Faculty of Engineering

Undergraduate Handbook 2020

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 document, *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 first 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.

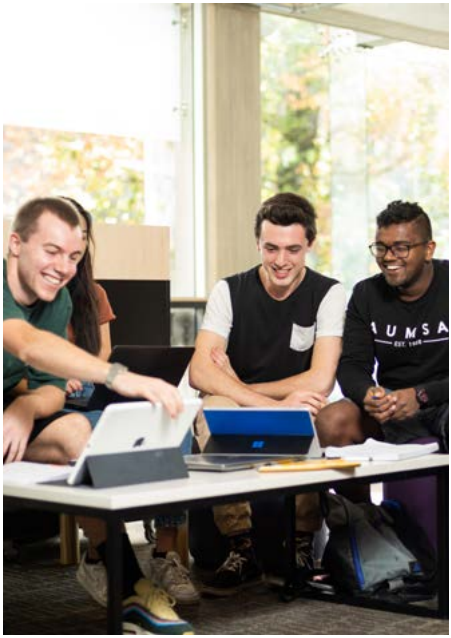
Canvas

https://canvas.auckland.ac.nz
The online-based learning platform utilised throughout our 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/en/about/admission-and-enrolment/ae-before-you-arrive.html. 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
Visit Student Services Online to see your academic requirements, find course advice, enrol in classes 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 on page 10**.

General information for undergraduate engineering students

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

www.engineering.auckland.ac.nz/undergrads

Student life

www.auckland.ac.nz/en/on-campus.html
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 can connect 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 provides access to a range of support services and entry to social events.

iSPACE

A lounge at Level 4 of the Kate Edger Student commons dedicated to student activities, including regular coffee sessions.

Career Development and Employment Services (CDES)

www.cdes.auckland.ac.nz
CDES, located in Room 151, Level 1, Kate Edger Information Commons, provides students with career and employment advice, opportunities, and help with CVs and interviews.It hosts MyCDES, an online portal that allows you to self-manage access to career tools, workshops, events and more.

Health and counselling services

www.auckland.ac.nz/health
The University provides a range of health services, including emergency healthcare and counselling sessions. The University Counselling Service is free and confidential for any 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, criticism or pressure to adopt any particular course of action.

They provide free self-help online resources, or you may call +64 9 923 7681 to make an appointment. Alternatively, you can visit them at level 3, Kate Edger Information Commons.

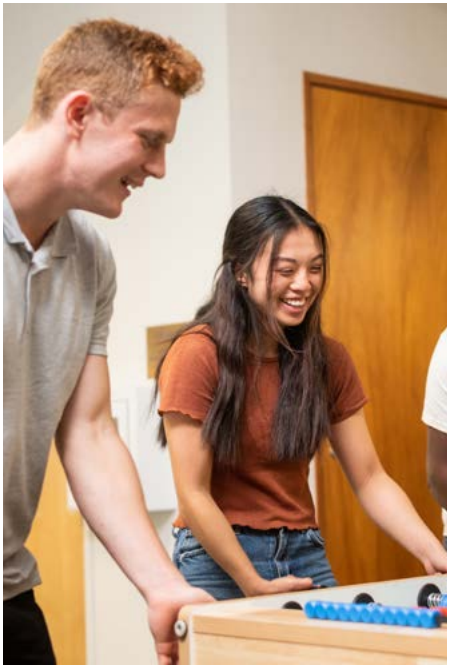
Unleash Space for students

A place where anybody can create what they imagine, design for today and prototype for tomorrow.

www.unleashspace.ac.nz

Contact numbers for personal safety and emergencies

- **University Security:** +64 9 373 7599 EXT. 85000
  DDI: +64 9 923 5000
- **Police emergency:** 111
- **Auckland Central Police Station:**
  + 64 9 302 6400
- **Non-emergency traffic incidents:** 555
- **Mental Health Crisis Line** (24/7): 0800 800 717



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 important and personalised information in one place. This includes items such as your calendar, timetables, email notifications, course updates, library information, financial information and personal details. Once enrolled, you can sign in with your username and password at **www.myaucklanduni.ac.nz**.

Timetables

Enrolment dates for Engineering are staggered between November to mid-December. Class timetables will be available to view on Student Services Online once enrolment for those classes open (**www.studentservices.auckland.ac.nz**). Room allocations, and occasionally class times may change before the start of semester and during the first two weeks of semester.

Building access

All engineering students are allowed to enter the City Campus Engineering buildings 401 and 402 (20 Symonds Street) and building 405 (5 Grafton Road) between 6am 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 enter and exit the building via door 401.300L1/1 (Level 3 leading in from the underpass).
- You are required to start packing up your 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.

Newmarket Campus is open to students with access cards between 7am and 11pm seven days a week.

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

To gain access to the building after hours, and to certain labs that will be required, you must activate the card by completing the online application form via **https://accesscard.foe.auckland.ac.nz.** It may take up to two weeks for your card to be activated and your card must be renewed at the beginning of every year. To renew it, follow the same process as your initial application.

Access/Campus cards are not transferable under any circumstances. Please report loss or theft to the Security Office on extension 85000. You will need to buy a replacement card, once you have reported the loss. This is not a deposit and there are no refunds.

For any questions please contact **foe-facilities@auckland.ac.nz.**

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 and you'll have access to staff with unique knowledge related to your specialisation.

- Use your ID card to borrow books. Find out more about your library account, borrowing, and requesting books at **www.library.auckland.ac.nz/borrowing**.
- Log in anywhere, at any time, with your username and password. 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 five computer labs available for use by engineering students:

- Room 401.307
- Room 401.311
- Room 401.312
- Room 439.G08
- Building 402 Level 2 Engineering Info commons
- Building 405 - MDLS computer labs #6, 7, 8

Student drop-in work areas:

- Room 401.301

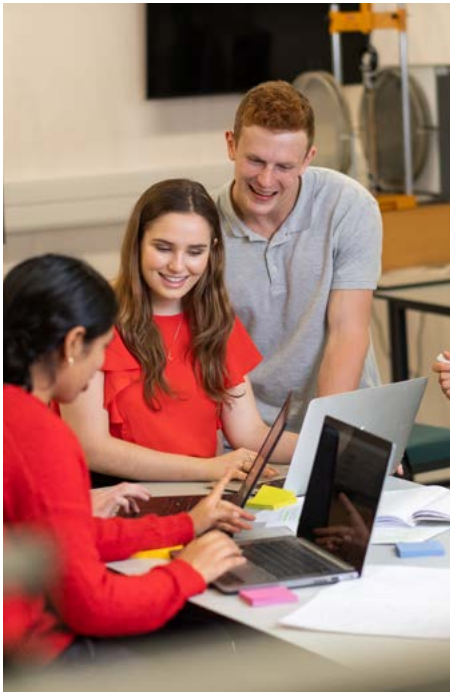
Please do not unplug any of the devices in the labs for any reason. There are usually spare power outlets available for powering any personal devices. Please also remember that the University's computing facilities are provided exclusively for educational and study purposes.

Opening hours

Student drop-in work areas are open 6am-midnight on Monday to Friday during semesters (except public holidays) and 7.30am-6.30pm at other times.

- Teaching labs may not be available outside 7.30am-6.30pm Monday to Friday. Outside these hours, access is available via swipe card to B401.301 and B402.306.
- Teaching labs are unavailable for general student use when classes are scheduled.

Students can access other computer labs in the University in places such as the Information Commons in the Kate Edger building.



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 campus, providing network connectivity for laptop and other mobile users.

Files saving and sharing

All students are provided with free:

- Unlimited Google Drive
- University file storage

File storage is accessible from all University computers and is also accessible off-campus.

Located in each of the Information Commons facilities, IC Helpdesks provide walk-in, email and telephone support for student computing resources and services.

Email: **ichelpdesk@auckland.ac.nz**

Phone: +64 9 923 2333

For more information, refer to **www.library.auckland.ac.nz/services/it-essentials/file-saving-and-sharing**.

