be notified of the tutorial timetable by email. MAPTES students organise their timetables around these tutorials, while General Entry Māori and Pacific students can just turn up when needed.

There are Tuākana tutorials for all core Part I engineering courses: Mathematical Modelling, Mechanics, Design, Biology and Chemistry, Materials Science, Computation and Software, and Electrical. For further information, email **foe-engagement@auckland.ac.nz.**

Scholarships and prizes

More than 40 scholarships ranging from $1,000 to $7,500 are gifted annually by individuals, societies, businesses and industry to promising undergraduate engineering students.

The Faculty of Engineering also offe s up to 22 Kick Start scholarships specifical y for school-leavers applying to Part I of BE(Hons). These scholarships are a one-year award of $2,000 aimed at helping students with "set up" costs for their fi st year at the University of Auckland. **The closing date for all 2017 Kick Start scholarships is 15 January 2017.**

Visit **www.engineering.auckland.ac.nz/scholarships** to find out mo e about engineering undergraduate scholarships, or get further assistance by contacting the Scholarships Offic at **scholarships@auckland.ac.nz.**

Degree specialisations

Biomedical Engineering

www.des.auckland.ac.nz

Biomedical engineers combine engineering, medicine, and biology to resolve challenges in the healthcare industry with the aim of improving the quality of human lives. They respond to challenging problems like: how can we diagnose ill health sooner? How can we design medical therapies and devices for more effecti e treatment and quicker recovery? How might autonomous technology and telemedicine improve healthcare delivery? As the role of technology in healthcare becomes more prominent, biomedical engineers find the selves at the forefront of real-world, life-changing outcomes.

What will I study?

In Parts II and III of the Biomedical Engineering specialisation, you will take courses that provide you with a solid foundation in mathematics, mechanics, bioinstrumentation, engineering design and computation, in addition to medical science courses in biology and physiology. Part IV provides scope to specialise: you can focus on areas that interest you most, such as biomedical imaging, biotechnology, medical devices, computational physiology, or sports science. You will also carry out your own research project based on problems relevant to industry or research. In the past, students have worked on a wide variety of projects including orthopaedic implant design, needle-free jet injection, respiratory technologies, tissue and genetic engineering, instrument design, sports biomechanics, and cardiac diagnostic imaging. You will have excellent facilities and outstanding expertise at your fin ertips within the Faculty of Engineering, the Auckland Bioengineering Institute, the Faculty of Medical and Health Sciences, and the Faculty of Science.

Where will it take me?

Much of the biomedical engineering landscape remains uncharted. Transformative changes are expected over the coming decades, and many areas of the industry remain open for exploration and innovation. As a Biomedical Engineering graduate, you will find ca eer opportunities in biomedical companies, research facilities, hospitals, and government regulatory agencies. You could design medical devices, prostheses or implants, develop drugs or drug delivery systems, improve sports and injury assessment, or work in medical IT. There is high demand for biomedical engineers from established companies in New Zealand and abroad, such as Fisher and Paykel Healthcare, Orion Health, and Siemens. Alternatively, you can start a career working on cutting edge research through a postgraduate programme. Our graduates have made their mark by creating new companies in emerging areas such as implantable and wearable technology. Biomedical engineers are extremely versatile engineers, with a breadth of knowledge that can be applied to seemingly unrelated fie ds, such as software development, electronics, engineering and management consulting, financial modellin , and the food/meat/wool science industries.

Undergraduate course adviser

Dr Vinod Suresh
Room 439.711, 70 Symonds Street
bme-undergrad-adviser@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Biomedical Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
BIOMENG 221	Mechanics of Engineered and Biological Materials	15	BIOMENG 241	Instrumentation and Design	15
BIOSCI 107	Biology for Biomedical Science: Cellular Processes and Development	15	BIOMENG 261	Tissue and Biomolecular Engineering	15
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Managing Design and Communication	15
ENGSCI 233	Computational Techniques and Computer Systems	15	MEDSCI 142	Biology for Biomedical Science: Organ Systems	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
BIOMENG 321	Continuum Modelling in Bioengineering	15	BIOMENG 341	Bioinstrumentation and Design	15
ENGGEN 303	Managing Projects and Innovation	15	ENGSCI 331	Computational Techniques 2	15
ENGSCI 314	Mathematical Modelling 3ES	15	MEDSCI 309	Biophysics of Nerve and Muscle	15
MEDSCI 205	The Physiology of Human Organ Systems	15			
15 points of electives from the following:					
			CHEM 380	Materials Chemistry	15
			CHEM 392	Issues in Drug Design and Development	15
			CHEMMAT 315	Chemical Reactor Engineering	15
			COMPSYS 303	Microcomputers and Embedded Systems	15
			ENGSCI 355	Applied Modelling in Simulation and Optimisation	15
			MATHS 362	Methods in Applied Mathematics	15
			MECHENG 313	Real Time Software Design	15
			MECHENG 352	Manufacturing Systems	15
			MECHENG 371	Digital Circuit Design	15
			MEDSCI 305	Systematic Pharmacology	15
			MEDSCI 312	Endocrinology of Growth and Metabolism	15
			MEDSCI 314	Immunology	15
Or other courses approved by the Head of Department.					
			ENGSCI 309	Image and Digital Signal Processing	15

Please consult the Biomedical Engineering study tracks for a list of Part II and Part III elective suggestions:
www.des.auckland.ac.nz/uoa/bme-tracks

Part IV

120 points comprising:

Semester One			Semester Two		
ENGSCI 700 A & B Research Project					
BIOMENG 791	Advanced Biomedical Engineering Design	15	ENGGEN 403	Managing a Business	15
60 points of electives from the following:					
CHEMMAT 753	Non-metallic Materials	15	CHEMMAT 754	Materials Engineering	15
ELECTENG 722	Control Systems	15	CHEMMAT 757	Engineering Biotechnology	15
ELECTENG 733	Signal Processing	15	ENGSCI 712	Computational Algorithms for Signal Processing	15
ENGSCI 711	Advanced Mathematical Modelling	15	ENGSCI 741	Advanced Mathematical and Computational Modelling in Mechanics	15
ENGSCI 740	Advanced Mechanics in Modern Research and Technology	15	ENGSCI 772	Whole Organ Modelling	15
ENGSCI 753	Computational Techniques in Mechanics and Bioengineering	15	MATHS 764	Mathematical Biology	15
MECHENG 743	Composite Materials	15	MEDSCI 737	Biomedical MRI	15
MEDSCI 703	Advanced Biomedical Imaging	15			
Or other courses approved by the Head of Department (up to 30 points).					
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Chemical and Materials Engineering

www.ecm.auckland.ac.nz

Have you ever wondered how products like petrol, plastic bottles, and synthetic polyester are produced from oil? Or are you more interested in developing new, sustainable replacements to these everyday items? These topics are within the domain of Chemical and Materials Engineering. This sub-discipline involves the transformation of raw materials into valuable end-products, and aims to optimise these transformations to develop high-performance materials for use in our modern, technological society. Chemical and materials engineers understand how to chemically or physically alter a substance in order to produce something useful in the safest, most cost-effecti e way. For this reason, these engineers are often "big picture" professionals, with responsibility for the overall design, operation and quality of what are often giant-scale processes.

What will I study?

Many universities offer sepa ate chemical engineering and materials engineering programmes, so the combination of both disciplines offe ed by the University of Auckland holds real-world value. Throughout your specialisation, you will gain a solid grounding in applied chemistry, materials characterisation, process engineering, energy, and mathematical modelling. You will also get a taste of chemical reactor engineering, food process engineering and biotechnology. You will gain a well-rounded qualific tion and specialist knowledge that can be applied to a number of key industries, both in New Zealand and abroad. With a BE(Hons) in Chemical and Materials Engineering, you will have skills that are particularly important in areas such as plant design and operations, and you will be an expert when it comes to choosing, designing and optimising materials in any business.

Where will it take me?

The Chemical and Materials Engineering specialisation provides graduates with a diverse and exciting range of career opportunities. Major industries requiring employees with this specialist expertise include dairy and food industries, pharmaceuticals, paper and pulp, petrochemicals, energy processing and production, construction and cement, timber, water treatment, resource development and management, electronics, and mineral processing industries such as aluminium and steel production. As well as being essential to the New Zealand economy, these industries are major growth areas on a global scale. Furthermore, as sustainable practices become more important than ever, chemical and material engineers will be required to re-evaluate and re-design many of the fundamental products and processes that these industries have been built upon. Graduates can be found in a wide range of relevant areas, including process operations, research and development, construction and installation, design, manufacturing and production, administration, management and consulting.

Undergraduate course adviser

Dr Peng Cao
Room 529.129B, 2 – 6 Park Avenue
p.cao@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Chemical and Materials Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
CHEMMAT 211	Introduction to Process Engineering	15	CHEMMAT 212	Energy and Processing	15
CHEMMAT 221	Materials	15	CHEMMAT 213	Transfer Processes 1	15
CHEMMAT 242	Applied Chemistry	15	CHEMMAT 232	Process Design 1	15
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Managing Design and Communication	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
CHEMMAT 312	Transfer Processes 2	15	CHEMMAT 313	Advanced Process Engineering	15
CHEMMAT 322	Materials Processing and Performance	15	CHEMMAT 315	Chemical Reactor Engineering	15
CHEMMAT 331	Process Design 2	15	ENGSCI 311	Mathematical Modelling 3	15
ENGGEN 303	Managing Projects and Innovation	15			
15 points of electives from the following:					
			CHEMMAT 317	New Developments in Process Engineering	15
Or other courses approved by the Head of Department.					
			CHEMMAT 754	Materials Engineering	15
			CHEMMAT 755	Electronic Materials and their Applications	15
			CHEMMAT 757	Engineering Biotechnology	15

Part IV

120 points comprising:

Semester One			Semester Two		
CHEMMAT 750 A & B Design Project					30
CHEMMAT 751 A & B Research Project					30
CHEMMAT 752	Process Dynamics and Control	15	ENGGEN 403	Managing a Business	15
30 points of electives from the following:					
CHEMMAT 724	Advanced Materials Characterisation	15	CHEMMAT 754	Materials Engineering	15
CHEMMAT 753	Non-metallic Materials	15	CHEMMAT 755	Electronic Materials and their Applications	15
CHEMMAT 756	Food Process Engineering	15	CHEMMAT 757	Engineering Biotechnology	15
Or other courses approved by the Head of Department, such as:					
			ENGGEN 701	Professional Project	15
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Civil and Environmental Engineering

www.cee.auckland.ac.nz

When you think of engineering, you might imagine a hardhat-wearing project manager overseeing the construction of skyscrapers, motorways, bridges, tunnels or dams. That person is likely to be a civil engineer. Civil engineers plan, design, construct and maintain the projects that make modern life possible. They are the people who calculate the maximum weight a bridge will be able to hold, or work out how to earthquake-proof new buildings. Because environmental protection and sustainability are now crucial factors to consider in any major construction project, environmental expertise is closely linked to civil engineering principles. Environmental engineers are able to technically evaluate structures, equipment and systems for potentially harmful effects of human activity, and design practical solutions that help mitigate further harm to our planet. You can see how, as disciplines, civil and environmental engineering will only become further connected as time passes.

What will I study?

In Part II of the Civil and Environmental Engineering specialisation, you will get a taste of both sub-disciplines: you will learn the fundamentals of structural engineering, environmental principles, fluid mechanics, geotechnical engineering, materials, design and management. In Parts III and IV, you will be able to tailor your electives to focus on either civil or environmental engineering, or maintain a broad coverage of both if you prefer. Regardless of your focus, you will learn how to apply technical maths and science knowledge to the designs of major construction projects, while practising skills in teamwork, management, creativity and communication.

Where will it take me?

As cities continue to grow, aging infrastructure needs replacing and the need to rectify human harm to the environment becomes critical. Graduates will find opportuniti s that involve the design, construction and maintenance of earth structures for roads, dams and urban developments; structural refits and co struction of earthquake-resistant structures in steel, concrete and timber; use of water resources and environmental protection; and general supervision and management of large projects. Our graduates can be found in state-owned enterprises, in regional and district councils, and in the private sector, working as civil engineering contractors or for fi ms of consulting engineers. You might also use your qualific tion as a stepping stone into other careers; a number of our graduates are working in the top echelons of business around the world.

Undergraduate course advisers

Part II: Dr James Lim
Room 401.1012, 20 Symonds Street
james.lim@auckland.ac.nz

Part III: Dr Subeh Chowdhury
Room 404.622. 20 Symonds Street
s.chowdhury@auckland.ac.nz

Part IV: Dr Gary Raftery
Room 401.1012, 20 Symonds Street
g.raftery@auckland.ac.nz

Conjoints/student exchange:
Dr Quincy Ma
Room 401.711, 20 Symonds Street
q.ma@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Civil and Environmental Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
CIVIL 201	Land Information Systems	10	CIVIL 211	Structures and Design 1	10
CIVIL 210	Introduction to Structures	15	CIVIL 221	Geomechanics 1	10
CIVIL 220	Introductory Engineering Geology	10	CIVIL 250	Civil Engineering Materials and Design	10
CIVIL 230	Fluid Mechanics 1	10	ENGGEN 204	Managing Design and Communication	15
ENGSCI 211	Mathematical Modelling 2	15	ENVENG 244	Environmental Engineering 1	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
CIVIL 322	Geomechanics 2	10	CIVIL 361	Transportation Engineering 2	10
CIVIL 331	Hydraulic Engineering	10	ENGSCI 311	Mathematical Modelling 3	15
CIVIL 360	Transportation Engineering 1	10	ENVENG 333	Engineering Hydrology	10
ENGGEN 303	Managing Projects and Innovation	15			
15 points of electives in each of Semester One and Two from the following:					
CIVIL 312	Structures and Design 2	15	CIVIL 313	Structures and Design 3	15
ENVENG 341	Environmental Engineering 2	15	ENVENG 342	Environmental Engineering Design	15
10 points of electives from the following:					
			CIVIL 314	Structural Dynamics	10
			CIVIL 324	Geomechanics 3	10
			CIVIL 332	Fluid Mechanics 2	10

Part IV

120 points comprising:

Semester One			Semester Two		
CIVIL 705 A & B Research Project					30
CIVIL 790	Civil Engineering Administration	15	ENGGEN 403	Managing a Business	15
No less than 30 points of electives from the following:					
CIVIL 713	Structures and Design 4	15	CIVIL 714	Multistorey Building Design	15
CIVIL 731	Water Resources Modelling	15	CIVIL 741	Ground Improvements and Geosynthetics Engineering	15
CIVIL 758	Traffic stems and Design	15	CIVIL 750	Timber Engineering	15
CIVIL 791	Construction Management	15	CIVIL 759	Highway and Transportation Design	15
			ENVENG 701	Urban Stormwater Management	15
			ENVENG 740	Water and Wastewater Engineering	15
Up to 30 points of electives from the following:					
CIVIL 718	Light Gauge Steel	15	CIVIL 715	Advanced Structural Concrete	15
CIVIL 719	Matrix Structural Analysis	15	CIVIL 726	Engineering Geology	15
CIVIL 721	Foundation Engineering	15	CIVIL 733	Coastal Engineering 1	15
CIVIL 722	Slope Engineering	15	CIVIL 782	Water Resource Engineering	15
ENVENG 702	Engineering Decision Making in Aotearoa	15			
ENVENG 746	Surface Water Quality Modelling	15			
ENVENG 747	Soil-Contaminant Fate Processes and Modelling	15			
Or other courses approved by the Head of Department (up to 15 points), such as:					
CIVIL 701	Studies in Civil Engineering 1	15	CIVIL 706	Special Topic	15
			CIVIL 710	Advanced Structural Dynamics	15
			CIVIL 743	Special Topic: Building Information Modelling	15
			ENGGEN 701	Professional Project	15
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Computer Systems Engineering

www.ece.auckland.ac.nz

Computer systems are present in almost every aspect of our world, with structures hidden in numerous electro-mechanical environments. Computers are used as controllers and components of wireless communication systems, home automation systems, appliances, automobiles, factory processes, mechatronics, instrumentation, embedded systems and nanosystems. Computer Systems Engineering is a crucial branch of discipline that solves practical engineering problems, often by embedding a computer system into a large and complex operation. These computers must function in the real world, so their design requires specialised knowledge that encompasses both hardware and software. A degree in Computer Systems Engineering will provide you with the fundamental tools to keep up with this fast-paced area of expanding innovation.