Printing, copying and scanning

Printing, scanning and copying is provided by Follow Me copy and print service system.

To print, scan or photocopy, you will need to 'tap' your Campus Card to the card reader.

For more information, refer to **www.library.auckland.ac.nz/services/it-essentials/copying-and-printing/changes-copy-and-print-service**.

Refer to IT essentials web page for information about IT services and support at the University: **www.library.auckland.ac.nz/services/it-essentials**.

University IT Policy

To use any University IT equipment, you must comply with current University IT Policy. Policy breaches (for example, copyright infringement) exposes both you and the University to 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 find further details and other IT best-practice information at **www.library.auckland.ac.nz/services/it-essentials**.

Further information and IT help

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

Health and safety

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

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**. You must ensure you are familiar with all provided Health and Safety information.

Essential safety personnel

Your first 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** or the Engineering Facilities team at **foe-facilities@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:

- Stop activities that are dangerous to you and others
- Complete any required health and safety training
- Follow health and safety instructions. If you are unsure, in doubt of what to do, or have concerns 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, near misses, ill health and building/equipment damage
- Where required, wear personal protective clothing, personal protective equipment, and use provided safety equipment
- Familiarise yourself with the procedures and limitations for working alone
- Do not interfere with health and safety equipment, devices or signage. If you find damage, or there is a malfunction, please alert your supervisor/leader immediately

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 appropriately 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 authorisation, 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 cards or keys *does not* mean you are authorised to access a facility, nor permit you to allow another person into that area.

3 You must not attempt to operate any equipment or apparatus unless you have been authorised and shown how to use it safely.

4 When working, keep your work area clean and tidy, and make sure your bags and/or personal items do not cause trip hazards.

5 When you have finished for the day, 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.

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

Laboratories and Workshops

Students may only use the laboratories and workshops where they have been given specific authority to work by their course coordinators and/or academic supervisors and technical staff in charge.

All students will be required to wear appropriate personal protective equipment depending on which laboratory and workshop you work. Personal protective equipment, such as safety glasses, lab coats, masks, hearing protection will be provided by laboratories and workshops. Some laboratories might require students to wear protective laboratory coat, students are permitted to wear their own if they wish (boiler suits/overalls or similar protective clothing are also acceptable for most labs: the student will need to confirm the suitability with their course tutor/lab coordinator).

Because there are hazardous substances and various types of equipment in the laboratories and workshops, there are guidelines around their use:

1. You should not work alone in a laboratory or workshop
2. You should only carry out work you are familiar with. Specific in-person training will be required and provided for undertaking hazardous operations. This includes (but 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
3. When leaving a laboratory or workshop, students and staff are responsible for making sure that all equipment and services are in a safe condition. This means, for example, turning off any electricity, gas and water that have been used.

Inductions

Many teaching and learning spaces areas such as lecture theatres are considered low risk, and you may only need a quick briefing to know where the emergency exits are.

The laboratories and workshops present increased risks. Anyone who needs to access laboratories and workshops will be invited to participate an induction with a staff member. These inductions are generally facilitated by a technical staff in charge. After an induction and 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?
- What are the emergency contact numbers?
- Where is the nearest fire alarm, first aid kit and defibrillator?
- Where are the isolation controls/emergency shut-off procedures for the equipment I am going to use?
- Do I need specific training 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 others?
- 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 go home?

If you can't answer these questions, please see your academic leader or supervisor or the technical staff in charge of the laboratory or workshop.

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 fire, 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 Officers will be on-site to provide an immediate response. Contact Unisafe on +64 9 923 5000 (we recommend you save this number to your mobile), or via emergency telephones around the campus: Ext 85000.

Help and advice

Faculty support services

Course planning and enrolment advice

The Engineering Student Centre may be your first 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

We recognise that there are various factors that may impact your studies. The University offers a range of support mechanisms for you. This includes anxiety and stress, learning needs, financial stress, and unforeseen events.

The Faculty of Engineering Student Engagement team provides individual support if you are struggling, stressed, or have experienced a traumatic event which may impact your study. Feel free to drop in and see us, or email

foe-engagement@auckland.ac.nz.

In general, we provide academic and pastoral services, and are able to link you to key support services such as health and counselling, career development, and our library and learning staff.

Our experienced staff work closely with the faculty's student clubs and associations to provide social, professional and academic opportunities for students. The initiatives we support and operate include: Orientation; the Part I Assistance Centre; wellbeing resources; student clubs; SPIES; Tuākana tutoring and mentoring for Māori 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.

The Faculty of Engineering's Student Development and Engagement team

Student Development and Engagement Manager

Oversees and manages student development, engagement, support and initiatives to enhance the student experience**.**

Employer Liaison Manager

Facilitates employer networking, fosters industry relationships, and provides advice on practical work experience and graduate job applications.

Women in Engineering Adviser

Leads the development of successful support strategies for Women in Engineering, provides individual advice and support, and coordinates the Women in Engineering Network.

Team Leader, Student Development & Engagement

Responsible for coordinating the delivery of development opportunities and support services to all Engineering students.

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

Student Experience Adviser

Provides a range of development and engagement activities for all students, supports Campus Life and our faculty's student clubs.

Student Support Adviser: Equity

Offers pastoral care, wellbeing and learning support, coordinates the Rainbow Engineering Network, manages the Part One Assistant Centre, and supports students at academic risk.

Student Support Adviser: Māori and Pacific

Organises the Tuākana Programme, and offers pastoral care, wellbeing and learning support to all students, with a particular emphasis on Māori and Pacific students.

All engineering students are welcome to contact us at **foe-engagement@auckland.ac.nz**, or find out more at **www.auckland.ac.nz/en/engineering/currentstudents/student-support/studentdevelopment-engagement.html.**

Academic issues

If matters arise that affect your study, you should feel confident discussing them with your lecturer or course coordinator. You may also like to speak with the relevant Departmental UG Adviser and/or the Deputy Head of Department (Academic). If the situation is not dealt with to your satisfaction, these may then be referred to your Head of Department. Find contact details for the Departmental UG Advisers here: **www.auckland.ac.nz/en/engineering/study-with-us/study-options/courses/academic-advisers.html.**

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 SSCC, Associate Deans or the AUSA Advocacy Service.

Faculty Staff-Student Consultative Committee (SSCC)

SSCC contains two student representatives nominated from each department's SSCC, representatives from major student groups, administrative staff and academics. The Faculty SSCC addresses faculty-wide issues affecting acadeacademic life, resources and services.

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.**

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 402 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 Undergraduate and Postgraduate students to provide targeted tutorials and academic support for Māori and Pacific Engineering students. Tutorials start in the second week of semester. Your timetable is set by the faculty by way of a special Tuākana-only stream of classes to make sure there are no clashes in your class schedule. Access to this stream of classes is granted for all MAPTES entry students and by registration with the Māori and Pacific adviser for all General Entrants. Please note that General Entry students who do not register will not be able to choose the Tuākana class timetable on enrolment, will have timetable clashes, and will not be able to make use of all the Tuākana tutorial sessions and academic support. We strongly recommend registering for access to the Tuākana class stream timetable.

There are Tuākana tutorials for all seven core Part I Engineering courses. For more information please 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 offers up to 22 Kick Start scholarships specifically 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 first year at the University of Auckland. **The closing date for all Kick Start scholarships is 15 January**

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

University support services

AUSA Advocacy Service

The AUSA Advocacy Service provides free, confidential and quality advice 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 issues; allegations of misconduct; tenancy/rent issues; bullying and more.

www.auckland.ac.nz/en/students/information-new-students/ausa-advocacy.html.

English Language Enrichment (ELE)

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

www.library.auckland.ac.nz/ele

Equity Office

Offers 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; parents; LGBTI students; students with disabilities; students from

Contacts for academic issues

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 (Postgraduate)

Our two Associate Deans (Postgraduate) are responsible for either research or taught postgraduate engineering students. They provide academic oversight for admission and advice for research specialisations.

foe-postgrad-dean@auckland.ac.nz

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 also provides emergency food parcels for students in need.

www.ausa.org.nz/support/grants/hardship-grant-application/

Harassment and disputes

If you encounter problems with unwanted, unacceptable or offensive staff/student behaviour, 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 can find more information on the Prevention of Bullying, Harassment and Discrimination Guidelines page on the University website **www.auckland.ac.nz/en/about-us/about-the-university/equity-at-the-university.**

You may also contact the University Proctor at **proctor@auckland.ac.nz**

International Office

The International Office is 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 are parents, and we offer private areas and breastfeeding facilities. No bookings are required; you can find a list of all available spaces on campus at **www.auckland.ac.nz/en/on-campus/student-support/personal-support/parenting-support-childcare/breastfeeding-facilities.html**

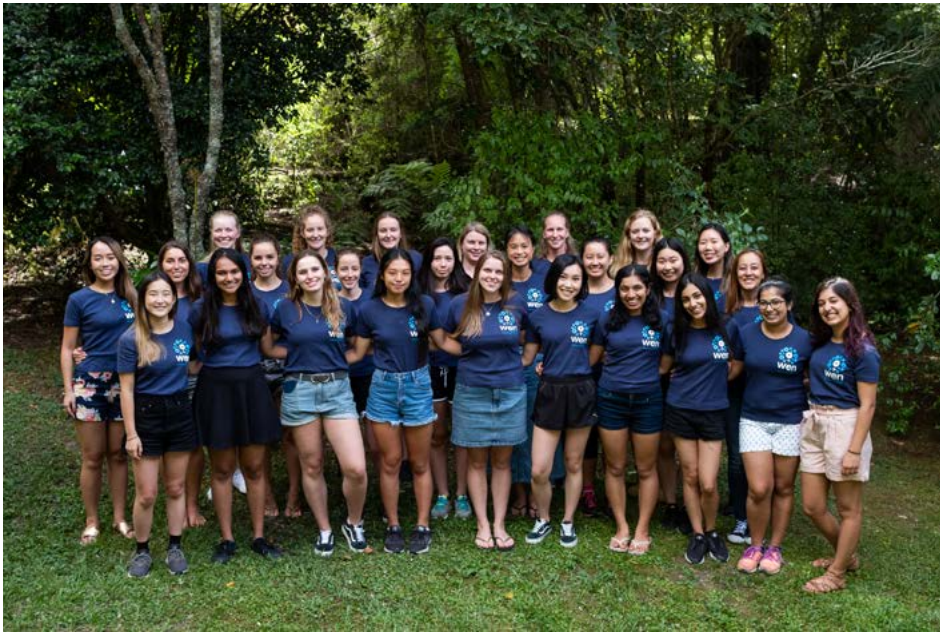
The University also provides Parent Space, which is a dedicated kitchen and study area for you to use, with or without your children. The city campus Parent Space is located in Old Choral Hall – entrance from 3 Alfred Street. Resources include port-a-cot, high chair, change table, TV, computer and printer, children's toys and books, and kitchen facilities.

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. For more information:

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

www.library.auckland.ac.nz/services/student-learning/learning-disabilities-students



Textbooks

If you are interested in buying or selling second-hand textbooks, check the notice boards throughout the university. The University's bookshop and other outlets also sell second-hand textbooks. AUSA and Ubiq provide textbook grants to AUSA members who have 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

AskAuckland Central

The University opened its new AskAuckland Central student information centre in Alfred Nathan House in November 2017.

Alfred Nathan House, located on Princes Street, now integrates a number of our student services and houses AskAuckland Central, International Office, School of Graduate Studies, Communications and Marketing, and School Partnerships Office.

Students can be helped directly by centre staff, can be assisted to self-serve on the computers in the centre, or can book an appointment if more detailed or specialised support is needed.

For general enquiries, you can email studentinfo@auckland.ac.nz, phone 0800 61 62 63, or visit the Ask Auckland webpage at **www.auckland.ac.nz/en/students/academic-information/askauckland-central.html**.

Clubs, networks and associations

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

Auckland University Engineering Society (AUES)

Provides social, educational, networking, and community involvement events on and off campus for engineering students.

www.facebook.com/AUESociety

Biomedical Engineering and Engineering Science Student Association (BESA)

The club aims to bring students together through social activities such as pub quizzes, movie nights and also expand skills through events such as speed interviews and internship experience talks.

www.facebook.com/besauoa

Civil Engineering Student Association (CESA)

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

www.facebook.com/CESAUOA

Chemical and Materials Engineering Students Association (CMESA)

Provides mentorship and industry connection through both social and professional events including plant tours, and speakers nights.

www.facebook.com/CMESA.uoa

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 New Zealand

New Zealand's engineers are represented by Engineering New Zealand, a professional body that provides information and engagement opportunities with the industry. Student membership is free if you're studying towards a BE(Hons).

www.engineeringnz.org

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

Foiling Yacht Innovation

Provides an opportunity for students to put their knowledge to use in a practical context, with a unique and exciting test upon completion. Utilises the University's expertise in yacht and materials research, alongside industry partnerships to help students create and construct innovative designs, and see them performing on the world stage.

www.facebook.com/foilingyachtinnovation

Impulse

A multi-disciplinary club with an interest in space. All levels of expertise are welcome, and only a passion for space is required for you to join us

www.facebook.com/impulseuoa

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 offers 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.

https://communities.theiet.org

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)

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

www.sesa.org.nz

South Pacific Indigenous Engineering Students (SPIES)

SPIES was formed in 1993 as a social, cultural and academic support group for Maori and Pacific Island students studying Engineering at the University of Auckland

www.facebook.com/groups/uoa.spies

spies@auckland.ac.nz

Society of Petroleum Engineers (SPE)

The largest individual member organization serving up to 164,000 professionals worldwide in the oil and gas industry – as well as 73,000 students. SPE exchanges technical knowledge related to the production of oil and gas resources. It strives to get down to the roots of what it means to be a petroleum engineer and why it is so crucial to understand the fossil fuels we rely on so heavily.

www.facebook.com/spemembers

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

Mechanical and Mechatronics Students Association (MECHA)

Provides opportunities for mechanical and mechatronics students to network with peers and the industry.

www.facebook.com/mechaUoA

Women in Engineering (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/wen

Academic information

Course details and requirements

You will receive detailed course outlines in Canvas describing the material covered; how it will be assessed; the percentage of assessments contributing to your final grades, and assessment due dates. This information may also be provided as a handout in your first 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 submitting and returning assignments, and you will be informed of the right procedure. Many courses use the Student Services Stall on Level 3 of B402 (Leech) 20 Symonds Street, 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 office.

Academic misconduct, cheating and plagiarism

The University of Auckland views 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:

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

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. See **www.auckland.ac.nz/exams** for more information.

Restricted Calculators

There are specific regulations about the type of calculator you may use during tests and exams. If your exam specifies a "Restricted Calculator" the following defines 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 specifications
- A typical complying calculator is the Casio fx-82AU PLUS II.

If in doubt, check with your course coordinator 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.
- Suffered illness or other misfortune which affected 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. You must have obtained a medical certificate providing full details of your condition. For compassionate consideration, please see the University Health and Counselling Service.
- Complete the online application **https://aegrotat.auckland.ac.nz/apply**. You must submit it within seven days of your last affected examination.

Your academic performance throughout the course will also be taken into consideration. The final decision on an aegrotat is determined by the University Senate. Visit **www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/during-exams/aegrotat-and-compassionate-consideration.html** for more information.

Missed exams

Students who report too late for admission to the exam room or who miss the exam completely cannot sit that exam at another time. If you missed your exam due to illness or unforeseen circumstances then you may be eligible to apply for an aegrotat or compassionate consideration. Strict criteria applies.

For more information see: Aegrotat and compassionate consideration for exams.