What will I study?

As it's not possible to provide a lasting professional education based on the technology alone, a BE(Hons) in Computer Systems Engineering provides a well-rounded foundation that will equip you for this dynamic and rapidly changing fie d.

You will study a combination of: fundamental knowledge in computer systems, practical skills in hardware and software design, and general problem solving skills required for designing and building systems. Through stimulating project work and exposure to a variety of existing and innovative electronic, hardware and software technologies, you will learn about embedded systems, computational intelligence, computer architecture, distributed computing, information engineering, intelligent robotics, industrial decision support systems, home automation, automobiles and instrumentation. All of this is supplemented with a solid grounding in electrical and electronic engineering.

Where will it take me?

There are vast opportunities for computer systems engineers. As a graduate, you may work in the mainstream computer industry or in other areas of electrical and computer engineering. Career options exist in multinational computer companies, consultancy fi ms, the telecommunications industry, and in the research and development teams of companies in a multitude of sectors. You might become a software and hardware designer for embedded computing devices, a computer network manager, a product development engineer, a system test or automation engineer, an embedded systems designer, or a fie d specialist. As an extension of your Part IV research project, you could develop a new technology and form your own start-up. Or, you might decide on a research-oriented career pathway and continue into postgraduate study. Whatever your path, we are confident th t you won't be short of options.

Undergraduate course adviser

Dr Morteza Biglari-Abhari
Room 401.708, 20 Symonds Street
m.abhari@auckland.ac.nz

Part II

120 points comprising:

Semester One			Semester Two		
COMPSYS 201	Fundamentals of Computer Engineering	15	COMPSYS 202	Object Oriented Design and Programming	15
ELECTENG 202	Circuits and Systems	15	ELECTENG 204	Engineering Electromagnets	15
ELECTENG 210	Electronics 1	15	ELECTENG 209	Analogue and Digital Design	15
ENGSCI 211	Mathematical modelling 2	15	ENGGEN 204	Managing Design and Communication	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
COMPSYS 302	Design: Software Practice	15	COMPSYS 301	Design: Hardware Software Systems	15
COMPSYS 305	Digital Systems Design 1	15	ELECTENG 303	Systems and Control	15
ENGGEN 303	Managing Projects and Innovation	15			
ENGSCI 313	Mathematical Modelling 3ECE	15			
30 points of electives from the following:					
			COMPSYS 303	Microcomputers and Embedded Systems	15
			COMPSYS 304	Computer Architecture	15
			SOFTENG 325	Software Architecture	15
Or other courses approved by the Head of Department.					

Part IV

120 points comprising:

Semester One			Semester Two		
ELECTENG 700 A & B Research Project					30
			ENGGEN 403	Managing a Business	15
75 points of electives from the following (at least 45 points recommended to be from COMPSYS 7XX courses):					
COMPSYS 701	Advanced Digital Systems Design	15	COMPSYS 704	Advanced Embedded Systems	15
COMPSYS 723	Embedded Systems Design	15	COMPSYS 705	Formal Methods for Engineers	15
COMPSYS 726	Robotics and Intelligent Systems	15	COMPSYS 725	Computer Networks and Distributed Applications	15
ELECTENG 722	Control Systems	15	ELECTENG 704	Advanced Control Systems	15
ELECTENG 732	Communication Systems	15	ELECTENG 726	Digital Communications	15
ELECTENG 733	Signal Processing	15	SOFTENG 761	Agile and Lean Software Development	15
ELECTENG 734	Power Electronics	15			
SOFTENG 701	Advanced Software Engineering Development Methods	15			
SOFTENG 751	High Performance Computing	15			
Or other courses approved by the Head of Department (up to 15 points), such as:					
			ENGGEN 701	Professional Project	15
			ENGGEN 705	Advanced Innovation and New Product Development	15
Students who take ENGGEN 701 are not permitted to enrol for ENGGEN 705 and vice versa.					
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Electrical and Electronic Engineering

www.ece.auckland.ac.nz

Modern society is highly dependent on reliable power, communications and electronic systems. Electrical and electronic engineers design the equipment and systems that provide these essential services. This sub-discipline encompasses a range of exciting and diverse fie ds, from heavy electrical power generation, to sophisticated medical electronics, computer modelling, electromagnetics, information technology and expert systems. We will have electrical and electronic engineers to thank when new forms of green electricity are developed, when electric vehicles replace our fossil fuel-powered fleet, and when smart phones recharge by resting on an inductively-powered mat, rather than requiring a plug point.

What will I study?

The pace of change in electrical and electronic engineering is so rapid that it's neither possible nor desirable to cover all aspects of current technology within a four-year degree programme, even in a focused fie d of specialisation. With our programme, you will get a solid foundation of basic science, engineering science, electrical engineering, and selected fie ds of current technology. You can later build upon this as you progress in your career as a professional engineer. In Part II, you'll learn about electrical materials and electronic devices, circuit theory, software design and mathematical modelling tools. We provide an introduction to engineering electromagnetics and computer systems, and the programme is broadened by examining how engineers communicate material of a complex and technical nature. These strands of knowledge are further developed in the core courses of Part III. Elective courses of your choice throughout Parts III and IV allow you to further specialise in specific a eas that interest you.

Where will it take me?

Virtually no other engineering discipline changes as rapidly as Electrical and Electronic Engineering. With this in mind, it may be difficult o envision the types of technology you might be working on by the time you graduate – they may not even be invented yet! However, it is safe to assume you'll have a broad number of opportunities available to you after graduation. Our graduates are employed in roles relating to communications, wireless computing technologies, electronics, instrumentation, power electronics and motor-control. Opportunities also exist in processing industries such as timber, pulp and paper, steel, aluminium, meat, and dairy.

Undergraduate course adviser

Dr Stevan Berber
Room 401.709, 20 Symonds Street
s.berber@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Electrical and Electronic Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
COMPSYS 201	Fundamentals of Computer Engineering	15	COMPSYS 202	Object Oriented Design and Programming	15
ELECTENG 202	Circuits and Systems	15	ELECTENG 204	Engineering Electromagnetics	15
ELECTENG 210	Electronics 1	15	ELECTENG 209	Analogue and Digital Design	15
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Managing Design and Communication	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
ELECTENG 310	Electrical Engineering Design 1	15	ELECTENG 303	Systems and Control	15
ENGGEN 303	Managing Projects and Innovation	15	ELECTENG 305	Electronics 2	15
ENGSCI 313	Mathematical Modelling 3ECE	15	ELECTENG 311	Electrical Engineering Design 2	15
30 points of electives from the following:					
COMPSYS 302	Design: Software Practice	15	COMPSYS 303	Microcomputers and Embedded Systems	15
COMPSYS 305	Digital Systems Design 1	15	COMPSYS 304	Computer Architecture	15
ELECTENG 307	Transmission Lines and Systems	15	ELECTENG 309	Power Apparatus and Systems	15
			SOFTENG 325	Software Architecture	15
Or other courses approved by the Head of Department.					

Part IV

120 points comprising:

Semester One			Semester Two		
COMPSYS 700A & B Research Project					30
			ENGGEN 403	Managing a Business	15
75 points of electives from the following:					
COMPSYS 723	Embedded Systems Design	15	COMPSYS 704	Advanced Embedded Systems	15
COMPSYS 726	Robotics and Intelligent Systems	15	ELECTENG 701	Wireless Communication	15
ELECTENG 721	Radio Systems	15	ELECTENG 703	Advanced Power Systems	15
ELECTENG 722	Control Systems	15	ELECTENG 704	Advanced Control Systems	15
ELECTENG 731	Power Systems	15	ELECTENG 724	Special Topic	15
ELECTENG 732	Communication Systems	15	ELECTENG 726	Digital Communications	15
ELECTENG 733	Signal Processing	15	ELECTENG 735	Green Energy Technologies	15
ELECTENG 734	Power Electronics	15	ELECTENG 736	Analog and Digital Filter Synthesis	15
			ELECTENG 738	Selected Topics in Advanced Power Systems	15
Or other courses approved by the Head of Department, such as:					
			ENGGEN 701	Professional Project	15
			ENGGEN 705	Advanced Innovation and New Product Development	15
Students who take ENGGEN 701 are not permitted to enrol for ENGGEN 705 and vice versa.					
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Engineering Science

www.des.auckland.ac.nz

Engineering scientists are problem solvers. They use their intellect and advanced computing and mathematical skills to find be ter solutions for many aspects of our daily lives. How can a forest be managed to make a profit whi e still remaining environmentally friendly? How can a sail be designed to work in low wind conditions? What prices should be charged for airline tickets to maximise the revenue from a given flight? Th se are all questions an engineering scientist can answer. Engineering scientists are becoming increasingly important to modern society as their understanding of science, mathematics and computing underpins how everything operates around us, and their unique skill set can be applied to an extremely broad range of everyday problems.

What will I study?

In addition to core courses in mathematics, design, mechanics and computational techniques, you will be able to choose elective courses in areas that interest you most. You might align with one of the themes of Engineering Science: operations research, or computational mechanics. Operations research, or "the science of better", involves solving mathematical puzzles to design the best solutions to practical problems, such as optimising bicycle routes. Computational mechanics examines how the application of force affects diff ent materials – for instance, how a car is damaged when it crashes, or how a bubble rises. Other study areas include environmental modelling, biomedical engineering, analytics and financial m thematics. The diverse range of options available throughout your degree will directly contribute to your own professional versatility.

Where will it take me?

As a graduate with skills spanning mathematics, mechanics, computers, problem solving and project management, you will be able to apply yourself to a very wide range of business areas. You might end up modelling an optimal production process for a large manufacturer, using your advanced programming skills as a software designer, or applying your logical thinking and communications skills in a management position with a bank or financial co sultancy. Our graduates are found in many leading companies such as Fonterra, Air New Zealand, Meridian Energy, Navman, Orion, government organisations such as NIWA and Transpower, and engineering consultancies such as Beca and Maunsell.

Undergraduate course adviser

Dr John Cater
Room 439.341
engsci-undergrad-adviser@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Engineering Science specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
BIOMENG 221	Mechanics of Engineered and Biological Materials	15	ENGGEN 204	Managing Design and Communication	15
ENGSCI 211	Mathematical Modelling 2	15	ENGSCI 263	Engineering Science Design I	15
ENGSCI 233	Computational Techniques and Computer Systems	15			
ENGSCI 255 Modelling in Operations Research (Semester One or Two)		15			
30 points of electives approved by the Head of Department.					
ENGGEN 299 Workshop Practice to be completed during Part II		0			

Part III

120 points comprising:

Semester One			Semester Two		
ENGGEN 303	Managing Projects and Innovation	15	ENGSCI 331	Computational Techniques 2	15
ENGSCI 314	Mathematical Modelling 3ES	15	ENGSCI 363	Engineering Science Design II	15
ENGSCI 343	Mathematical and Computational Modelling in Mechanics	15			
ENGSCI 391	Optimisation in Operations Research	15			
30 points of electives approved by the Head of Department, such as:					
			ENGSCI 344	Modelling and Simulation in Computational Mechanics	15
			ENGSCI 355	Applied Modelling in Simulation and Optimisation	15

Please consult the Engineering Science study tracks for a list of Part II and Part III elective suggestions:
www.des.auckland.ac.nz/uoa/engsci-tracks

Part IV

120 points comprising:

Semester One			Semester Two		
ENGSCI 700 A & B Research Project					30
			ENGGEN 403	Managing a Business	15
75 points of electives from the following:					
ENGSCI 711	Advanced Mathematical Modelling	15	ENGSCI 712	Computational Algorithms for Signal Processing	15
ENGSCI 740	Advanced Mechanics in Modern Research and Technology	15	ENGSCI 741	Advanced Mathematical and Computational Modelling in Mechanics	15
ENGSCI 753	Computational Techniques in Mechanics and Bioengineering	15	ENGSCI 763	Advanced Simulation and Stochastic Optimisation	15
ENGSCI 760	Algorithms for Optimisation	15	ENGSCI 768	Advanced Operations Research and Analytics	15
ENGSCI 761	Integer and Multi-objective Optimisation	15	GEOTHERM 785	Geothermal and Reservoir Engineering	15
ENGSCI 762	Scheduling and Optimisation in Decision Making	15			
Or other courses approved by the Head of Department (up to 30 points), such as:					
			ENGSCI 772	Whole Organ Modelling	15
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Mechanical Engineering

www.mech.auckland.ac.nz

Mechanical engineers apply science and technology to the design, production and operation of mechanical devices, machinery and systems. They are technical experts in mathematical modelling, materials, thermal engineering, fluid dynamics, vibrations and structure, and can design complex systems such as robots, wind turbines and cars. Their versatility allows them to work in diffe ent scales, from nanotechnologies to large-scale industrial machinery and processes such as paper mills or car assembly plants.

What will I study?

As a Mechanical Engineering student, you will learn the fundamentals of engineering science – dynamics, fluid mechanics, heat transfer, thermodynamics, industrial engineering, control systems, solid mechanics and materials. You will then apply this theory to practical problems, while practising essential aspects of professional engineering, including: design, communication and project management. In Part IV, you will be able to choose elective courses to specialise in a fie d that interests you. Throughout our specialisation, we emphasise design and project work, so that you are able to practise applying your knowledge to the development of new products.

Where will it take me?

Mechanical engineers can use their knowledge and skills in a wide range of industries. As a graduate, you might pursue opportunities in major primary process plants that produce things like wood pulp, dairy, meat, aluminium, steel, petroleum, and electricity. You might build rockets or yachts, or be employed in the manufacturing industries, designing and manufacturing medical devices, washing machines, machine tools, or agricultural machinery. The transport industry employs mechanical engineers to ensure that ships, trains, aircraft and buses are operating reliably and efficien y. Many of our graduates work as consulting engineers; they are commissioned by other companies to provide design, construction and technical advice. For example, companies planning a new brewery, an airport baggage-handling system or an air-conditioning system would usually turn to a consulting mechanical engineer. Because graduates are valued for their analytical and problem-solving skills, there are also opportunities for them in commercial areas like insurance assessment, banking, and management.