Missing a test

Tests that contribute to your final grade, 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 online at: **https://tinyurl.com/y7chwh6w**, 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 first request an extension of the due date from the course coordinator. If an extension is not given or is considered inappropriate, you may submit an exemption request through the "Application for Exemption from On-course Assessment" form available online at **www.forms.auckland.ac.nz/en/student/engineering/faculty-of-engineering-application-for-exemption-from-on-course.html**.

- You must have been prevented from attending 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

If you fail a course, you may be eligible for a conceded pass, which carries a passing numerical grade of 1 (equivalent to a C-). You cannot apply for a conceded pass; eligible students will be automatically considered and conceded passes will be confirmed 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 above (C = 2, C+ = 3).
- The failed course(s) belong to Parts I, II or III of the BE(Hons) degree.
- One course to a maximum of 20 points per Part and a maximum of 20 points in any one academic year may be conceded.

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**

There are strict criteria in place for approving an exam to be sat at a different time (referred to as out-of-time) or place (out-of-centre). Applications for personal commitments or travel will not be accepted. You should not book any travel during the exam period until after your finalised exam timetable is published. **www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/before-exams/special-conditions.html**

Applications must be submitted at least 1 month before your first affected exam; otherwise your application may not be considered in time.

You need to contact the Exams Office (Email: **exams@auckland.ac.nz**, or for in-person queries please visit AskAuckland Central) not your lecturers for this.

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 your control. The deadline to submit a late deletion request is on the final day of lectures. If you wish to apply for late deletion, consider seeking support from the University's Counselling Service or student advisers first. Contact the Engineering Student Centre for more information.

Repeating a course for a third time

A concession request will need to be made to repeat a failed course for a third time. Third time repeats of Part I courses are likely to be declined, and will require the student to find another course of study, other than Engineering. Requests to repeat failed courses at Part II - IV for a third time will be assessed against the students overall performance in the programme and in their coursework and may be declined. If a core course cannot be repeated for a third time this will result in discontinuation from study in the BE(Hons). A full semester of DNS or DNC will also likely result in not being permitted to continue study in the BE(Hons). Contact the Faculty of Engineering Student Centre for advice.

Admission

Closing dates for 2020 applications

- **MAPTES:** 20 November 2019
- **BE(Hons) Semester One entry:** 8 December 2019

Admission to Part I

Places available in Part I (first year) of the BE(Hons) are limited and subject to selection. Successful candidates require a strong background in calculus, (classical) 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 2020 limits are:

- Biomedical Engineering: 35 places
- Chemical and Materials Engineering: 85 places
- Civil and Environmental Engineering: 280 places
- Computer Systems Engineering: 80 places
- Electrical and Electronic Engineering: 100 places
- Engineering Science: 75 places
- Mechanical Engineering: 125 places
- Mechatronics Engineering: 100 places
- Software Engineering: 100 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(Hons) programme at another tertiary institution may 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.

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 B average 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.

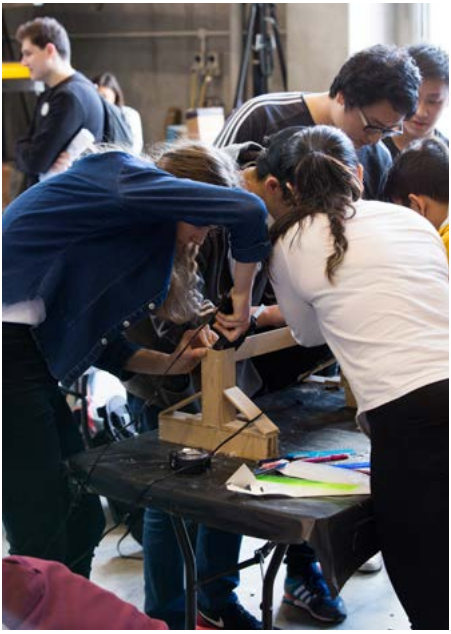
Students wishing to transfer need to complete an application via Student Services Online and indicate the specialisation for which they wish to be considered under Major/Specialisation, eg, Civil Engineering.

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 (more information on page 26). 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 top five choices of specialisation before the end of Semester Two. The faculty offers a variety of resources to help you consider your specialisation of choice, including editorials written by current students at **https://student-editorials.blogs.auckland.ac.nz/**.



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

- Completed a minimum of 90 points of Part I, including ENGSCI 111 (your General Education course can be included in the points requirement).
- 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; ENGGEN 121 for Civil, Mechanical and Mechatronics; and ENGGEN 131 for Biomedical, Engineering Science and Software).
- Completed requirements for ENGGEN 199.
- Completed requirements for ACADINT A01.

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 be ranked unless they complete the above requirements.

Places in your preferred specialisations are not guaranteed and you may be offered a place in another specialisation if places are no longer available in your first (or lower) choice/s.

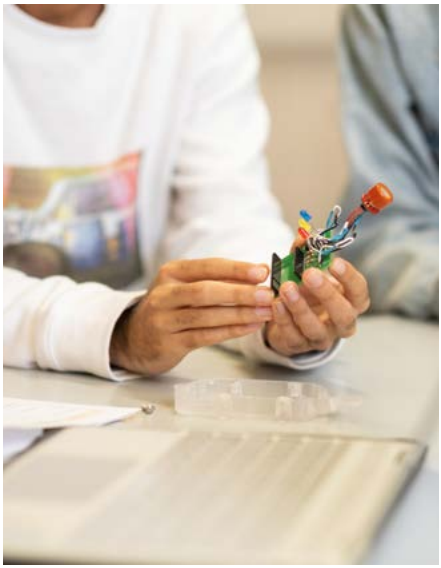
If you fail up to 30 points of courses in Part I, you are advised to repeat them at Summer School. Similarly, if you only began the BE(Hons) in Semester Two (and have only completed 60 points of Part I) you are required to make up your remaining 30 points for Part I at Summer School, in order to be considered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

If you are admitted to Part II in Semester One, before you have completed all of Part I, you will be required to complete any outstanding Part I courses in Summer School of the following year. You will not normally be permitted to enrol in the outstanding Part I courses during Semester One or Two.

Any student who does not complete Part I within two years of initial enrolment may not be permitted to continue in the BE(Hons).

More information can be found at:

www.auckland.ac.nz/en/engineering/current-students/undergraduate/choosing-engineering-specialisation.html.



Enrolment

Dates to remember	
Enrolment opens for Part I 2020	1 November 2019
Enrolment opens for Parts II 2020	13 December 2019
Enrolment opens for Parts III and IV 2020	10 December 2019
Recommended date for enrolment completion	14 February 2020
Last day to change Semester One courses	13 March 2020
Last day to change double Semester (A and B) courses	27 March 2020
Last day to change Semester Two courses	31 July 2020

Part I students

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

Students enrol in their courses through Student Services Online. Instructions and tutorials on how to enrol can be found at w**ww.auckland.ac.nz/en/study/applications-and-admissions/enrolment.html**.

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 14 February** as classes fill up quickly. Enrolment deadlines can be found in the Important Dates section of the University Calendar: **www.calendar.auckland.ac.nz/en/keydates/enrol-dates.html**.

Conjoint students

It is advised that you prioritise enrolment in your BE(Hons) courses, as these course schedules can be inflexible and places fill quickly. Remember that you are still required to meet the requirements to be allocated to a specialisation in the following year, and should try to focus on keeping your GPA high in your Engineering courses. **Refer to the conjoint information on page 34**.