Undergraduate course adviser

Dr Stuart Norris
Room 401.703, 20 Symonds Street
s.norris@auckland.ac.nz

Conjoints: Dr Karl Stol
Room 401.905, 20 Symonds Street
k.stol@auckland.ac.nz

Exchange: Dr Hazim Namik
Room 401.1004, 20 Symonds Street
h.namik@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Mechanical Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Managing Design and Communication	15
MECHENG 235	Design and Manufacture 1	15	MECHENG 211	Thermofluids	15
MECHENG 242	Mechanics of Materials 1	15	MECHENG 222	Dynamics	15
			MECHENG 236	Design and Manufacture 2	15
15 points of electives from the following:					
MECHENG 201	Electronics and Computing for Mechanical Engineers	15			
Or other courses approved by the Head of Department.					
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
ENGGEN 303	Managing Projects and Innovation	15	ENGSCI 311	Mathematical Modelling 3	15
MECHENG 322	Control Systems	15	MECHENG 311	Thermal Engineering	15
MECHENG 334	Engineering Design 3M	15	MECHENG 325	Dynamics of Fluids and Structures	15
MECHENG 340	Mechanics of Materials 2	15	MECHENG 352	Manufacturing Systems	15

Part IV

120 points comprising:

Semester One			Semester Two		
MECHENG 700 A & B Research Project					
MECHENG 731	Engineering Design 4M	15	ENGGEN 403	Managing a Business	15
60 points of electives from the following:					
MECHENG 712	Aerohydrodynamics	15	MECHENG 715	Building Services	15
MECHENG 713	Energy Technology	15	MECHENG 724	Multivariable Control Systems	15
MECHENG 722	Engineering Vibrations	15	MECHENG 726	Acoustics for Engineers	15
MECHENG 743	Composite Materials	15	MECHENG 747	Manufacturing and Industrial Processes	15
MECHENG 752	Technology Management	15	ENGGEN 701	Professional Project	15
Or other courses approved by the Head of Department, such as:					
			ENGGEN 705	Advanced Innovation and New Product Development	15
Students who take ENGGEN 701 are not permitted to enrol for ENGGEN 705 and vice versa.					
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Mechatronics Engineering

www.mech.auckland.ac.nz

Mechatronics Engineering integrates mechanical design, electronics, and computer systems to design and develop automated systems. Specialists in this discipline work with sensors and actuators, develop control algorithms, and use advanced functional materials to design mechatronic products such as chassis-stabilising systems, anti-lock brakes, engine control units, disk drives, drones, service and surgical robots, and medical devices. All of these systems are largely mechanical in nature, but could not function without their essential electronic and computer control system components. Mechatronics engineers are often generalists rather than specialists, and this versatility can lead to employment in a very wide range of industries. Mechatronics engineers often work in and coordinate teams of diffe ent engineering disciplines.

What will I study?

The Department of Mechanical Engineering has offe ed this specialisation since 2002. Because a significant number of co e courses in Parts II are identical to those required for the Mechanical Engineering specialisation, Mechatronics students are provided with a strong foundation in mechanical engineering. This is supplemented with an emphasis on software design and electronics courses. After Part III, the balance between mechanical, electrical and computer engineering courses is almost equal. You will study software design, sensors and actuators, signal processing, analogue and digital circuit design, microcontroller systems, systems modelling, digital control and industrial automation which will guide you towards various projects in Part IV that require comprehensive knowledge across the disciplines.

A particular feature of the degree programme is the strong emphasis placed on design and project work, in which students apply their knowledge to the development of new products, and learn to develop skills in teamwork and communication.

Where will it take me?

Career prospects for mechatronics engineers are outstanding: our recent survey results indicate that 100% of graduates are pursuing relevant employment or further study. In recent years, Mechatronics Engineering has become an internationally-recognised sub-discipline, with degree programmes now offe ed in a number of universities worldwide. Because of your broad foundations in several key areas of engineering – mechanics, electronics and computer systems – your employment opportunities as a mechatronics graduate will be plentiful and varied. Our degree programme is in line with the modern world's desire for a high-tech, knowledge-based economy, and as society moves closer toward 'smart' homes, cities and grids, mechatronics engineers will be in high demand. Our graduates are employed a wide range of jobs that involve the design and improvement of high-tech products, such as home appliances, medical devices and machine tools, and processes related to precision agriculture and remote sensing.

Undergraduate course adviser

Dr Yusuke Hioka
Room 401.714, 20 Symonds Street
y.hioka@auckland.ac.nz

Exchange: Dr Hazim Namik
Room 401.1004, 20 Symonds Street
h.namik@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Mechatronics Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Managing Design and Communication	15
MECHENG 235	Design and Manufacture 1	15	MECHENG 211	Thermofluids	15
MECHENG 242	Mechanics of Materials 1	15	MECHENG 222	Dynamics	15
			MECHENG 270	Software Design	15
15 points of electives from the following:					
ELECTENG 208	Electric Circuit Analysis	15			
Or other courses approved by the Head of Department.					
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
ENGGEN 303	Managing Projects and Innovation	15	ENGSCI 311	Mathematical Modelling 3	15
MECHENG 312	Sensors and Actuators	15	MECHENG 313	Real Time Software Design	15
MECHENG 322	Control Systems	15	MECHENG 325	Dynamics of Fluids and Structures	15
MECHENG 370	Analog Circuit Design	15	MECHENG 371	Digital Circuit Design	15

Part IV

120 points comprising:

Semester One			Semester Two		
MECHENG 700 A & B Mechatronics Research Project					30
MECHENG 705	Mechatronics Systems	15	ENGGEN 403	Managing a Business	15
MECHENG 706	Mechatronics Design	15			
45 points of electives from the following:					
COMPSYS 726	Robotics and Intelligent Systems	15	MECHENG 715	Building Services	15
MECHENG 709	Industrial Automation	15	MECHENG 724	Multivariable Control Systems	15
MECHENG 712	Aerohydrodynamics	15	MECHENG 726	Acoustics for Engineers	15
MECHENG 722	Engineering Vibrations	15	MECHENG 735	MEMS and Microsystems	15
MECHENG 743	Composite Materials	15	MECHENG 736	Biomechatronic Systems	15
MECHENG 752	Technology Management	15	MECHENG 747	Manufacturing and Industrial Processes	15
			ENGGEN 701	Professional Project	15
Or other courses approved by the Head of Department, such as:					
			ENGGEN 705	Advanced Innovation and New Product Development	15
Students who take ENGGEN 701 are not permitted to enrol for ENGGEN 705 and vice versa.					
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Software Engineering

www.ece.auckland.ac.nz

Software engineers are part of the foundation of most sectors in today's economy. From small-scale items such as smartphones, to full telecommunication networks, they have direct impacts on our day-to-day lives. Software Engineering involves creating cost-effecti e solutions for developing and maintaining software systems in the service of society. Software engineers combine their expertise in computer science, engineering and mathematics to design, develop and test their applications for various uses. The sub-discipline involves software architecture, system performance, testing and quality assurance, requirements engineering, computer and human interaction, computer security, and documentation, amongst considerations of ethical, social, legal, economic, and safety issues. This area of engineering is complex and fast-paced, but propelled by the momentum of intuitive software and app development, the possibilities stretch as far as your imagination.

What will I study?

The Software Engineering specialisation produces graduates capable of engineering large, complex, and fault-tolerant systems that function reliably and can be effecti ely developed and maintained. You will build on the general engineering literacy you acquired in Part I by developing specialist software and programming knowledge. You will learn about operating systems, programming languages, computer organisation and architecture, software design and construction, data communications and algorithm design and analysis, all alongside fundamental mathematics, project management, and professional ethics. Our degree is co-taught by the Departments of Electrical and Computer Engineering and Computer Science. This means you will receive a strong engineering perspective in addition to skills and knowledge relating to modern computing applications, technology, and systems. By the end of Part IV, you'll not only have superior ICT training, but also an ability to understand and work through the entire lifecycle of software development and maintenance.

Where will it take me?

We consider Software Engineers to be the newest generation of ICT workforce leaders, and believe graduates will continue to be in demand for the foreseeable future. Infrastructure, government agencies, businesses and individuals are increasingly reliant on intuitive and dependable cloud-based software. With a BE(Hons) in Software Engineering, you can work in virtually any company, managing their information storage and sharing technologies. You will also find amp e opportunities in dedicated software consultancy fi ms, where you'll be discussing requirements with clients and designing solutions, making quotes and meeting budgets, and potentially directing your own team. You might end up in management, as an ICT CEO, CTO, project leader or specialist technical lead. Other graduates have extended their Part IV projects with postgraduate research, using this to launch their very own start-up companies.

Undergraduate course adviser

Dr Catherine Watson
Room 401.706, 20 Symonds Street
c.watson@auckland.ac.nz

Courses outlined here for Parts II, III and IV of the Software Engineering specialisation are being taught in 2017.

Part II

120 points comprising:

Semester One			Semester Two		
COMPSYS 201	Fundamentals of Computer Engineering	15	ENGGEN 204	Managing Design and Communication	15
ENGSCI 213	Mathematical Modelling 2SE	15	SOFTENG 206	Software Engineering Design 1	15
SOFTENG 250	Introduction to Data Structures and Algorithms	15	SOFTENG 211	Software Engineering Theory	15
SOFTENG 251	Object Oriented Software Construction	15	SOFTENG 254	Quality Assurance	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
ENGGEN 303	Managing Projects and Innovation	15	SOFTENG 306	Software Engineering Design 2	15
SOFTENG 350	Human Computer Interaction	15	SOFTENG 325	Software Architecture	15
SOFTENG 351	Fundamentals of Database Systems	15	SOFTENG 370	Operating Systems	15
30 points of electives from the following:					
COMPSCI 373	Computer Graphics and Image Processing	15	COMPSCI 367	Artificial In elligence	15
COMPSYS 305	Digital Systems Design 1	15	COMPSYS 303	Microcomputers and Embedded Systems	15
SOFTENG 364	Computer Networks	15	COMPSYS 304	Computer Architecture	15
Or other courses approved by the Head of Department.					

Part IV

120 points comprising:

Semester One			Semester Two		
SOFTENG 700 A & B Research Project					30
SOFTENG 750	Software Development Methodologies	15	ENGGEN 403	Managing a Business	15
45 points of electives from the following:					
COMPSYS 723	Embedded Systems Design	15	COMPSYS 705	Formal Methods for Engineers	15
COMPSYS 726	Robotics and Intelligent Systems	15	SOFTENG 702	Advanced Human Computer Interaction	15
ENGSCI 760	Algorithms for Optimisation	15	SOFTENG 752	Formal Specific tion and Design	15
SOFTENG 701	Advanced Software Engineering Development Methods	15	SOFTENG 761	Agile and Lean Software Development	15
SOFTENG 751	High Performance Computing	15			
Or other courses approved by the Head of Department (up to 30 points).					
ENGGEN 499 Practical Work to be completed before and during Part IV					0
SOFTENG 753	Special Topic: Foundations of (Bayesian) Machine Learning	15	SOFTENG 754	Special Topic: Requirements Engineering	15

Course descriptions

Biomedical Engineering

Part II

BIOMENG 221 (15 Points)
Mechanics of Engineered and Biological Materials

The principles of mechanics and the special circumstances associated with applying these principles to living and prosthetic structures will be presented. Topics include: introduction to linear elasticity, stresses and strains specific o direct and torsional loading, material constitutive relationships (including anisotropy, nonlinearity, and viscoelasticity), axial and transverse loading of bone, pressure loading of the heart, and theories of failure.

BIOMENG 241 (15 Points)
Instrumentation and Design

An introduction to engineering instrumentation related to the measurement of biological signals. Topics include: Fundamentals of measurement systems (electric circuits, basic electronics, frequency domain signal analysis and transient analysis, measurement systems). This course will cover the design methodology of instrumentation systems and include an instrumentation design project.

Prerequisite: ELECTENG 101

BIOMENG 261 (15 Points)
Tissue and Biomolecular Engineering

Overview of molecular and tissue engineering principles emphasising biochemical kinetics, gene regulation, cell behaviour and biomedical ethics. Laboratory practice and design project in cell culture and molecular biology techniques. Topics include enzymes and regulation of metabolic pathways, thermodynamic principles of biochemical reactions, systems biology and regulatory motifs in biochemical networks, cell culture techniques, research and medical ethics.

Prerequisite: BIOSCI 107, ENGSCI 211

Restriction: BIOMENG 361

Part III

BIOMENG 321 (15 Points)
Continuum Modelling in Bioengineering

An introduction to continuum modelling approaches to bioengineering problems across a range of spatial scales. Topics include: tensor analysis, molecular and cellular mechanics of striated muscle; fini e deformation elasticity and constitutive relations for soft biological materials; conservation equations for momentum, mass and heat transfer in fluids; viscous flow; boundary layers; pure conduction and diffusion; dvective transport of mass and heat.

Restriction: ENGSCI 343

BIOMENG 341 (15 Points)
Bioinstrumentation and Design

Sensors and actuators (temperature, position, force, pressure, flow, bioelectric, optical sensors and instruments). Signals, systems and controls (s-domain signal notation, transfer functions, frequency response functions, block diagrams, the Laplace transform, fi st and second order systems, characterisation methods, fundamentals of control). Bioinstrumentation design methodology, Biomedical instrumentation design project.

Part IV

BIOMENG 791 (15 Points)
Advanced Biomedical Engineering Design

An engineering project requiring the application and integration of material taught in lecture courses to the design of medical devices and

software to meet client needs. The project also requires consideration of ethical issues, social impact, safety risks, and international regulations.

Prerequisite: BIOMENG 341

Chemical and materials engineering

Part I

CHEMMAT 121 (15 Points) Materials Science

Introduction to materials science starting with the fundamentals of atomic structure and bonding and how this builds up a microstructure to create a solid. Metals, polymers, ceramics, electronic materials, composite and biomaterials will be covered and the properties, advantages and disadvantages of each discussed. Considerations such as corrosion, degradation and failure will be studied with a focus on improving design and creating new materials for our future world.

Part II

CHEMMAT 211 (15 Points) Introduction to Process Engineering

Materials and energy balancing with and without chemical reaction, materials and energy balances in multiphase systems such as crystallisation, evaporation, drying, humidific tion, dehumidific tion, absorption, distillation, extraction and filt ation. An introduction to the most important unit operations in the chemical industry, design concept and safety as applied to processing.

CHEMMAT 212 (15 Points) Energy and Processing

Introduction to thermodynamics for process engineering. The second law of thermodynamics. Thermodynamics of power and refrigeration cycles and flow processes. Classical chemical thermodynamics including concepts of chemical potential, fugacity and activities; their applications to vapour-liquid equilibria and reacting systems. Multi-component physical equilibria. Multiple reaction equilibria and system-free energy minimisation. Practical examples and applications.

CHEMMAT 213 (15 Points) Transfer Processes 1

Fluid properties: specific g avity, viscosity, surface tension and types of flow. Fluid statics and manometry. Math models of fluid motion: the Bernoulli equation. Dimensional analysis and similitude: Reynolds Number, Friction factor and Prandtl number. Flow measurement, pumps/ pumping and valves. Heat transfer via steady state conduction, convection and radiation. Effect of eometry, force and natural convection. Dimensionless correlations of heat transfer processes with flow processes. Film and overall heat transfer coefficients. actical examples and applications.

CHEMMAT 221 (15 Points) Materials

Solid state transformation – diffusion, v cancies, solidific tion, nucleation and growth. Dislocations and plastic deformation, strengthening mechanisms. Mechanical performance of materials. Iron-carbon alloy systems and transformations (including pearlitic, austenitic, bainitic and martensitic), effects of al oying elements. Analytical methods: X-ray diff action and electron microscopy.

Prerequisite: CHEMMAT 121

CHEMMAT 232 (15 Points) Process Design 1

Mechanics of solids and analysis of stress and strain. Introduction to materials selection. Design of thin walled pressure vessels. Application to the design of vessels, tanks, reactors, piping and heat transfer equipment. Introduction to the chemical industry, unit operations, line diagrams and process equipment. Report writing and oral communication skills.

Prerequisite: ENGGEN 121

Restriction: CHEMMAT 231

CHEMMAT 242 (15 Points)
Applied Chemistry

Fundamental chemistry required for chemical engineering and materials engineering. Topics may include phase equilibrium, reaction kinetics, thermodynamics, surface chemistry, electrochemistry and polymer chemistry.

Prerequisite: ENGGEN 140 or CHEM 110 or 120

Part III

CHEMMAT 312 (15 Points)
Transfer Processes 2

Principles of continuous and staged processes. Mass transfer in various media, systems and phases. Interrelating equipment design to mass transfer processes. Studies of selected separation processes such as absorption, solvent extraction, and distillation. Heat transfer with phase change; nucleate and film boiling of liquids

Prerequisite: CHEMMAT 242

CHEMMAT 313 (15 Points)
Advanced Process Engineering

An in-depth analysis of selected topics that influence the design, operation, and performance of process plants. Topics may include particulate technology, particle mechanics and particle motions, non-Newtonian fluid flow, two-phase solid-liquid and gas-liquid flow, flow through porous media and packed beds, filt ation, centrifugation, fluidisation, variable-analysis of variations in materials and product processing, membrane separation methods and optimisation techniques.

Prerequisite: CHEMMAT 213

Restriction: CHEMMAT 316, 411

CHEMMAT 315 (15 Points)
Chemical Reactor Engineering

Kinetics of multiple reactions, analysis of basic reactors – batch, plug flow, and continuous stirred tank. Performance under isothermal, adiabatic, and varying temperature. Effect of semi continuous, counterflow and recycle on performance. Heterogeneous reactions and catalysis, diffusion and eaction in porous catalysts, effects of xternal mass transfer resistance, fi ed and fluidised bed reactors, gas-liquid reactors. Reactor engineering for biological and electrochemical systems.

Prerequisite: CHEMMAT 212, 242

CHEMMAT 317 (15 Points)
New Developments in Process Engineering

Important current and developing technologies used in energy production, storage and management, both globally and in New Zealand. They include: energy sources and uses, biomass and biofuels, energy storage, petroleum processing, solar thermal stations, and photovoltaics.

Prerequisite: CHEMMAT 211

CHEMMAT 322 (15 Points)
Materials Processing and Performance

Materials processing for three main categories of materials: metallic, polymeric and ceramic. Topics include liquid metal processing, metal deformation technologies, performance of metals and alloys, corrosion principles and practice, polymer processing technologies, polymer structure property relationship, polymeric materials applications, ceramics processing technologies, microstructure/property/performance of typical ceramics.

Prerequisite: CHEMMAT 121

Restriction: CHEMMAT 321, 421

CHEMMAT 331 (15 Points)
Process Design 2

The nature and function of design – process conception, alternatives, constraints and their simulation. Raw materials, safety and environmental considerations. Flow sheet representation of information. Separation systems, heat exchanger networks, and specific tion of equipment. Process economics and project documentation.

Prerequisite: CHEMMAT 232

Part II

CHEMMAT 724 (15 Points)
Advanced Materials Characterisation

The underlying theory essential to understanding modern methods of advanced materials analysis including: electron microscopy, surface analysis, atomic force microscopy and nanoindentation. Teaching is highly research informed with examples drawn from the Research Centre for Surface and

Materials Science (RCSMS) and involves principles, practical experience and independent project work related to the application of these techniques.

Prerequisite: CHEMMAT 121 or equivalent

CHEMMAT 750A (15 Points)
CHEMMAT 750B (15 Points)
Design Project

Specific tion, planning and executing a specific process design project. The detailed considerations in the project to include environmental impact, safety and occupational health issues, material selection, process energy demand and efficie y, costing and economics, process start-up and operation.

Prerequisite: CHEMMAT 331

Restriction: CHEMMAT 431, 432

To complete this course students must enrol in *CHEMMAT 750 A and B*

CHEMMAT 751A (15 Points)
CHEMMAT 751B (15 Points)
Research Project

Students are required to submit a report on independent investigation carried out on a topic assigned by the Head of Department of Chemical and Materials Engineering. The work shall be supervised by a member of staff.

Restriction: CHEMMAT 441, 442

To complete this course students must enrol in *CHEMMAT 751 A and B*

CHEMMAT 752 (15 Points)
Process Dynamics and Control

Application of mathematical modelling and simulation for understanding modern methods of process control via open-ended workshop study projects. Includes rigorous treatment of control fundamentals (dynamics, hardware, transient analysis, feedback, tuning), advanced classical control (feed-forward, cascade), and advanced control (multiple variable control, whole plant control and model predictive control). Research informed with examples from the Industrial Information and Control Centre (I2C2).

Prerequisite: ENGSCI 211

Restriction: CHEMMAT 311, 411, 412

CHEMMAT 753 (15 Points)
Non-metallic Materials

Polymers – structure and physical properties, influence of structure and temperature on mechanical properties. Engineering polymers and design. Biological materials – structural and hierarchical relationships, structural proteins, natural fib es. Biological tissues as integrated multicomponent systems. Growth, adaptation and remodelling. Ceramics – bonding, structure, mechanical and thermal properties, high performance ceramics, glasses and composites, processing techniques.

Prerequisite: CHEMMAT 121

Restriction: CHEMMAT 422

CHEMMAT 754 (15 Points)
Materials Engineering

Advanced aspects of mechanical behaviour, primarily application of fracture mechanics and failure analysis. Nanomaterials and nanotechnology, synthesis, processing and characterisation of nanomaterials. Applications in devices – sensing, catalysis and biomedical areas. Selected topics on surface engineering – coating and thin fil s technology. Further topics on tribology, friction and wear of materials, powder metallurgy, welding technologies.

Prerequisite: CHEMMAT 121

Restriction: CHEMMAT 423

CHEMMAT 755 (15 Points) Electronic Materials and their Applications

Introduction to electronic properties of materials and their applications. Contents include: basic theories of electrical conduction, conducting and insulating materials, semiconductor properties and materials, dielectric, magnetic, optical, thermal and sensing properties and materials, and superconductors. This course will cover the basic properties, processing methods and performance of electronic materials. The applications of electronic materials in energy and environmental engineering will be emphasised.

Prerequisite: CHEMMAT 121

Restriction: CHEMMAT 424

CHEMMAT 756 (15 Points) Food Process Engineering

Application of engineering principles to food processing. Study of main food processing operations: heating and thermal processing, cooling, freezing and thawing, evaporation, dehydration, the use of membranes and packaging. Innovative thermal and non-thermal food processes, and most fundamental areas of engineering relevant for food processing such as heat and mass transfer, are covered. Process impact on food safety, quality and preservation is also discussed.

Prerequisite: ENGSCI 111 or MATHS 108

Restriction: CHEMMAT 463

CHEMMAT 757 (15 Points) Engineering Biotechnology

Principles of biochemical engineering. Exploitation of bioreaction and bioprocess systems. Enzyme and microbial reaction kinetics, bioreactor design and downstream processing. Examples of biochemical process and food industry applications.

Prerequisite: ENGSCI 111 or equivalent

Restriction: CHEMMAT 361, 464, FOODSCI 704

Civil Engineering

Part II

CIVIL 201 (10 Points) Land Information Systems

Aspects of elementary engineering surveying as used for gathering site information for the design and setting out of works. Land information systems, modern methods of gathering, processing and presenting information for engineering purposes.

CIVIL 210 (15 Points) Introduction to Structures

Structural forms and systems. Analysis of determinate systems, elasticity. Engineering beam theory, elasticity, failure theories. Introduction to structural design.

Prerequisite: ENGGEN 121 or 150

Restriction: ENVENG 210, RESOURCE 210

CIVIL 211 (10 Points) Structures and Design 1

Introduction to structural design – philosophy, loads, codes; design of simple structural elements in various materials.

CIVIL 220 (10 Points) Introductory Engineering Geology

Principles of physical and structural geology. Elementary stratigraphy. Applied geomorphology. Geologic surveying and mapping. Elementary seismology; microzoning and seismotectonic hazard evaluation. Engineering properties, description and identific tion of geologic materials. General applications of geology to engineering.

CIVIL 221 (10 Points) Geomechanics 1

The basic concepts and principles governing the mechanical behaviour of soil, including phase relationships, permeability and seepage, the principle of effecti e stress, soil strength, compressibility and basic stability analysis.

CIVIL 230 (10 Points)
Fluid Mechanics 1

Fluid properties and definitio s. Hydrostatics and stability of floating bodies. Fluid flow, energy and continuity relationships. Viscosity. Force and momentum relationship. Dimensional analysis and similarity. Introduction to turbomachinery.

CIVIL 250 (10 Points)
Civil Engineering Materials and Design

Properties and manufacturing of concrete, steel and timber structural products. Design principles and examples for concrete, steel and timber members.

Part III

CIVIL 312 (15 Points)
Structures and Design 2

Structural analysis of indeterminate structures. Moment-area method for deformations. Loading actions as per NZS 1170 and load collation. Design of structural members in timber portal frames.

CIVIL 313 (15 Points)
Structures and Design 3

Design of structures in reinforced concrete, prestressed concrete and structural steel. Computer analysis of structures; use of a commercial analysis program. Design project.

CIVIL 314 (10 Points)
Structural Dynamics

Dynamics of single and multi-degree-of-freedom systems. Ground motion, response spectra, time-history and spectral modal analysis; introduction to seismic design.

CIVIL 322 (10 Points)
Geomechanics 2

Stability analysis in geotechnical engineering; slope stability, soil pressures on retaining structures, bearing capacity. Consolidation and settlement.

Prerequisite: CIVIL 221

CIVIL 324 (10 Points)
Geomechanics 3

Shear strength of soil – triaxial testing, measurement of pore water pressures, and interpretation of test data. Effecti e and total stress paths for drained and undrained loading in laboratory tests and fie d applications. Consolidation and the use of preloading to accelerate consolidation. Application of elastic solutions in geomechanics.

Prerequisite: CIVIL 322 or equivalent

Restriction: CIVIL 420, 728

CIVIL 331 (10 Points)
Hydraulic Engineering

Pipe flow – fluid resistance, friction factor, simple pipe flow and minor losses, steady-state pipe flow and pipe networks. Open channel flow – energy and momentum, uniform flow and flow resistance, critical flow, specific ene gy and flow force, backwater analysis, channel transitions.

CIVIL 332 (10 Points)
Fluid Mechanics 2

Laminar and turbulent flow. Ideal fluid flows. Boundary layer theory and separation, drag and lift. River morphology and flows. River pollution. Unsteady flow in channels.

CIVIL 360 (10 Points)
Transportation Engineering 1

Highway alignment geometrics (horizontal, vertical and cross sectional design). Basis of the main pavement design techniques, pavement materials, stabilisation, compaction and bituminous surfacings.

CIVIL 361 (10 Points)
Transportation Engineering 2

Planning for land transport facilities and urban development. Arrangement of street networks and environmental areas. Basic operational analyses at priority and signalised intersections for vehicles and pedestrians. Highway capacity analyses. Parking design. Introduction to transportation planning modelling.

Part IV

CIVIL 701 (15 Points)
Studies in Civil Engineering 1

Advanced course on topics to be determined each year by the Head of Department of Civil and Environmental Engineering.

CIVIL 705A (15 Points)
CIVIL 705B (15 Points)
Research Project

Restriction: CIVIL 408

To complete this course students must enrol in *CIVIL 705 A and B*

CIVIL 706 (15 Points)
Special Topic

Restriction: CIVIL 406

CIVIL 710 (15 Points)
Advanced Structural Dynamics

Advanced topics in structural dynamics, such as wave guide representation, holistic consideration of structural behaviour including soil, main and secondary structures interaction, nonlinearities of soil-foundation-structure system including uplift, pile-soil separation, plastic hinge or pounding. The core skills are taught and accompanied by an individual project in which independent research is undertaken to solve a challenging structural dynamics problem.

Prerequisite: Departmental approval

CIVIL 713 (15 Points)
Structures and Design 4

Continuation of the design and detailing of structures in structural steel, reinforced concrete, reinforced masonry, and timber including connections in steelwork, composite steel/concrete beams, masonry structures and retaining walls in reinforced masonry. Practical understanding and design of concrete ground floor slabs. Introduction to the NZ Standard for light timber frame construction. Introduction to fi e engineering. Techniques in the checking of existing structures and lessons learned from failures.

Prerequisite: CIVIL 312 and 313 or equivalent

Restriction: CIVIL 411

CIVIL 714 (15 Points)
Multistorey Building Design

Techniques for the design of structures to resist seismic loading. Derivation of design actions, alternative structural systems for resisting these loads, design of structural components subject to cyclic inelastic action, detailing of members and joints to enhance earthquake resistance. Techniques of seismic isolation. Design project.

Prerequisite: CIVIL 313 or equivalent

CIVIL 715 (15 Points)
Advanced Structural Concrete

Behaviour of reinforced and prestressed concrete components and systems under complex loading and environmental conditions. Thermal and other loading conditions in bridge structures.

Prerequisite: CIVIL 313 or equivalent

CIVIL 718 (15 Points)
Light Gauge Steel

Use of thin steel load bearing structural components in walls, floors and roofs. Behaviour of members and connections under the full range of structural actions. Theory and design application including the Direct Strength Method of design. Use of light gauge steel acting compositely with other materials such as concrete and structural foams.

Prerequisite: CIVIL 313 or equivalent

CIVIL 719 (15 Points)
Matrix Structural Analysis

Direct stiffn ss method applied to linear, nonlinear and stability analyses. Introduction to variational principles and fini e element method. Projects in practical modelling of major structures such as bridges and multi-storey buildings. Use of commercial software.

Restriction: CIVIL 416

CIVIL 721 (15 Points)
Foundation Engineering

Foundation performance requirements. Foundation types. Foundation design loads. Limit state design. Design of shallow foundations. Design of deep foundation. Case histories illustrating construction, performance and failure of foundations. Design and performance of gravity retaining structures, embedded retaining walls and reinforced earth walls.

Prerequisite: CIVIL 312 or equivalent

Restriction: CIVIL 323, 421

CIVIL 722 (15 Points)
Slope Engineering

Site investigation for slope assessment. Geological appraisal of slope behaviour and the use of aerial photographs. Failure mechanisms, shear strength of soil and rock masses. Influence of groundwater. Evaluation of stability and risk. Earth dams, stability analysis, flow net construction. Slope instrumentation. Remedial measures.