MAX (MATHS 153) students

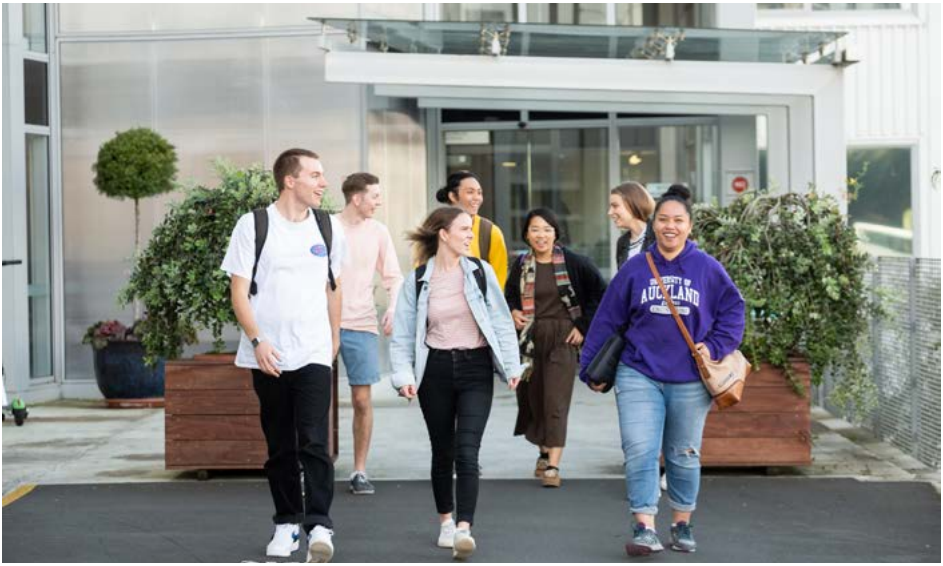
Students who have received a B+ grade or above in MATHS 153 usually enrol in Mathematical Modelling 2 (ENGSCI 211) in their first year of engineering. Those who received a grade lower than a B+ will be required to enrol in ENGSCI 111. However, those intending to complete a conjoint degree should consider other options. MAX students can contact Peter Bier by emailing **p.bier@auckland.ac.nz** for advice on mathematics courses.

MATHS 153 ran for the last time in 2019.

Parts II, III and IV students

Before enrolling, read our guidelines for returning students at **www.auckland.ac.nz/en/engineering/current-students/undergraduate/course-enrolments.html** You should also consider the guidelines on the main University website at **www.auckland.ac.nz/enrolment.**

If you fail a course, 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, or encounter a timetable clash with no alternative options, you will need to apply for an enrolment concession via Student Services Online. If approved, Student Centre staff will enrol 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."

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 4, 20 Symonds Street on Mondays to Fridays, excluding public and University holidays, from 8.30am to 4.30pm.

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. Concessions are only available for online submission within the first five working days of Semester One or Semester Two. If permission is needed to alter courses after week one, you will need to complete an AS-70 form and hand it to the student centre. After this period, an attempt to drop a course is classified as a "Withdrawal (W)" and will appear on your student record as such (note that a "Withdrawal" 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 and will be included in GPA calculations. 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 an Honours GPA of 4.0 (B- average) or above. Students who do not meet the grade requirement, but complete all of the course requirements for the BE(Hons), will be awarded the BE degree without Honours.

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

Part I

Part I is a common year – all students take the same courses. You gain exposure to each of the nine different 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	Energy and Society	15	ELECTENG 101	Electrical and Digital Systems	15
ENGSCI 111	Mathematical Modelling 1	15	ENGGEN 131	Introduction to 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 different disciplines and develop your awareness of interdisciplinary research.

You must pass one approved 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 MUST choose from a range of courses from either the "General Education Open Schedule" or the "Engineering, Medical and Health Sciences, and Science Schedule (EMHSS)". You cannot enrol in a General Education course with the same course subject as any you will take within the degree, such as ENGGEN 100G. 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 level of competence in academic English to support your study at University. This will not affect whether you are offered a place in a programme, being separate to University Entrance English requirements.

Applicants who have not met the AELR through their entrance qualification 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, and in addition to, AELR and University Entrance English requirements. 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 requirements of ENGGEN 199, firstly you must complete the 30 minute Diagnostic English Language Needs Assessment (DELNA) screening. For most students, the completion of this screening will be sufficient.

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 as soon as possible, or at least before the semester ends. 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 allocated a specialisation unless you have met 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. 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. This is also a requirement to be allocated a specialisation, and so BE(Hons) students (single and conjoint) are required to complete this in Part I. More details are provided at **www.auckland.ac.nz/academic_honesty**.

Parts II-IV

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

- Biomedical Engineering
- Chemical and Materials Engineering

- Civil Engineering
- Computer Systems Engineering
- Electrical and Electronic Engineering
- Engineering Science
- Mechanical Engineering
- Mechatronics Engineering
- Software Engineering
- Structural Engineering (Part II from 2021 – refer to Appendix)

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. Electives from outside your department or the faculty require the approval of your departmental course adviser. Programme structure for each specialisation can be found later in the handbook.

Field trips

As part of your course, you may need to go on field trips to study engineering plants and works. You will be given details about these requirements as soon as they are available. Any field 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 field 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 field trips that complement relevant lecture material.
- **Engineering Science and Biomedical Engineering** Part II students will participate in a compulsory two to three-day field trip provisionally planned for early in Semester One. These students visit industries in the upper half of the North Island.
- **Mechanical Engineering and Mechatronics** 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)

To complete Part II of the BE(Hons), you must have completed a recognised course in Workshop Practice. Though it is a zero-point course, you will not be deemed as having completed Part II until you have undertaken this workshop and, therefore, may have limited enrolment in higher Parts if you do not complete ENGGEN 299 at the appropriate time. Part II students will receive registration details and course dates via email or can find out more at **www.engineering.auckland.ac.nz/workshop-practice**.

Approved courses are held at Auckland University of Technology (AUT) throughout the year, and at Manukau Institute of Technology (MIT) during semester breaks. Although the intention is to hold the workshops during semester breaks, students should 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/or 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 (paid or unpaid) 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 (ENGGEN299) and Practical Work (ENGGEN499)have been completed.

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

Important points to note:

- **When:** To meet the requirements for the award of the BE or BE(Hons) degree, you must complete 800 hours of practical work (which may be made up of either all general hours, or all sub-professional hours, or a combination of both general and sub-professional hours) 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 different 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 first week of employment, so the Employment Manager can validate the company. If you miss this deadline please contact **foe-enquiries@auckland.ac.nz**.
- **Certification:** A Practical Work Certificate covering each work period must be completed, signed by your employer, and included with your report.
- **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 via CANVAS.
- If you wish to participate in the September 2020 graduation ceremony, your final report **should** be submitted on Canvas between **8.30am on Monday 9 March to 11.59pm on Friday 13 March 2020.** If you wish to participate in the May 2021 graduation ceremony, your final report **should** be submitted on Canvas between **8.30am on Monday 3 August to 11.59pm on Friday 7 August 2020.**
- **Prize:** Three prizes of $1,500 are offered 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 please include the entry form with your report and submit on CANVAS **by 11.59pm on Friday 13 March 2020.**
- **Exemptions:** If 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 800 hours over two summers for a 400 + 400 hour split, other hour splits are acceptable.

Practical work has historically been categorised as General or Sub-Professional

- **General engineering:** This is often undertaken in the first period of practical work period and should allow you to become familiar with engineering processes and trade skills, particularly those appropriate to your specialisation.
- **Sub-professional engineering:** This is more likely to be part of the second period of practical work period, when your knowledge of engineering subjects will be more extensive. Work of this type is of a sub-professional nature; the work of a junior engineer in a company with some responsibilities and technical expertise, which takes advantage of the academic training gained from your courses completed 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.

Ideally with your practical work you will undertake some work in each category, but there is now no minimum (or maximum) number of hours required in each category.

Specialisation	Type of work	Examples
Biomedical Engineering	General engineering	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, database design or inventory control.
	Sub-professional engineering	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; data gathering or analysis.
Chemical and Materials Engineering	General engineering	Work associated with skilled tradespeople, involving machining, structures, building construction, design, welding, quality control, production assembly or electronics.
	Sub-professional engineering	Work associated with professional engineers such as operating plants or laboratories in: metal; materials; chemicals; fertilisers; paints; soaps; foods; petrochemical; pulp and paper; dairy; water treatment; environmental or pollution control; and Summer Research Scholarship projects.
Civil and Environmental Engineering	General engineering	Work associated with skilled tradespeople, involving trade skills in: construction, earthmoving; mining; water and wastewater treatment; surveying; roads, traffic and transportation; asset condition; minerals and resources; and environmental monitoring industries.
	Sub-professional engineering	Work associated with professional engineers, including surveying; contract documentation; design and/or draughting; bore hole logging; construction and construction supervision; buildings and structures; geotechnical; earthworks; mining; roads, traffic and transportation; water/wastewater; hydrology/ hydraulics; and environmental engineering.