Restriction: ENVENG 324, CIVIL 422

CIVIL 725 (15 Points)
Geotechnical Earthquake Engineering

Advanced topics in earthquake effects on geotechnical structures, including: dynamic properties of soils; earthquake-induced ground response; seismic stability of slopes, embankments; earth-retaining structures; soil liquefaction; ground deformations; remediation and mitigation techniques. Design applications and advanced methods of analysis with case history analyses of major earthquakes. An independent research project will be used to solve a challenging geotechnical earthquake engineering problem.

Prerequisite: CIVIL 324 or equivalent

CIVIL 726 (15 Points)
Engineering Geology

Introduction to fundamentals in soil and rock mechanics and their application to engineering projects. Discussion of natural hazards and their implications on infrastructure design. Practical exercises in fie d mapping, core logging, aerial photograph interpretation, and basic laboratory tests.

Restriction: CIVIL 404, EARTHSCI 372, GEOLOGY 372

CIVIL 731 (15 Points)
Water Resources Modelling

Risk and uncertainty in water resources systems; evaluation of alternatives in water resources; hydrologic modelling; hydraulic modelling; river basin modelling; water resources economics.

CIVIL 733 (15 Points)
Coastal Engineering 1

Coastal, port and ocean engineering. Theories governing waves, tides and currents. Design of structures subject to a marine environment.

CIVIL 741 (15 Points)
Ground Improvements and Geosynthetics Engineering

Advanced ground improvement techniques including: densific tion, consolidation, preloading and surcharge, soil reinforcement, stabilisation and thermal ground improvement.

Prerequisite: CIVIL 322 or equivalent

Restriction: CIVIL 403

CIVIL 743 (15 Points)
Special Topic: Building Information Modelling

Introduction to the main principles and tools of Building Information Modelling (BIM) in the Architecture-Engineering-Construction (AEC) industry. This course is suitable for diffe ent AEC professionals such as civil and structural engineers, architects, among others.

CIVIL 750 (15 Points)
Timber Engineering

The practical understanding of timber and its use in the construction industry. Design and detailing techniques for connections in timber structures, plywood structures, pole structures, timber floor

systems, bridges, multi-storey buildings, formwork and falsework, arches and cable stayed systems.

Prerequisite: CIVIL 312 or equivalent

Restriction: CIVIL 451

CIVIL 758 (15 Points)
Traffic Systems Design

Traffic signal timing an ysis. Gap acceptance parameters. Intersection analysis of performance (priority, roundabouts and signalised). Some human factors. Introduction to transportation planning modelling. Planning land transport in NZ under the Resource Management and other requirements. Computer modelling and simulation.

Prerequisite: CIVIL 361

Restriction: CIVIL 403, 460, 660

CIVIL 759 (15 Points) Highway and Transportation Design

Economic and environmental assessments of transport projects. Land transport funding in NZ. Road safety engineering. Crash reduction and prevention methods. Pavement asset management. Pavement rehabilitation techniques. Heavy-duty pavements, highway drainage and chip seal design.

Prerequisite: CIVIL 360

Restriction: CIVIL 461, 661

CIVIL 782 (15 Points)
Water Resources Engineering

A selection from the following: reservoir design and optimisation, flood control and design of flood control structures, micro to large scale hydroelectric engineering, river engineering and sedimentation. A water resources engineering design project.

Prerequisite: ENVENG 333 or equivalent

Restriction: CIVIL 480, 482

CIVIL 790 (15 Points)
Civil Engineering Administration

The application of legal principles to problems in civil engineering and environmental engineering management. Examines the administration of national and international engineering contracts. Discusses statutes affecting enginee ing business. Investigates the implications of resource management and natural resource allocation legislation on engineering projects. Analyses processes for resolving engineering disputes.

Restriction: CIVIL 401, 490

CIVIL 791 (15 Points)
Construction Management

Understanding topics necessary for effecti e construction management. Using a generic construction project life cycle, essential aspects of construction projects including client brief preparation, the tendering process, preparing tenders, tender evaluation, project planning, resource allocation, teamwork, site safety and contract types are covered. Case studies are used to reinforce the application of theoretical ideas to the successful running of construction projects.

Restriction: CIVIL 409

Computer Systems Engineering

Part II

COMPSYS 201 (15 Points)
Fundamentals of Computer Engineering

Digital systems and binary coding; binary numbers; Boolean algebra and computer logic; combinational logic circuits; sequential logic circuits; hardware description language; digital design flow; register transfer level descriptions and design; data paths and control units; from circuits to microprocessors; basic computer organisation; introduction to modern microprocessors; timers and interfacing; C and assembly language for microprocessors; designing digital systems using microprocessors.

Prerequisite: ELECTENG 101

COMPSYS 202 (15 Points)
Object Oriented Design and Programming

A project-based course with extensive hands-on programming experience. Includes: an introduction to object oriented design including UML, sequence diagrams, use-case analysis; an introduction to object oriented programming in a modern high level language, algorithms, data abstraction and elementary data structures.

Prerequisite: ENGGEN 131 or ENGSCI 131

Part III

COMPSYS 301 (15 Points)
Design: Hardware Software Systems

An appreciation of the engineering design process as applied to computer systems. Design skills are enhanced through engineering projects which typically include elements of: computer hardware design, computer software design, system design and control, sensing, actuation and interfacing.

Prerequisite: COMPSYS 302, and COMPSYS 305 or ELECTENG 304, and ELECTENG 206 or 209

COMPSYS 302 (15 Points)
Design: Software Practice

A project-based course to gain experience in software design emphasising problem solving techniques and applications in computer systems engineering. The course includes practical, real-world project(s) involving a representative subset of the following topics: algorithm and data structure selection and implementation, parsing and translation, object-orientated and multi-threaded programming, scripting languages, peer-to-peer communication over internet.

Prerequisite: COMPSYS 202 or ELECTENG 203

COMPSYS 303 (15 Points)
Microcomputers and Embedded Systems

Embedded applications. Microprocessors, microcontrollers, architecture, organisation, programming memories, I/O interfacing. Sensors, actuators, analog interfaces. Hardware/Software partitioning and interfacing. Concurrency. Implementing data transformations and reactivity. Case studies.

Prerequisite: COMPSYS 202 or SOFTENG 251, and COMPSYS 201

COMPSYS 304 (15 Points)
Computer Architecture

Modern processor architectures. Principles of modern processor design; pipelining; memory hierarchies; I/O and network interfacing; compiler and OS support; embedded processors; performance; multiprocessing.

Prerequisite: 15 points from COMPSYS 201, ELECTENG 205

COMPSYS 305 (15 Points)
Digital Systems Design 1

Digital Systems implementation technologies with emphasis on hardware description languages and design abstraction levels; structural, architectural and behavioural modelling; register-transfer level design; datapath and control units; functional and timing simulations; FPGA-based implementation design flow and case studies.

Prerequisite: COMPSYS 201

Part IV

COMPSYS 700A (15 Points)
COMPSYS 700B (15 Points)
Research Project

Students are required to submit a report on project work carried out on a Computer Systems Engineering topic assigned by the Head of Department. The work shall be supervised by a member of staff.

Prerequisite: COMPSYS 301, and 45 points from COMPSCI 313, COMPSYS 302, 303, 304, 305, ELECTENG 303, 304

Restriction: COMPSYS 401

To complete this course students must enrol in *COMPSYS 700 A and B*

COMPSYS 701 (15 Points)
Advanced Digital Systems Design

Advanced concepts in digital design including: System-on-Chip (system level description, behavioural and register-transfer descriptions); advanced modelling techniques and design flows; design space exploration and optimisation; hardware-software partitioning and trade-offs; component reusability; reconfi urable systems; low-power systems; case studies (speech, image, video algorithms implementation, application specific p ocessor design); individual research projects to analyse the problem, model and implement the required hardware-software components.

Prerequisite: 15 points from COMPSYS 305, ELECTENG 304 or equivalent

COMPSYS 704 (15 Points)
Advanced Embedded Systems

Selected advanced topics from current research in embedded systems such as: embedded systems based on formal models of computation; centralised and distributed architectures for embedded systems; static and dynamic embedded systems; languages and frameworks for distributed embedded systems; actor and agent systems; verific tion. Includes a significant indivi ual research project.

Prerequisite: COMPSYS 302, 723 or SOFTENG 306

COMPSYS 705 (15 Points)
Formal Methods for Engineers

Mathematical modelling techniques for embedded, automation, and mechatronic systems; advanced techniques for validation and verific tion; techniques for formal specific tion; methods of verific tion such as bisimulation and model checking; state space explosion problem and solutions such as BDDs, symbolic model checking, and modular verific tion; verific tion of HDL/C using model checking tools. Includes a significant individual research project.

Prerequisite: COMPSYS 302, 305 or ELECTENG 304 or SOFTENG 211

COMPSYS 723 (15 Points)
Embedded Systems Design

Concurrency and models of computation, task models and race conditions, real-time operating systems based approach, synchronous approach, Safe state machines, key properties: determinism and reactivity, SoPC and MPSoC, cyber-physical embedded systems, static analysis techniques, case studies in smart grid, automotive, medical devices and the like.

Prerequisite: COMPSYS 303, 304 or ELECTENG 304 or SOFTENG 370

Restriction: COMPSYS 402, 403, 727

COMPSYS 725 (15 Points)
Computer Networks and Distributed Applications

Network layers and protocols. Packet switching. Broadband network principles. Low versus high bandwidth services. Network interfaces and instrumentation. Wireless networks in embedded applications. Industrial networking.

Prerequisite: COMPSYS 201 or ELECTENG 205, and COMPSYS 202 or ELECTENG 203

Restriction: COMPSYS 405

COMPSYS 726 (15 Points)
Robotics and Intelligent Systems

Robotics and intelligent systems, including: robot manipulators and mobile robots, navigation techniques, planning and programming of robot actions, sensors and actuators, kinematic analysis and may include topics in artificial in elligence, artificial neu al nets, fuzzy systems, genetic algorithms. Core concepts are extended by an individual research project where a challenging robotics problem is analysed and a solution implemented and tested.

Prerequisite: 15 points from COMPSYS 302, MECHENG 313, SOFTENG 306

Restriction: COMPSYS 406

Electrical and Electronic Engineering

Part I

ELECTENG 101 (15 Points)
Electrical and Digital Systems

An introduction to electrical, computer and electronic systems and technology. Digital circuits and analysis techniques, computer organisation. Analog circuits and analysis techniques. Inductive power transfer, power systems and electric machines. Communication systems.

Restriction: ELECTENG 202, 204, 208, 210

Part II

ELECTENG 202 (15 Points)
Circuits and Systems

This course aims to provide a good understanding of the way electrical circuits work. It covers DC and AC circuit theorems and analysis; transient analysis, including the Laplace transform; transfer functions; AC power calculations; and time and frequency representation of signals.

Prerequisite: ELECTENG 101

ELECTENG 204 (15 Points)
Engineering Electromagnetics

Electrical conduction theories, conducting materials and insulators, magnetic and dielectric properties and materials, electrostatics and magnetostatics, steady electric currents, the magnetic fie d of steady electric currents, Ampere's law and its applications, electromagnetic induction, Faraday's law and its applications, electromagnetism, simple transmission lines, magnetic circuits, permanent magnets, inductors, transformers, introduction to electrical machines.

Prerequisite: ELECTENG 101

ELECTENG 208 (15 Points)
Electric Circuit Analysis

Aims to provide a good understanding of the way electrical circuits work. The course covers DC and AC circuit theorems and analysis. It also introduces some semiconductor devices (diodes, transistors and operational amplifie s) and gives examples of their applications.

Prerequisite: ELECTENG 101 Restriction: ELECTENG 202

ELECTENG 209 (15 Points)
Analogue and Digital Design

This project-based course provides an introduction to real-world design of analogue and digital circuits. Practical skills will be gained in electronic circuit analysis, use of CAD tools, PCB design and construction, circuit testing and calibration using laboratory equipment. Appropriate design method-ology will be developed in a practical framework.

Prerequisite: ELECTENG 101, 202, ELECTENG 205 or COMPSYS 201, ELECTENG 207 or 210

ELECTENG 210 (15 Points)
Electronics 1

Semiconductor devices and applications, diodes, bipolar junction transistors and operational amplifie s. Elementary device physics. Linear and non-linear devices, terminal characteristics, small-signal modelling and analysis. Frequency-dependent behaviour of circuits and analysis methods. Linear and non-linear circuits such amplifie s and switching circuits. Biasing, coupling and bypass techniques. Operational amplifie s, frequency-dependence and characteristic limitations, frequency selective and non-linear switching circuits.

Prerequisite: ELECTENG 101

Part III

ELECTENG 303 (15 Points)
Systems and Control

Introduction to linear, time-invariant, continuous-time system theory from both a time-domain and frequency domain standpoint. This leads on to the fundamental body of knowledge underlying the control and enhancement of system behaviour, with application to the analysis and control of electrical systems.

Prerequisite: ELECTENG 202

ELECTENG 305 (15 Points)
Electronics 2

The operation, analysis and design of a range of electronic devices and systems will be discussed, taking examples from the full spectrum of electrical engineering. Such analysis will consider non-ideal circuit models and their frequency dependence. Selected applications will be taken from the fie ds of signal conditioning, amplifie s, communications systems and energy conversion.

Prerequisite: ELECTENG 202, 207 or 210

ELECTENG 307 (15 Points)
Transmission Lines and Systems

The basic concepts of electromagnetism are completed with a formal treatment of Maxwell's equations and their applications, including electromagnetic wave propagation, transmission lines, the Smith chart and an introduction to antennas and radio systems.

Prerequisite: ELECTENG 204

ELECTENG 309 (15 Points)
Power Apparatus and Systems

Introduces students to three-phase electric machines and power system components. Covers theory, modelling and practical aspects for synchronous machines, induction machines, transformer connections, transmission lines and substation components.

Prerequisite: ELECTENG 204

ELECTENG 310 (15 Points)
Electrical Engineering Design 1

An appreciation of the design process as applied to various electrical and electronic engineering systems. Design skills are enhanced through a variety of engineering projects which typically introduce students to modelling, simulation and analogue and digital electronic hardware design.

Prerequisite: ELECTENG 202, ELECTENG 203 or COMPSYS 202, ELECTENG 205 or COMPSYS 201, ELECTENG 206 or 209, ELECTENG 207 or 210

ELECTENG 311 (15 Points)
Electrical Engineering Design 2

The formal introduction to the design process is completed by one or more open-ended projects which typically include elements of design from concept to working prototype.

Prerequisite: ELECTENG 310 or ELECTENG 203, 205, 206, 207

Part IV

ELECTENG 700A (15 Points)
ELECTENG 700B (15 Points)
Research Project

Students are required to submit a report on project work carried out on a topic assigned by the Head of Department. The work shall be supervised by a member of staff.

Prerequisite: ELECTENG 303, 305, ELECTENG 301 or 310 and 311 Restriction: ELECTENG 401.
To complete this course students must enrol in *ELECTENG 700 A and B*

ELECTENG 701 (15 Points)
Wireless Communication

Aspects of the design and planning of wireless communication systems. Introduction to cellular system design. Issues related to radio propagation: multipath, path loss prediction, channel characterisation. System aspects: cellular technologies, system planning and reliability estimation. Wireless systems and standards.

Prerequisite: ELECTENG 421 or 721

ELECTENG 703 (15 Points)
Advanced Power Systems

Electricity markets: structure, pricing, optimisation, ancillary services; Power system protection practices; Distribution network development: Smart Grid, Demand Side participation; HVDC and FACT Devices Theory and Application; Renewable energy grid integration.

Prerequisite: ELECTENG 411 or 731 Restriction: ELECTENG 738

ELECTENG 704 (15 Points)
Advanced Control Systems

Advanced theory of modern control systems with emphasis on optimisation techniques for both deterministic and stochastic processes. State-space modelling of dynamic systems and choice of suitable performance criteria. Adaptive, nonlinear and sliding mode control systems. Core concepts are extended by an individual research project in which a challenging control problem is analysed and solved.

Prerequisite: ELECTENG 422 or 722

ELECTENG 721 (15 Points)
Radio Systems

Transmission lines and waveguides, impedance matching, devices. Radio propagation, antennas and arrays. Radio system design – mobile, point-to-point, area coverage.

Prerequisite: ELECTENG 302 or 306 or 307

Restriction: ELECTENG 421, 737

ELECTENG 722 (15 Points)
Control Systems

State space analysis, relationship to transfer function methods, controllability and observability, multivariable plant. Computer simulation. Stability considerations. State variable feedback. Digital control system, design and realisation of digital controllers, adaptive controllers. Nonlinear systems, phase-plane and describing function techniques, Liapunov's method of stability analysis, design of controllers for non-linear systems. Variable structure systems.

Prerequisite: ELECTENG 303

Restriction: ELECTENG 422

ELECTENG 724 (15 Points)
Special Topic

An advanced course on topics to be determined each year by the Head of Department.

ELECTENG 726 (15 Points)
Digital Communications

Advanced principles and techniques in digital transmission systems: base-band and pass-band digital systems. Geometric representation of signals: theory of orthonormal signals, correlation demodulators, optimal detector. Digital phase (PSK) and frequency (FSK) modulation. Digital communication systems with noise. Information theory, capacity theorem and applications. Signal and information coding: data compression, digital transmission, error detection and correction, block and convolutional codes. Noise, thermal noise, noise fi ure. Traffic theo . Digital networks and OSI model.

Prerequisite: ELECTENG 303, 732

Restriction: ELECTENG 426, 741

ELECTENG 731 (15 Points)
Power Systems

Builds on the knowledge of three-phase power systems components to understand modelling, formulation and typical analysis carried out by electricity transmission, distribution and generation entities. Load flow, fault, stability and power quality. Supplemented by laboratories where students learn to use professional software to implement the theoretical aspects.

Prerequisite: ELECTENG 302 or 309

Restriction: ELECTENG 411

ELECTENG 732 (15 Points)
Communication Systems

Analog AM and FM modulation. Noise in AM and FM systems. AM modulators and demodulators. Coherent and non-coherent receivers. Superheterodyne receivers. Multiplexing: FDM,

TDM, CDMA. Pulse modulation. Nyquist theorem; PCM modulation and multiplexing. Baseband digital transmission; optimal fil ering; matched fil er detection; probability of error. Intersymbol interference, waveform coding and data compression, base-band data transmission. Introduction to digital systems and modulations.

Prerequisite: ELECTENG 303

Restriction: ELECTENG 412

ELECTENG 733 (15 Points) Signal Processing

Analog signals and systems: Spectral analysis, linear time-invariant systems, power spectral density, correlation, and the Weiner-Khinchine theorem. Digital signals and systems: Sequence classific tion, linear and circular convolution and correlation, Z-transform, discrete Fourier transform, causality and stability conditions. Random signal analysis: Representation, functions of a random variable, multiple random variables, random vectors, correlation, stochastic processes, stationarity, ergodicity, and spectral analysis.

Prerequisite: ELECTENG 303

Restriction: ELECTENG 413

ELECTENG 734 (15 Points) Power Electronics

Selected advanced concepts in power electronics are introduced through a practical and research based individual design project, utilising modern power converter topologies with supporting lectures that include: inductive power transfer and control, DC-DC converter design and control, high frequency magnetics design, semiconductor switches, practical design issues, controlled rectifie s and PWM converters with application to conventional and brushless DC motors.

Prerequisite: ELECTENG 303

Restriction: ELECTENG 414

ELECTENG 735 (15 Points) Green Energy Technologies

Advanced green energy technologies with examples from current industry practice and cutting edge research developments. Topics include: renewable energy systems, distributed power generation, energy storage techniques, transportation electrific tion, power converters for renewable energy integration, soft-switched resonant converters, wireless power transfer, new semiconductor devices, motor drives, and LED lighting.

Prerequisite: ELECTENG 734

ELECTENG 736 (15 Points) Analog and Digital Filter Synthesis

Filter concepts and network functions, a review of approximation techniques and frequency transformations, leading to a thorough treatment of passive, active and digital fil er implementations.

Prerequisite: ELECTENG 303

Restriction: ELECTENG 416

ELECTENG 738 (15 Points) Selected Topics in Advanced Power Systems

Electricity markets: structure, pricing, optimisation, ancillary services; Power system protection practices; Distribution Network Development: Smart Grids, Demand Side Participation, Integration of DG/renewable sources and Electric Vehicles. Core concepts are extended by an individual research project, a self-guided protection laboratory and industry engagement in advanced power system practices.

Prerequisite: ELECTENG 411 or 731

Restriction: ELECTENG 703

Energy Technology

Part IV

GEOTHERM 785 (15 Points)
Geothermal and Reservoir Engineering

Topics include: worldwide geothermal development, types of geothermal systems, geothermal geology, resource estimation, thermodynamics, properties of water and steam, steam-fie d equipment, geothermal power cycles, direct use of geothermal energy, completion tests, two-phase flow, flow measurements, geothermal reservoir engineering modelling theory, reinjection, scaling and corrosion, drilling engineering, heat exchangers, geothermal well-test analysis, stimulation, sedimentary geology, oil and gas formation, petroleum reservoir engineering.

Prerequisite: CHEMMAT 313 or ENGSCI 343 or MECHENG 311, and ENGSCI 311 or 313 or 314

Restriction: GEOTHERM 601, 602, 603, 620

Engineering General

Part I

ENGGEN 115 (15 Points)
Principles of Engineering Design

An introduction to the principles of design as a fundamental part of engineering practice and a foundation for subsequent design courses. Students are also introduced to essential drawing skills and CAD, and complete group-based design projects. Topics include systems life cycle, design, and introductions to professional issues such as health and safety, ethics, sustainability, cultural diversity, communication, leadership and teamwork.

ENGGEN 121 (15 Points)
Engineering Mechanics

An introduction to planar mechanics including: free body diagrams, planar equilibrium of rigid bodies, friction, distributed forces, internal forces, shear force and bending moment diagrams, kinematics and kinetics of particles, work and energy, relative motion, kinematics and kinetics of rigid bodies.

Restriction: CIVIL 210, MECHENG 222

ENGGEN 131 (15 Points)
Introduction to Engineering Computation and Software Development

Introduction to problem solving in engineering through the use of the software package MATLAB, and the high level programming language C.

Restriction: ENGSCI 233, 331

ENGGEN 140 (15 Points)
Engineering Biology and Chemistry

Introduction to chemical and biological systems. The application of engineering analysis and design techniques to facilitate understanding the multiscale structure, function and interactions of such systems. The use of case studies to illustrate systems approaches to chemistry and biology.

ENGGEN 150 (15 Points)
Advanced Mechanics and Mathematical Modelling

An accelerated course replacing ENGGEN 121 and ENGSCI 111 for well-prepared and conjoint students. Topics include: Free body diagrams, equilibrium of rigid bodies, internal forces, shear force and bending moment diagrams, work and energy, motion of particles and rigid bodies. Introduction to mathematical modelling. Diffe entiation and integration. Diffe ential equations, Vector and matrix algebra. Introduction to probability.

Restriction: ENGGEN 121, ENGSCI 111

Part II

ENGGEN 204 (15 Points)
Managing Design and Communication

The management of engineering design based on systems engineering, plus the practical application of advocacy, and individual and group-based

communication skills. Scenarios representative of real-world issues are addressed through team-based projects and problem solving. The professional issues introduced in ENGGEN 115 (health and safety, ethics, sustainability, cultural diversity, communication, leadership and teamwork) are continued and developed.

Prerequisite: ENGGEN 115, 199

Part III

ENGGEN 303 (15 Points) Managing Projects and Innovation

Introduction to theory and practice of managing projects, innovation, product development and service delivery. Students work in interdisciplinary teams to complete a project based on a complex real-world systems scenario. Project management and innovation topics are integrated with design studies covered in previous courses, and extended to wider business issues of risk and opportunities, entrepreneurship, financial mana ement and regulatory issues.

Prerequisite: ENGGEN 204 and 104 OR 199

Part IV

ENGGEN 403 (15 Points) Managing a Business

An introduction to the commercial drivers and business practices which prepare students for successful roles in the commercial, government and non-profit sec ors after graduation. Students are presented with a systems thinking approach to managing large, complex, multidisciplinary challenges. Professional issues (such as health and safety, sustainability, resilience, ethics, leadership and cultural diversity) from previous courses are expanded.

Prerequisite: ENGGEN 303

ENGGEN 701 (15 Points) Professional Project

A comprehensive investigation, analysis and reporting of a complex engineering design, development or professional engineering problem. Problem synthesis, solution specific tion, development and reporting as approved by the Head of Department of Mechanical Engineering.

Prerequisite: Departmental approval required

Restriction: ENGGEN 401, 405, 410, 705

ENGGEN 705 (15 Points) Advanced Innovation and New Product Development

An advanced course dealing with the theoretical foundations of innovation, design and new product development. Theory is linked to practice in multidisciplinary teams engaged in innovation and design simulations and case studies.

Prerequisite: ENGGEN 303 with a grade of B or better

Restriction: ENGGEN 401, 405, 410, 701, MGMT 305

Engineering Science

Part I

ENGSCI 111 (15 Points) Mathematical Modelling 1

Introduction to mathematical modelling. Diffe entiation and integration (polynomials, trigonometric, exponential, logarithmic, and rational functions). Integration by parts, substitution and partial fractions. Diffe ential equations and their solutions (including Euler's method). Vector and matrix algebra, transformations, solving systems of linear equations. Modelling using probability.

Restriction: ENGSCI 211, 213, 311, 313, 314, MATHS 150, 153

Part II

ENGSCI 211 (15 Points)
Mathematical Modelling 2

First and second order ordinary diffe ential equations and solutions. Laplace transforms. Taylor series and series in general. Multivariable and vector calculus including divergence, gradient and curl. Further linear algebra. Eigenvalues and eigenvectors. Fourier series. Application of the techniques through appropriate modelling examples. Introductory data analysis and statistics.

Prerequisite: ENGSCI 111 or ENGGEN 150 or MATHS 150 or 153 or at least a B+ in MATHS 108

Restriction: ENGSCI 213

ENGSCI 213 (15 Points)
Mathematical Modelling 2SE

Probability theory, random variables and distributions, data analysis and statistics, linear algebra, stochastic process.

Prerequisite: ENGSCI 111 or ENGGEN 150 or MATHS 108 or 150 or 153

Restriction: ENGSCI 211

ENGSCI 233 (15 Points)
Computational Techniques and Computer Systems

Introduction to digital electronics, computer organisation and computational techniques. Digital gates, combinatorial and synchronous circuits, data representation, instruction sets, memory, hardware, interfacing. Numerical computation, numerical algorithms.

Prerequisite: ENGSCI 111 or ENGGEN 150, and ENGGEN 131 and ELECTENG 101

Corequisite: ENGSCI 211 or 213

ENGSCI 255 (15 Points)
Modelling in Operations Research

Emphasises the relationship between business and industrial applications and their associated operations research models. Software packages will be used to solve practical problems. Topics such as: linear programming, transportation and assignment models, network algorithms, queues, inventory models, simulation, analytics and visualisation will be considered.

Prerequisite: 15 points at Part I in Statistics or Mathematics or Engineering

Restriction: STATS 255

ENGSCI 263 (15 Points)
Engineering Science Design 1

Introduction to concepts of modelling of engineering problems, including model formulation, dimensional analysis, solution procedures, comparisons with reality, and shortcomings, with examples from elementary mechanics, structures, hydrostatics, one-dimensional heat, diffusion and uid motion. Further development of problem-solving skills and group project work. The use of computer tools in engineering design, including advanced spreadsheeting integrated with solid modelling.

Prerequisite: ENGSCI 111 or ENGGEN 150, and ENGGEN 115

Corequisite: ENGSCI 211 or 213

Part III

ENGSCI 309 (15 Points)
Image and Digital Signal Processing

Fundamentals of image processing and digital signal processing. One dimensional signals and digital fil ers. Digital fil ering with FIR and IIR fil ers and the Digital Fourier Transform (DFT). Two-dimensional signals, systems and analysis methods. Two-dimensional digital fil ers and their application. Colour image processing. Quantitative image analysis and information extraction.

Prerequisite: ENGSCI 211

Restriction: ELECTENG 709

ENGSCI 311 (15 Points)
Mathematical Modelling 3

A selection from: ordinary diffe ential equations, systems of equations, analytical and numerical

methods, nonlinear ODEs, partial diffe ential equations, separation of variables, numerical methods for solving PDEs, models for optimisation, industrial statistics, data analysis, regression, experimental design reliability methods.

Prerequisite: ENGSCI 211

Restriction: ENGSCI 313, 314

ENGSCI 313 (15 Points) Mathematical Modelling 3ECE

Complex Analysis, including complex numbers, analytic functions, complex integration, Cauchy's theorem, Laurent series, residue theory; Laplace transforms; Modelling with partial diffe ential equations, including electronic and electrical applications; Fourier Analysis, Fourier transform, Fast Fourier transform; Optimisation, including unconstrained and constrained models, linear programming and nonlinear optimisation.

Prerequisite: ENGSCI 211

Restriction: ENGSCI 311, 314

ENGSCI 314 (15 Points) Mathematical Modelling 3ES

Mathematical modelling using ordinary and partial diffe ential equations. Topics include: probability, conditional probability, random variables as models of a population, common distribution models, the Poisson process, applications to reliability, exploratory data analysis, confidence intervals, tests of hypothesis, t-tests, sample tests and intervals, paired comparisons. Introduction to one-way ANOVA. Linear and polynomial regression, regression diagnostics.

Prerequisite: ENGSCI 211

Restriction: ENGSCI 311, 313, 321

ENGSCI 331 (15 Points) Computational Techniques 2

Numerical algorithms and their translation to computer code. A selection of topics from numerical solution of linear equations, eigen problems, ordinary diffe ential equations, numerical integration, nonlinear equations, fini e diffe ences and partial diffe ential equations.

Prerequisite: ENGSCI 233

Corequisite: ENGSCI 311 or 313 or 314

ENGSCI 343 (15 Points) Mathematical and Computational Modelling in Mechanics

Vector calculus and integral theorems. Continuum hypothesis, indicial notation, deformation, strain, traction, stress, principal directions, tensors, invariants, constitutive laws, isotropy, homogeneity. Navier-Stokes and Navier's equations. Isotropic elasticity, elastic moduli, plane stress and plane strain. Airy stress function, Viscous flow, simple solutions of the Navier-Stokes equations. Flow over fl t plates, boundary layers. Ideal flow, velocity potential, stream function, 2-D flows.