Computer Systems Engineering	General engineering	Work associated with skilled tradespeople, involving the fabrication, manufacture, installation, maintenance and configuration of mechanical, electrical and computer systems.
	Sub-professional engineering	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 and the installation and configuration of networks.
Electrical and Electronic Engineering	General engineering	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	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	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	Work associated with professional engineers, involving product design; systems/applications analysis; analysis of optimisation and simulation models; or software development.

Mechanical Engineering	General engineering	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	Work associated with professional engineers, involving design, draughting, inventory control, production planning, administrative/managerial processes and coordinating labour.
Mechatronics Engineering	General engineering	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 configuration of computer systems.
	Sub-professional engineering	Work associated with professional engineers including mechanical design, draughting, inventory control, production planning, administrative/managerial processes and the design, implementation and testing of electrical, computer or software systems.
Software Engineering	General Engineering	Work associated with skilled tradespeople involving the fabrication, manufacture, installation, maintenance and configuration of mechanical, electrical and computer systems.
	Sub-professional engineering	Work associated with professional engineers involving the installation of software systems; design, implementation and testing of software systems; helpdesk, backup and system support; network configuration; computer security services; information system support and 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 specifications:

- You must provide a separate report for each employer. However we will accept **one report** if the work was taken at the same company. If this work was carried out during separate work periods; then you will be expected to provide the following:

For each period of work in the same company:

1. If its continuous work over different periods of time in the same role/team- **then one reflective appraisal will suffice**.

2. If it is two separate periods of work in a different role/team- **then two reflective appraisals will be required**.

- Reports must be no more than 25 pages in length.
- All reports MUST contain:

- **Title page:** including your name, specialisation, the name and address of your employer, dates of the work period and the 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 and 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 figures 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 may include staff organisation structure, number of employees engaged in various work, general comments on buildings, plant layout, technical facilities and amenities for staff.
- **Central sections:** these sections should provide a full description of the work undertaken and any other activities observed.
- **Reflective appraisal (Must be at least one page in length):** this section should be a critical appraisal, or evaluation, of 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 2020

- **Practical Work Committee Chair:** Dr Vicente Gonzalez (v.gonzalez@auckland.ac.nz)
- **Biomedical Engineering:** Associate Professor Iain Anderson (i.anderson@auckland.ac.nz)
- **Chemical and Materials Engineering:** Dr Wei Yu (w.yu@auckland.ac.nz)
- **Civil and Environmental Engineering:** TBC
- **Computer Systems, Electrical and Electronic, and Software Engineering:** Dr Abhisek Ukil (a.ukil@auckland.ac.nz)
- **Engineering Science:** Dr Michael O'Sullivan (michael.osullivan@auckland.ac.nz)
- **Mechanical and Mechatronics Engineering:** Dr Jonathan Stringer (j.stringer@auckland.ac.nz)
- **(ex officio) Student Centre 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 your 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 of completing two undergraduate degrees.

Most BE(Hons) conjoint programmes can be completed in five years. They generally consist of 420* points' worth of courses in engineering, 255 points from the other degree courses, and 15 points from approved General Education courses. Exceptions include conjoints with the LLB and LLB (Hons) and the BAdvSci (Hons). The conjoint combinations currently available with Engineering are:

- BE(Hons)/Bachelor of Arts (BA)
- BE(Hons)/Bachelor of Commerce (BCom)
- BE(Hons)/Bachelor of Design
- BE(Hons)/Bachelor of Global Studies (BGlobalSt)
- BE(Hons)/Bachelor of Property (BProp)
- BE(Hons)/Bachelor of Laws (LLB)

** for students starting a conjoint with BE(Hons) in 2019 or later*

- BE(Hons)/Bachelor of Laws (Honours) (LLB(Hons))
- BE(Hons)/Bachelor of Music (BMus)
- BE(Hons)/Bachelor of Advanced Science (Hons) (BAdvSci(Hons))
- 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 GPA of 4.0 across your most recent academic year of study.

As per the regulations of the University of Auckland, students cannot enrol for courses that have substantially similar content. Thus, certain 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 BSc in Data Science BAdvSci(Hons) in Computer Science BCom in Information Systems BCom in Information Management
Approval from your BE(Hons) Specialisation Adviser required	
Biomedical Engineering	BSc in Physiology or Pharmacology
Computer Systems Engineering	BSc in Computer Science BAdvSci(Hons) in Computer Science
Electrical and Electronics Engineering	BAdvSci(Hons) in Physics BSc in Physics
Engineering Science	BSc in Mathematics BSc in Applied Mathematics BAdvSci(Hons) in Mathematics BSc in Physics BAdvSci(Hons) in Physics BSc in Statistics BAdvSci(Hons) in Statistics BA in Logic and Computation BSc in Logic and Computation
Mechatronics Engineering	BSc in Computer Science BAdvSci(Hons) in Computer Science BSc in Physics BAdvSci(Hons) 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 420* points' worth of courses made up of:

- 105 points at Part I: CHEMMAT 121, ELECTENG 101, ENGGEN 115, 121, 131, 140, 199, ENGSCI 111, ACADINT A01
- 210 points at Parts II and III (including ENGGEN 204) from courses listed in the schedule of your chosen BE(Hons) specialisation + ENGGEN 299
- 105 points at Part IV (including ENGGEN 403) from courses listed in the schedule of your chosen BE(Hons) specialisation + ENGGEN 499.

This is 60 points less than the full BE(Hons). This reduction in points is accounted for by:

- 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

Note: If you pass all your courses and complete all other requirements for the BE(Hons) but your Honours GPA is below 4.0, you will be awarded the conjoint degree with a BE.

There are specific regulations 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. As a conjoint student you will choose your preferred Engineering specialisation at the end of Part I, along with single BE(Hons) students. This choice will guide your course selection for Parts II- IV of your BE(Hons).

You are advised to select your BE(Hons) courses first and then fill your points with courses from your other degree, as the latter usually provides more timetable flexibility. Depending on the conjoint programme, you may be exempt from courses in the other component if an Engineering course covers similar content. 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.

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. You can find the list of course advisers online here:

www.auckland.ac.nz/en/engineering/study-with-us/study-options/courses/academic-advisers.html.

Conjoint planners

Detailed conjoint planners specific to each BE(Hons) specialisation are available at the Engineering Student Centre and on the Faculty of Engineering website here: **www.auckland.ac.nz/en/engineering/study-with-us/study-options/courses/conjoint-degrees.html**. Information on the requirements of your other degree components can be found in the University of Auckland Calendar. You are advised to visit the relevant Student Centres to ensure you are enrolling in the correct courses, or see the tables for your specialisation later in this handbook.

**for students starting a conjoint with BE(Hons) in 2019 or later*

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

Course descriptions

BE(Hons) students may vist **https://courses.foe.auckland.ac.nz/course** for detailed information on their courses each semester, or see the back of this handbook.

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 field 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 **www.space.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 exchange agreement – you'll pay tuition only to the University of Auckland, be eligible to apply for scholarships, and bring credits you've earned overseas to your BE(Hons).

- To be eligible to study abroad, you must have a cumulative GPA of 5.0 from your BE(Hons) study, a 5.0 term GPA in the semester prior to departure, and be approved by the faculty.
- BE(Hons) students are permitted to credit a maximum of 60 points of Engineering courses while on exchange. Exchange for BE(Hons) is permitted only in Semester Two of Part II, or either semester of Part III of the degree. Conjoint students may take courses to credit towards their other degree component or a separate period of exchange if permitted by their other 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.