Prerequisite: BIOMENG 221, and ENGSCI 211 or 213

Restriction: BIOMENG 321

ENGSCI 344 (15 Points) Modelling and Simulation in Computational Mechanics

Solution of real-world continuum mechanics problems, using computational tools commonly used in engineering practice. This will develop skills in: analysing complexity and selecting an appropriate model representation of the physical problem; choosing the correct computational tool with which to solve the model; designing and executing appropriate numerical experiments using the chosen tool; validating, interpreting and communicating the simulation results.

Prerequisite: BIOMENG 321 or ENGSCI 343

ENGSCI 355 (15 Points) Applied Modelling in Simulation and Optimisation

Use of optimisation modelling languages and simulation software, with an emphasis on practical problem solving and laboratory-based learning.

Prerequisite: 15 points from ENGSCI 255, STATS 255

Restriction: OPSRES 385

ENGSCI 363 (15 Points)
Engineering Science Design II

Applications of elasticity and fluid dynamics theory to engineering problems including design and analysis of mechanical assemblies. Group projects solving an integrated, complex design problem, including costings for development, manufacture and other professional engineering issues. Underlying Finite Element Modelling (FEM) and Continuum Mechanics concepts. Utilisation of

3D CAD and FEM software during both design and analysis phases.

Prerequisite: ENGSCI 263 or BIOMENG 241

ENGSCI 391 (15 Points)
Optimisation in Operations Research

Linear programming, the revised simplex method and its computational aspects, duality and the dual simplex method, sensitivity and post-optimal analysis. Network optimisation models and maximum flow algorithms. Transportation, assignment and transhipment models, and the network simplex method. Introduction to integer programming.

Prerequisite: 15 points from ENGGEN 150, ENGSCI 111, MATHS 208, 250, 253, and one of COMPSCI 101, ENGGEN 131, MATHS 162, STATS 220

Part IV

ENGSCI 700A (15 Points)
ENGSCI 700B (15 Points)
Research Project

An investigation carried out under the supervision of a member of staff on a opic assigned by the Head of Department of Engineering Science. A written report on the work must be submitted.

To complete this course students must enrol in *ENGSCI 700 A and B*

ENGSCI 711 (15 Points)
Advanced Mathematical Modelling

A selection of modules on mathematical modelling methods in engineering, including theory of partial diffe ential equations, integral transforms, methods of characteristics, similarity solutions, asymptotic expressions, theory of waves, special functions, non-linear ordinary diffe ential equations, calculus of variations, tensor analysis, complex variables, wavelet theory and other modules offe ed from year to year.

Prerequisite: ENGSCI 311 or 313 OR 314

ENGSCI 712 (15 Points) Computational Algorithms for Signal Processing

Advanced topics in mathematical modelling and computational techniques, including topics on singular value decomposition, Principle Component Analysis and Independent Component Analysis, eigen-problems, and signal processing (topics on neural network models such as the multi-layer perception and self-organising map).

Prerequisite: ENGSCI 311 or 313 or 314

ENGSCI 740 (15 Points)
Advanced Mechanics in Research and Technology

Applications of continuum mechanics to problems in biomechanics, fluid mechanics and solid mechanics. Including topics such as large deformation elasticity theory applied to soft tissues, inviscid flow theory, compressible flows, viscous flows, meteorology, oceanography, coastal ocean modelling, mixing in rivers and estuaries. Fracture, composite materials and geomechanics.

Prerequisite: BIOMENG 321 or ENGSCI 343

ENGSCI 741 (15 Points)
Advanced Mathematical and Computational Modelling in Mechanics

Turbulence and turbulence modelling. Advanced numerical techniques in computational fluid dynamics (CFD). Application of CFD to environmental flows and aerodynamics. A variety of topics in engineering solid mechanics which could include composite materials, geomechanics, contact mechanics, fracture mechanics, rheology, thermomechanics, constitutive theory and computational methods.

Prerequisite: BIOMENG 321 or ENGSCI 343

ENGSCI 753 (15 Points) Computational Techniques in Mechanics and Bioengineering

Theoretical and applied fini e element and boundary element methods for static and time dependent problems of heat flow, bioelectricity, linear elasticity and non-linear mechanics.

Prerequisite: ENGSCI 311 or 313 or 314, and ENGGEN 131 or Equivalent

ENGSCI 755 (15 Points) Decision Making in Engineering

Introduction to techniques for decision making in engineering systems including decision heuristics, simple prioritisation, multi-attribute value theory, outranking approaches, analytic hierarchy process and dealing with uncertainty in decision making.

Prerequisite: Departmental approval required

ENGSCI 760 (15 Points) Algorithms for Optimisation

Meta-heuristics and local search techniques such as Genetic Algorithms, Simulated Annealing, Tabu Search and Ant Colony Optimisation for practical optimisation. Introduction to optimisation under uncertainty, including discrete event simulation, decision analysis, Markov chains and Markov decision processes and dynamic programming.

ENGSCI 761 (15 Points) Integer and Multi-objective Optimisation

Computational methods for solving optimisation problems. Algorithms for integer programming including branching, bounding, cutting and pricing strategies. Algorithms for linear and integer programmes with multiple objective functions.

Prerequisite: ENGSCI 391

ENGSCI 762 (15 Points) Scheduling and Optimisation in Decision Making

A course of advanced topics arising in the practical application of optimisation models for machine and resource scheduling, routing applications, staff rostering and performance measurement.

Prerequisite: ENGSCI 391

ENGSCI 763 (15 Points) Advanced Simulation and Stochastic Optimisation

Advanced simulation topics with an emphasis on optimisation under uncertainty. Uniform and non-uniform random variate generation, input distribution selection, output analysis, variance reduction. Simulation-based optimisation and stochastic programming. Two-stage and multi-stage programs with recourse. Modelling risk. Decomposition algorithms. Scenario construction and solution validation.

Prerequisite: ENGSCI 391

ENGSCI 768 (15 Points) Advanced Operations Research and Analytics

Advanced Operations Research and Analytics topics including selected theory, algorithms and applications for non-linear programming, smooth and non-smooth optimisation, equilibrium programming and game theory.

Prerequisite: ENGSCI 391

ENGSCI 772 (15 Points) Whole Organ Modelling

Advanced computational modelling of whole organs with an emphasis on integrative physiology and coupled fie d problems in bioengineering. Finite deformation elasticity theory and computational aspects. Current flow in excitable tissue. Finite element collocation techniques. Coupled fini e element – boundary element problems.

Prerequisite: BIOMENG 321 or ENGSCI 343

Environmental Engineering

Part II

ENVENG 244 (15 Points)
Environmental Engineering 1

Water quality, water and wastewater characteristics - physical, chemical and biological treatments (unit operations and processes). Solid waste characteristics and disposal, hazardous waste treatment. Stormwater management.

Restriction: RESOURCE 244, ENVENG 243

Part III

ENVENG 333 (10 Points)
Engineering Hydrology

Hydrologic processes, analysis of rainfall-runoff relationships. Statistical analysis of hydrological data. Groundwater movement.

ENVENG 341 (15 Points)
Environmental Engineering 2

Examines natural environmental processes and their relevance to engineering. Soil and water chemistry, equilibrium and organic chemistry, microbiology, biochemistry and biological processes will be examined, focusing on the application of these in engineering design, practice and management.

Restriction: RESOURCE 341

ENVENG 342 (15 Points)
Environmental Engineering Design

The applications of design practice in environmental engineering with a number of design projects. Elements of water and wastewater engineering. Landfill d sign and air pollution control.

Restriction: RESOURCE 342, ENVENG 405

Part IV

ENVENG 701 (15 Points)
Urban Stormwater Management

Design and application of stormwater runoff quantity and quality control systems for urban development including: bioretention, living roofs, swales, permeable/porous pavement, detention ponds, and constructed wetlands. An independent project couples technical design, safety, maintenance, construction, hydrologic and water quality modelling, and stakeholder engagement in an application of “Low Impact Design” from the site to the catchment scale.

Prerequisite: ENVENG 244 and 333 or equivalent

ENVENG 707 (15 Points)
Special Topic: Advanced Water Treatment and Reuse

Covers advanced treatment technologies including desalination, membrane technologies, advanced oxidation processes, novel materials for treatment of emerging contaminants, and fundamentals of water reuse, applications, and case studies for potable reuse, industrial reuse and aquifer recharge.

Prerequisite: ENVENG 244, 342

ENVENG 740 (15 Points)
Water and Wastewater Engineering

Chemistry and microbiology of water and wastewater treatment, flow models and reactors. Unit operations and process analysis and design. Treatment plant design and operation. Nutrient removal processes. Effluent and residues disposal.

ENVENG 746 (15 Points)
Surface Water Quality Modelling

Advanced specialist topics in modelling of lakes and rivers. Specific opics covered include response to diffe ent loadings applied to surface water systems, and modelling of organic matter, dissolved oxygen consumption, eutrophication, and toxic substances. The core taught skills are extended by an individual project in which

independent research is undertaken to solve a challenging surface water quality engineering problem.

Prerequisite: ENVENG 341, 342 or equivalent

ENVENG 747 (15 Points)
Soil-Contaminant Fate Processes and Modelling

Focuses on modelling sorption, degradation kinetics, and leaching of chemicals in the soil environment. Topics include deriving sorption parameters, parent and metabolite fi ting with statistical rigours, calculating degradation end-points, novel adsorbents for removing contaminants in soil and water. The core taught skills are extended by an individual project in which independent research is undertaken to solve an environmental issue.

Prerequisite: ENVENG 341 or equivalent

Mechanical Engineering

Part II

MECHENG 201 (15 Points)
Electronics and Computing for Mechanical Engineers

Mechanical engineers need to be familiar with those electronics and software elements that are now vital components of most mechanical products and processes. Introduces sensors and actuators, analogue and digital circuit elements for signal processing, and computing and software programming.

Prerequisite: ELECTENG 101, ENGGEN 131

MECHENG 211 (15 Points)
Thermofluids

The fundamentals of fluid mechanics, thermodynamics and heat transfer with practical applications to engineering devices and systems.

MECHENG 222 (15 Points)
Dynamics

Kinematics of particles, rectilinear and curvilinear motion, kinematics of rigid bodies in the plane. Kinetics of particles, systems of particles and rigid bodies. Impulse and momentum, mechanism motion in the plane. Vibration of a particle.

Prerequisite: 15 points from ENGGEN 121 or 150

MECHENG 235 (15 Points)
Design and Manufacture 1

The design process as a teamwork, and system based, problem-solving activity. Design methodology and evaluation, design failure and safety, communicating design intent through graphical means. Introduction to engineering material properties and concepts of material failure. Introduction to motive power sources, machine elements and production and fabrication processes.

Prerequisite: ENGGEN 115

Restriction: MECHENG 223, 234

MECHENG 236 (15 Points)
Design and Manufacture 2

Introduction to computer-assisted design animation and virtual mechanisms and computer-aided production processes. Basic hydraulics and pneumatics systems and components. Fundamental techniques for the determination of material behaviour under external loads. Further production processes. Design reliability. Basic principles of "Design for X".

Prerequisite: MECHENG 235
Restriction: MECHENG 223, 234

MECHENG 242 (15 Points)
Mechanics of Materials 1

Statically determinate stress systems; stress – strain relations. Bending of beams: stress – moment and moment – curvature relations; beam deflections; buckling of struts. Shear in joints, couplings, beams and circular shafts. General analysis of plane stress. Introduction to failure criteria by yield and fracture. Safety factors.

Prerequisite: ENGGEN 121 or 150

MECHENG 270 (15 Points)
Software Design

Fundamentals of software design and high-level programming making use of case studies and programming projects. Includes: requirements analysis, specific tion methods, software architecture, software development environments, software quality, modularity, maintenance, reusability and reliability; models of software development.

Part III

MECHENG 311 (15 Points)
Thermal Engineering

Second Law of Thermodynamics, entropy. Cycles and applications. Heat transfer, heat exchangers.

Prerequisite: MECHENG 211

MECHENG 312 (15 Points)
Sensors and Actuators

An introduction to mechatronics engineering and its main elements. Topics include interfacing and signal processing, sensors, actuators, control technologies, systems modelling, simulation and analysis.

Restriction: ELECTENG 428

MECHENG 313 (15 Points)
Real Time Software Design

Introduces the principles of software design in a real time environment. Main topics include computer/ microprocessor architecture, programming in real-time environment, software design, embedded C or C# and data acquisition systems.

MECHENG 322 (15 Points)
Control Systems

An introduction to classical control of mechanical and mechatronic systems. Topics include: transfer functions, block diagrams, time response characteristics, stability, frequency response characteristics and controller design (eg, pole placement, lead-lag compensation, PID). Applications in MATLAB/Simulink and with physical systems.

Prerequisite: ENGSCI 211, MECHENG 222

MECHENG 325 (15 Points)
Dynamics of Fluids and Structures

3D rigid body kinetics – inertia tensor, Euler's equations, gyroscopic motion. Vibration of single and two degree of freedom systems. Applications to vibration engineering. Introductory acoustics and spectral analysis. Mass, energy and momentum equations. Angular momentum equation. Dimensional analysis. Similarity. Turbulence, logarithmic overlap law, pipe losses and networks, Bernoulli obstruction theory. External flows, lifting bodies. Pumps, turbines. Open channel flows.

Prerequisite: MECHENG 211, 222

Restriction: MECHENG 324

MECHENG 334 (15 Points)
Engineering Design 3M

Good practice and standard methods in mechanical engineering design. Conceptual and detailed design in projects involving machine elements, engineering sciences and engineering mechanics. Some of the advanced computer-aided tools (eg, CAD, CAM, CAE) will be introduced and utilised in some projects.

Prerequisite: MECHENG 235, 236

Restriction: MECHENG 332, 333

MECHENG 340 (15 Points)
Mechanics of Materials 2

States of stress and strain at a point in a general three-dimensional stress system, failure theories for ductile materials, elementary plasticity. Generalised stress – strain relations for linearly elastic isotropic materials. Axisymmetric stress systems: thick-walled pressure cylinders, spheres and rotating discs. Advanced topics in bending of beams. Failure theories for brittle materials. Fatigue in ductile materials.

Prerequisite: MECHENG 242

Restriction: MECHENG 341

MECHENG 352 (15 Points)
Manufacturing Systems

An introduction to the procedures and technological aspects of typical manufacturing systems; basic concepts of plant and work design; automation; planning, implementation; simulation, and monitoring of production processes; project-based introduction to the tools and techniques applied by professional engineers in modern manufacturing plants.

Restriction: MECHENG 351

MECHENG 370 (15 Points)
Analog Circuit Design

An introduction to the design, analysis and implementation of electronic circuits or systems for various applications such as signal generation and processing, interfacing, and high power electronics. These include PCB design and testing.

Prerequisite: ELECTENG 101 or 208

MECHENG 371 (15 Points)
Digital Circuit Design

Fundamental concepts in the design of combinational and sequential logic circuits. Modern approach to design using CAD tools that exploit the advantage of automation. Students will be exposed to the use of FPGA to rapid prototype digital systems using schematic and hardware description language entries.

Prerequisite: ELECTENG 101 or 208

Part IV

MECHENG 700A (15 Points)
MECHENG 700B (15 Points)
Research Project

A comprehensive investigation carried out under the supervision of a member of staff on a opic assigned by the Head of Department of Mechanical Engineering leading to an oral presentation, a poster display and a written report.

Restriction: MECHENG 461, 762, 763

To complete this course students must enrol in *MECHENG 700 A and B*

MECHENG 705 (15 Points)
Mechatronics Systems

Fundamentals of digital control and signal processing as applied to mechatronics systems. Modelling and analysis of mechatronics systems that includes transducers and applications. Issues related to mechatronics systems such as thermal management, signal detection, fil ering and integrity, etc.

Prerequisite: MECHENG 312, 322

Restriction: MECHENG 405

MECHENG 706 (15 Points)
Mechatronics Design

A range of projects that demonstrate the application and integration of the material taught in lecture courses to create practical intelligent products and manufacturing processes.

Prerequisite: MECHENG 312, 322

Restriction: MECHENG 406

MECHENG 709 (15 Points)
Industrial Automation

Automation technologies widely used in manufacturing and processing industries. Topics include industrial robotics; programmable logic controllers (PLCs); pneumatics; machine vision systems including AR and VR; automated assembly; design for automation; and condition monitoring. Students will participate in a number of hands-on labs throughout the course.

Prerequisite: MECHENG 312

Restriction: MECHENG 409, 710

MECHENG 712 (15 Points)
Aerohydrodynamics

The study of fluid mechanics relevant to external flows, eg, wind turbines, yachts, aircraft or wind loadings on buildings, boundary layers, computational fluid dynamics.

Prerequisite: MECHENG 325

Restriction: MECHENG 412, 771

MECHENG 713 (15 Points)
Energy Technology

Industrial thermodynamics and energy conversion/efficie y, power cycles, availability and irreversibility, simple combustion analysis, mass transfer, energy studies, boiling and condensation.

Prerequisite: MECHENG 311

Restriction: MECHENG 413

MECHENG 715 (15 Points)
Building Services

Principles and practice of heating, ventilation, airconditioning and refrigeration (HVAC&R), psychrometry, heating/cooling loads, mass transfer and air quality, refrigeration/heat pump systems, cooling towers, pumps, fans, valves, pipes and ducts.

Prerequisite: MECHENG 325

Restriction: MECHENG 411

MECHENG 722 (15 Points)
Engineering Vibrations

Selected topics in vibration engineering: Multiple degree of freedom and continuous systems; Spectral analysis; analytical, approximate and numerical methods, including FEA; vibration instrumentation, measurement and testing; modal analysis; vibration treatment.

Prerequisite: MECHENG 325 or equivalent

Restriction: MECHENG 421, 719

MECHENG 724 (15 Points)
Multivariable Control Systems

Advanced control of mechanical and mechatronic systems. Topics include: state-space representations, linearisation, discretisation, stability, state feedback control design, optimal control, state estimation and Kalman fil ers. Applications in MATLAB/Simulink and with physical systems.

Prerequisite: MECHENG 322

Restriction: MECHENG 423, 720

MECHENG 726 (15 Points)
Acoustics for Engineers

Wave equations, sources, directionality; behaviour of sound waves. Principles of active control for sound. The ear and hearing system. Measurement of sound fie ds. Philosophy of annoyance. Legal and Standards requirements. Sound fie ds in enclosures. Mass Law. General insulation equation. Materials as absorbers and reflectors, room acoustics, requirements in auditoria, sound system design principles and transducer performance.

Restriction: MECHENG 425

MECHENG 731 (15 Points)
Engineering Design 4M

A variety of engineering projects requiring the development and communication of design solutions to a professional standard, and using a wide range of advanced engineering methods.

Prerequisite: MECHENG 334

Restriction: MECHENG 431

MECHENG 735 (15 Points)
MEMS and Microsystems

Introduction to working principles and fabrication of MEMS/microsystems such as microsensors, microactuators, microfluidics, etc. Exposure to engineering design principles including engineering mechanics, fluidics, materials, etc. at microscale. Exposure to microfabrication processes as part of a laboratory component.

Prerequisite: MECHENG 211, 242

Restriction: MECHENG 728

MECHENG 736 (15 Points)
Biomechatronic Systems

Explores mechatronic principles and techniques for measuring and manipulating biological systems. Learning objectives include: human biomechanics and motion control, advanced serial and parallel robots, compliant soft robots, software and functional safety, human robot interaction and force control, novel sensors and actuators, and biomechatronics design principles.

Prerequisite: MECHENG 312

Restriction: MECHENG 730

MECHENG 743 (15 Points)
Composite Materials

Applications and manufacturing of composite materials. Mechanics of composite lamina/ laminate. Failure prediction, design and fini e element analysis of composite laminates and structures. Analysis and design of sandwich structures.

Prerequisite: MECHENG 340

Restriction: MECHENG 441, 772

MECHENG 747 (15 Points)
Manufacturing and Industrial Processes

Theory of plasticity; material characterisation; process analyses; extrusion, wiredrawing, forging, rolling; metal cutting: thin shear model and Merchant's diagram, tool wear and tool life; sheet forming; forming limit diagram; thermal analyses of industrial operations including polymer processing; basic polymer science: thermosets and thermoplastics, profi e extrusion, sheet extrusion; blown-film xtrusion, filament xtrusion, blow moulding.

Prerequisite: MECHENG 340

Restriction: MECHENG 342, 447

MECHENG 752 (15 Points)
Technology Management

An appreciation of the strategic systems and technology management aspects of manufacturing systems. Industry based projects that explore the design and optimisation of manufacturing operations form a major part of the course.

Prerequisite: ENGGEN 303 with a grade of B or better

Restriction: MECHENG 451

Software Engineering

Part II

SOFTENG 206 (15 Points)
Software Engineering Design 1

Project work. Skills and tools in systematic development of software, including testing, version control, build systems, working with others.

Prerequisite: SOFTENG 250, 251

SOFTENG 211 (15 Points)
Software Engineering Theory

Sets. Formal languages, operations on languages. Deterministic and nondeterministic automata, designing automata, determinisation. Regular expressions. Logic. Induction. Recursion. Program correctness. Computability. Counting. Elements of graph algorithms.

Prerequisite: ENGGEN 131 or COMPSCI 101

SOFTENG 250 (15 Points)
Introduction to Data Structures and Algorithms

Introduction to the analytical and empirical behaviour of basic algorithms and data structures.

Prerequisite: ENGGEN 131 or COMPSCI 101

Corequisite: ENGSCI 213

SOFTENG 251 (15 Points)
Object Oriented Software Construction

An introduction to Object Oriented software development. Programming with classes; objects and polymorphism. Evolutionary and test-driven development. Analysis and design. Modelling with UML. Design patterns. Design for reuse, for testing, and for ease of change.

Prerequisite: ENGGEN 131 or COMPSCI 101

SOFTENG 254 (15 Points)
Quality Assurance

Software verific tion and validation. Static and dynamic QA activities as part of the software lifecycle. Unit, integration, system, and usability testing. Use of visual notations, automation, and

tools to support development activities. Metrics to quantify strength of testing and complexity of programs.

Prerequisite: SOFTENG 250, 251

Part III

SOFTENG 306 (15 Points) Software Engineering Design 2

Working in project teams to develop software to meet changing requirements for a large application. Project Planning. Requirements gathering. Estimating, costing and tracking. Acceptance and unit testing. Evolutionary design and development. Collaborative development tools.

Prerequisite: SOFTENG 206, 254, 350

SOFTENG 325 (15 Points) Software Architecture

Taxonomy of software architecture patterns, including client/server and multi-tier. Understanding quality attributes. Methodologies for design of software architectures. Technologies for archi-tecture level development, including middleware.

Prerequisite: 15 points from SOFTENG 351, COMPSYS 302

SOFTENG 350 (15 Points) Human Computer Interaction

Human behaviour and humans' expectations of computers. Computer interfaces and the interaction between humans and computers. The significance of the user in erface, interface design and user centred design process in software development. Interface usability evaluation methodologies and practice. Includes an evaluation project, group design project, and implementation using current techniques and tools.

Prerequisite: SOFTENG 206

Restriction: COMPSCI 345, 370

SOFTENG 351 (15 Points) Fundamentals of Database Systems

Relational model, Relational algebra, Relational calculus, SQL and programming languages, Entity-Relationship Model, Normalisation, Query processing, Query optimisation, Distributed databases, Transaction management, Concurrency control, Database Recovery.

Prerequisite: SOFTENG 211 or COMPSCI 225

SOFTENG 364 (15 Points) Computer Networks

Principles of data communications; representation, transmission. Physical layer, signals in time and frequency domain. Modulation and coding. Data layer and protocols. Layered architecture model of computer networks, OSI and TCP/IP, Flow control, error control. Local area networks and IEEE standards, Ethernet and Wireless LAN. Circuit, message and packet switching. The internet protocol (IPV4 and IPV6), routing algorithms, design of subnets. TCP and UDP. Network security. Introduction to ATM.

Prerequisite: 15 points from COMPSYS 201, SOFTENG 252 and 15 points from SOFTENG 206, 211, 250, 251, 254, 325

SOFTENG 370 (15 Points) Operating Systems

History of operating systems. Multi-user systems. Scheduling. Concurrent processes, threads and synchronisation. Memory allocation and virtual memory. Managing fi es, disks and other peripherals. Security, protection and archiving. Engineering distributed systems; location, migration and replication transparency. Real-time programming and embedded systems.

Prerequisite: COMPSYS 201 or SOFTENG 252, 250

Part IV

SOFTENG 700A (15 Points)
SOFTENG 700B (15 Points)
Research Project

Students are required to submit a report on project work carried out on a Software Engineering topic assigned by the Head of Department.

Prerequisite: SOFTENG 306

Restriction: SOFTENG 401

To complete this course students must enrol in SOFTENG 700 A and B

SOFTENG 701 (15 Points)
Advanced Software Engineering Development Methods

Advanced studies in methods and techniques for developing complex software systems including topics in software engineering environments, advanced software design, tool construction and software architectures. The core taught skills are extended by individual projects in which independent research is undertaken to address challenging software system problems.

Prerequisite: COMPSYS 302 or SOFTENG 306

SOFTENG 702 (15 Points)
Advanced Human Computer Interaction

Advanced topics in human computer interaction and human aspects of computer systems relevant to commercial solution development and computer science research. Sample topics: advanced evaluation methods; support of pen and touch-based interaction; trends with domain specific user in erface design, such as interfaces for enterprise systems.

Prerequisite: COMPSCI 345 or SOFTENG 350

Restriction: COMPSCI 705

SOFTENG 750 (15 Points)
Software Development Methodologies

Software lifecycle; software process models; examples of software processes; software process improvement; project management; tool support for software development; issues in software engineering.

Prerequisite: SOFTENG 306

Restriction: SOFTENG 450

SOFTENG 751 (15 Points)
High Performance Computing

Advanced parallel and high performance computing concepts and techniques such as memory architecture and networks; multicores, hardware acceleration devices; shared memory and data parallel programming; object oriented and low level parallel programming; parallelisation process: subtask decomposition, dependence analysis and scheduling. Core concepts are extended by a hands-on research project in which a challenging parallel computing problem is analysed and solved.

Prerequisite: SOFTENG 306 or COMPSYS 302 or MECHENG 313 or 30 points at Part III in Computer Science

Restriction: SOFTENG 461

SOFTENG 752 (15 points)
Formal Specification and Design

Formal specific tion, design, and (automatic) analysis of software systems. Quality assurance through precise description and rigorous verific tion on the design. Introduction to the Z, OCL, and CSP notations. Comparison of approaches, emphasising their practical application.

Prerequisite: SOFTENG 306

Restriction: SOFTENG 462

SOFTENG 753 (15 points)
Special Topic: Foundations of Bayesian Machine Learning

Basic probability theory, Bayesian state estimation, Bayesian classific tion and regression, kernel methods, sequential models, graphical models, deep (learning) architectures, applications.

Prerequisite: ENGSCI 213, SOFTENG 251, SOFTENG 250 or equivalents

SOFTENG 754 (15 points)
Special Topic: Requirements Engineering

Advanced software engineering concepts focusing on techniques for requirements analysis and requirements engineering (RE) of software systems. Students will participate in a semester-long project where they will define a set of conc ete requirements for and create a prototype of a new software system. Topics will include: requirements elicitation, analysis, specific tion, validation, verific tion, and test-driven development.

Prerequisite: SOFTENG 251 and SOFTENG 254 or equivalents.

SOFTENG 761 (15 Points)
Agile and Lean Software Development

Advanced software engineering concepts focussing on Agile and Lean software development; including hands-on iterative and incremental software development, self-organising teamwork, project management, and an individual research component to explore challenging issues in this discipline.

Prerequisite: SOFTENG 306 or equivalent

Key dates

Summer School 2017	Semester code: 1170
Summer School begins	Thursday 5 January
Last day to add, change or delete Summer School courses	Wednesday 11 January
Auckland Anniversary Day	Monday 30 January
Waitangi Day	Monday 6 February
Lectures end	Friday 17 February
Study Break	Saturday 18 February
Examinations	Monday 20 – Wednesday 22 February
Summer School ends	Wednesday 22 February

Semester One 2017	Semester code: 1173
Orientation – Semester One	Monday 27 February – Friday 3 March
Semester One begins	Monday 6 March
Last day to add, change or delete Semester One courses	Friday 17 March
Last day to add or delete double semester (A and B) courses	Friday 31 March
Mid-semester/Easter break	Friday 14 – Saturday 29 April
ANZAC Day	Tuesday 25 April
Autumn Graduation	Monday 1, Wednesday 3, Friday 5 May
Queen's Birthday	Monday 5 June
Lectures end	Friday 9 June
Study break	Saturday 10 – Wednesday 14 June
Examinations	Thursday 15 June – Monday 3 July
Semester One ends	Monday 3 July
Inter Semester Break	Tuesday 4 – Saturday 22 July

Semester Two 2017	Semester code: 1175
Orientation – Semester Two	Tuesday 17 – Friday 21 July
Semester Two begins	Monday 24 July
Last day to add, change or delete Semester Two courses	Friday 4 August
Last day to add or delete double semester (A and B) courses	Friday 18 August
Mid-semester break	Monday 4 – Saturday 16 September
Spring Graduation	Tuesday 26 September
Labour Day	Monday 23 October
Lectures end	Friday 27 October
Study break	Saturday 28 October – Wednesday 1 November
Examinations	Thursday 2 – Monday 20 November
Semester Two ends	Monday 20 November

Summer School 2018	Semester code: 1180
Summer School begins	Thursday 4 January 2018

Semester One 2018	Semester code: 1183
Semester One begins	Monday 26 February 2018

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

Contact
Faculty of Engineering
Engineering Student Centre
Level 4, 20 Symonds Street
Auckland, New Zealand

Phone
0800 61 62 63 (outside Auckland)
or 923 1969 (within Auckland)
or +64 9 923 1969 (International)

Email
foe-enquiries@auckland.ac.nz

Web
www.engineering.auckland.ac.nz
facebook.com/uoaengineering
twitter.com/uoaengineering

Postal
Faculty of Engineering
The University of Auckland
Private Bag 92019
Auckland 1142
New Zealand

uoaengineering

www.engineering.auckland.ac.nz