- 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

Once you have completed all requirements for your programme 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 professional engineer, you must meet two separate requirements. One of these relates to academic qualifications and the other to subsequent work experience. Satisfying the academic requirements normally means holding a degree which has been approved by Engineering New Zealand (formerly 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 Engineering NZ. Typically this membership requires a minimum of three years’ experience in the workforce including field, plant and design experience, and at least one year in a responsible position. For further information, visit **www.engineeringnz.org**.

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 effective 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 themselves 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 fingertips 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 career 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 fields, such as software development, electronics, engineering and management consulting, financial modelling, and the food/meat/wool science industries.

Undergraduate course adviser

Dr Vinod Suresh
bme-undergrad-adviser@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Biomedical Engineering specialisation are being taught in 2020.

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	Professional Skills 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
			COMPSYS 303	Microcomputers and Embedded Systems	15
			ENGSCI 344	Modelling and Simulation in Computational Mechanics	15
			ENGSCI 355	Applied Modelling in Simulation and Optimisation	15
			EXERSCI 303	Biomechanics 2	15
			MATHS 362	Methods in Applied Mathematics	15
			MECHENG 352	Manufacturing Systems	15
			MECHENG 371	Digital Circuit Design	15
			MEDSCI 305	Systems Pharmacology	15
			MEDSCI 312	Endocrinology of Growth and Metabolism	15
			MEDSCI 314	Immunology	15
Or another approved course above Stage II offered at this University					

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	Biomaterials and Applications	15	BIOMENG 771	Musculoskeletal and Orthopaedic Biomechanics	15
ELECTENG 722	Modern Control Systems (Previously Control Systems)	15	CHEMMAT 754	Materials Performance Enhancement	15
ELECTENG 733	Digital Signal Processing (Previously Signal Processing)	15	CHEMMAT 757	Engineering Biotechnology	15
ENGSCI 711	Advanced Mathematical Modelling	15	COMPSYS 705	Formal Methods for Engineering	15
ENGSCI 740	Advanced Mechanics in Research and Technology	15	ENGSCI 712	Computational Algorithms for Signal Processing	15
ENGSCI 753	Computational Techniques in Mechanics and Bioengineering	15	ENGSCI 741	Waves and Fracture	15
MATHS 765	Mathematical Modelling	15	MEDSCI 737	Biomedical MRI	15
MECHENG 743	Composite Materials	15			
MEDSCI 703	Advanced Biomedical Imaging	15			
Or up to 30 points from other approved 700 level courses offered at this University					
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-effective 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 separate chemical engineering and materials engineering programmes, so the combination of both disciplines offered 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 qualification 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
p.cao@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Chemical and Materials Engineering specialisation are being taught in 2020.

Part II

120 points comprising:

Semester One			Semester Two		
CHEMMAT 201 (previously CHEMMAT 211)	Process Engineering 1: Introduction	15	CHEMMAT 202 (previously CHEMMAT 212)	Process Engineering 2: Energy and Processing	15
CHEMMAT 204 (previously CHEMMAT 221)	Materials	15	CHEMMAT 203 (previously CHEMMAT 213)	Process Engineering 3: Transfer Processes	15
CHEMMAT 206 (previously CHEMMAT 242)	Applied Chemistry	15	CHEMMAT 205 (previously CHEMMAT 232)	Process Design 1	15
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Professional Skills and Communication	15
ENGGEN 299 Workshop Practice to be completed during Part II					0

Part III

120 points comprising:

Semester One			Semester Two		
CHEMMAT 301 (previously CHEMMAT 312)	Transfer Processes 2	15	CHEMMAT 302 (previously CHEMMAT 313)	Advanced Process Engineering	15
CHEMMAT 305 (previously CHEMMAT 322)	Materials Processing and Performance	15	CHEMMAT 303 (previously CHEMMAT 315)	Chemical Reactor Engineering	15
CHEMMAT 306 (previously 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 304 (previously CHEMMAT 317)	New Developments in Process Engineering	15
			CHEMMAT 754	Materials Performance Enhancement	15
			CHEMMAT 755	Materials for Energy and Environmental Applications	15
			CHEMMAT 757	Engineering Biotechnology	15
Or other courses approved by the Head of Department					

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 Performance Enhancement	15
CHEMMAT 753	Biomaterials and Applications	15	CHEMMAT 755	Materials for Energy and Environmental Applications	15
CHEMMAT 756	Food Process Engineering	15	CHEMMAT 757	Engineering Biotechnology	15
Or other courses approved by the Head of Department (up to 15 points), 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 opportunities that involve the design, construction and maintenance of infrastructure such as roads, dams and urban developments; structural refits and construction 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 firms of consulting engineers. You might also use your qualification 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

Direct Entry: Dr Tam Larkin
t.larkin@auckland.ac.nz

Part II: Dr James Lim
james.lim@auckland.ac.nz

Parts II/III and III: Dr Connor Hayden
connor.hayden@auckland.ac.nz

Parts III/IV and IV: Dr Gary Raftery
g.raftery@auckland.ac.nz

Conjoints/Exchange: Dr Quincy Ma
q.ma@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Civil and Environmental Engineering specialisation are being taught in 2020. Current students (those enrolled in the BEHONS prior to 2020) will complete their degree under the **2019 Calendar Regulations**. Students entering Part 1 from 2020 will follow the new programmes (see Appendix) and enrol in the new courses as they are introduced year by year.

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	Professional Skills 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
			CIVIL 756	Capstone Project	15
45 points of electives from the following:					
CIVIL 713	Structures and Design 4	15	CIVIL 714	Multistorey Building Design	15
CIVIL 715	Advanced Structural Concrete	15	CIVIL 726	Engineering Geology	15
CIVIL 719	Matrix Structural Analysis	15	CIVIL 732	Coastal Engineering Dynamics	15
CIVIL 721	Foundation Engineering	15	CIVIL 734	River Engineering	15
CIVIL 722	Slope Engineering	15	CIVIL 741	Ground Improvements and Geosynthetics Engineering	15
CIVIL 731	Water Resources Modelling	15	CIVIL 743	Special Topic: Building Information Modelling	15
CIVIL 733	Coastal Engineering Design	15	CIVIL 750	Timber Engineering	15
CIVIL 758	Traffic Systems Design	15	CIVIL 759	Highway and Transportation Design	15
CIVIL 791	Construction Management	15	CIVIL 782	Water Resources Engineering	15
ENVENG 740	Water and Wastewater Engineering	15	ENVENG 701	Urban Stormwater Management	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 710	Advanced Structural Dynamics	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 field.

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 firms, 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 field 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 that you won't be short of options.

Undergraduate course adviser

Dr Morteza Biglari-Abhari
m.abhari@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Computer Systems Engineering specialisation are being taught in 2020. Current students (those enrolled in the BEHONS prior to 2020) will complete their degree under the **2019 Calendar Regulations**. Students entering Part 1 from 2020 will follow the new programmes (see Appendix) and enrol in the new courses as they are introduced year by year.

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	Professional Skills 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 (previously 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 (up to 15 points).					

Part IV

120 points comprising:

Semester One			Semester Two		
COMPSYS 700 A & B Research Project					30
			ENGGEN 403	Managing a Business	15
75 points of electives from the following courses (with at least 45 points to be from COMPSYS 7XX courses highly recommended):					
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	Distributed Cyber-Physical Systems Design (previously Computer Networks and Distributed Applications)	15
ELECTENG 722	Modern Control Systems (previously Control Systems)	15	ELECTENG 704	Advanced Control Systems	15
ELECTENG 732	Communication Systems	15	ELECTENG 726	Digitial Communications	15
ELECTENG 733	Digital Signal Processing (previously 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 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 fields, from renewable electricity generation, to sophisticated medical electronics, signal processing, wireless communication, electro-magnetics, information technology and Artificial Intelligence (AI) based systems. We will have electrical and electronic engineers to thank when new forms of low-carbon energy resources are universally deployed, when electric vehicles and smart phones are charged wirelessly, and high-speed real-time communications are designed for self-driving vehicles and Internet-of-Things (IoT) applications.

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 field of specialisation. With our programme, you will get a solid foundation of basic science, electrical engineering fundamentals, engineering project managment and selected fields of emerging electrical/electronic technologies and platforms. 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 areas 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 to 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 electricity, communications, wireless computing technologies, electronics, instrumentation, power electronics, signal processing and motor-control. Opportunities also exist in processing industries such as timber, pulp and paper, steel, aluminium, meat, and dairy.

Several of our graduates also choose to join global consultancy firms and some have developed their career through management and leadership roles, within both private and public sectors. A few have led start-ups, eventually acquired by multinational companies.

Undergraduate course adviser

Dr Mark Andrews
m.andrews@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Electrical and Electronic Engineering specialisation are being taught in 2020. Current students (those enrolled in the BEHONS prior to 2020) will complete their degree under the **2019 Calendar Regulations**. Students entering Part 1 from 2020 will follow the new programmes (see Appendix) and enrol in the new courses as they are introduced year by year.

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	Professional Skills 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	Applied Electronics (previously 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 (previously Digital Systems Design 1)	15	COMPSYS 304	Computer Architecture	15
ELECTENG 307	Fields and Waves (previously 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		
ELECTENG 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	COMPSYS 725	Distributed Cyber-Physical Systems Design (previously Computer Networks and Distributed Applications)	15
ELECTENG 721	Radio Engineering (previously Radio Systems)	15	ELECTENG 701	Mobile Wireless Engineering (previously Wireless Communication)	15
ELECTENG 722	Modern Control Systems (previously Control Systems)	15	ELECTENG 703	Advanced Power Systems	15
ELECTENG 731	Power Systems	15	ELECTENG 704	Advanced Control Systems	15
ELECTENG 732	Communication Systems	15	ELECTENG 726	Digital Communications	15
ELECTENG 733	Digital Signal Processing (previously 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 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 better solutions for many aspects of our daily lives. How can a forest be managed to make a profit while 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? These 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 involves mathematically describing and optimising real-world scenarios in order to design the best solutions to practical problems, such as optimising the positioning of ambulances around a city. Computational mechanics examines how the application of force affects different materials – for instance, how a car is damaged when it crashes, or how a bubble rises. Other study areas include environmental modelling, biomedical engineering, data analytics and financial mathematics. 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, data science, and problem solving. You will be able to apply yourself to a very wide range of business areas.
You might end up optimising a production process for a large manufacturer, using coding and analytics skills to develop data-driven decision support tools for operational or strategic planning, or applying your logical thinking and communications skills in a management position with an engineering or financial consultancy. Our graduates are found in many leading companies such as Fonterra, Air New Zealand, Meridian Energy, Orion, local government organisations such as Watercare and Auckland Transport, and engineering consultancies such as Beca and WSP Opus.

Undergraduate course adviser

Dr Tony Downward
engsci-undergrad-adviser@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Engineering Science specialisation are being taught in 2020.

Part II

120 points comprising:

Semester One			Semester Two		
BIOMENG 221	Mechanics of Engineered and Biological Materials	15	ENGGEN 204	Professional Skills 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 from the following:					
			BIOMENG 241	Instrumentation and Design	15
			COMPSYS 202	Object Oriented Design and Programming	15
			MECHENG 211	Thermofluids	15
COMPSCI 225 Discrete Structures in Mathematics and Computer Science (Semester One or Two)		15			
STATS 210 Statistical Theory (Semester One or Two)		15			
Or other approved courses above Stage 1 offered at this University					
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 from the following:					
			BIOMENG 341	Bioinstrumentation and Design	15
			ENGSCI 344	Modelling and Simulation in Computational Mechanics	15
			ENGSCI 355	Applied Modelling in Simulation and Optimisation	15
Up to 15 points from other approved courses above Stage II offered at this University					

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	BIOMENG 771	Musculoskeletal and Orthopaedic Biomechanics	15
ENGSCI 740	Advanced Mechanics in Research and Technology	15	ENGSCI 712	Computational Algorithms for Signal Processing	15
ENGSCI 753	Computational Techniques in Mechanics and Bioengineering	15	ENGSCI 741	Waves and Fracture	15
ENGSCI 760	Algorithms for Optimisation	15	ENGSCI 763	Advanced Simulation and Stochastic Optimisation	15
ENGSCI 761	Integer and Multi-objective Optimisation	15	ENGSCI 768	Advanced Operations Research and Analytics	15
ENGSCI 762	Scheduling and Optimisation in Decision Making	15			
Up to 30 points from other approved 700 level courses offered at this University					
ENGGEN 499 Practical Work to be completed before and during Part IV					0

Please consult the Engineeering Science study tracks for a list of Part II and Part III elective suggestions:

https://tinyurl.com/y7ukj4xb

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 different 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 field 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 efficiently. 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 Jaspreet Dhupia
j.dhupia@auckland.ac.nz

Conjoints: Stuart Norris
s.norris@auckland.ac.nz

Exchange: Dr Vladislav Sorokin
v.sorokin@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Mechanical Engineering specialisation are being taught in 2020.

Part II

120 points comprising:

Semester One			Semester Two		
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Professional Skills 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	Introduction to Mechatronics	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	ENGGEN 705	Engineering Product Development	15
MECHENG 713	Energy Technology	15	MECHENG 715	Building Services	15
MECHENG 722	Engineering Vibrations	15	MECHENG 724	Multivariable Control Systems	15
MECHENG 743	Composite Materials	15	MECHENG 726	Acoustics for Engineers	15
MECHENG 752	Technology Management	15	MECHENG 747	Manufacturing and Industrial Processes	15
Or other 700 level courses approved by the Head of Department					
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 different engineering disciplines.

What will I study?

The Department of Mechanical Engineering has offered this specialisation since 2002. Because a significant number of core 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. During 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 employed or are pursuing further study. In recent years, Mechatronics Engineering has become an internationally-recognised sub-discipline, with degree programmes now offered 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 in 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
y.hioka@auckland.ac.nz

Exchange: Dr Vladislav Sorokin

v.sorokin@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Mechatronics Engineering specialisation are being taught in 2020.

Part II

120 points comprising:

Semester One			Semester Two		
ENGSCI 211	Mathematical Modelling 2	15	ENGGEN 204	Professional Skills 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:					
MECHENG 201	Introduction to Mechatronics	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 313	Design of Real-Time Software	15	MECHENG 312	Sensors and Actuators	15
MECHENG 322	Control Systems	15	MECHENG 325	Dynamics of Fluids and Structures	15
MECHENG 370	Electronics and Signal Processing	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	ENGGEN 705	Engineering Product Development	15
MECHENG 709	Industrial Automation	15	MECHENG 715	Building Services	15
MECHENG 712	Aerohydrodynamics	15	MECHENG 724	Multivariable Control Systems	15
MECHENG 722	Engineering Vibrations	15	MECHENG 726	Acoustics for Engineers	15
MECHENG 743	Composite Materials	15	MECHENG 735	MEMS and Microsystems	15
MECHENG 752	Technology Management	15	MECHENG 736	Biomechatronic Systems	15
			MECHENG 747	Manufacturing and Industrial Processes	15
Or other 700 level courses approved by the Head of Department					
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 personal devices, such as smartphones, to large telecommunication networks, they have direct impacts on our day-to-day lives. Software Engineering involves creating cost-effective solutions for developing and maintaining software systems in the service of society. Software engineers design, develop and test their applications for various uses. The sub-discipline involves software design, architecture, system performance, testing and quality assurance, requirements engineering, computer and human interaction, and computer security, 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 creative, usable, complex, and secure systems that function reliably and can be effectively developed and maintained. You will build on the general engineering literacy you acquired in Part I by developing specialist software knowledge. You will learn about software design and development, programming languages, software development processes, computer organisation and architecture, operating systems, data communications, algorithm design and analysis, all alongside fundamental mathematics, project management, customer collaboration, 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 software development 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 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 technology needs and driving technology innovation. You will also find ample opportunities in dedicated software consultancy firms, 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 Nasser Giacaman
n.giacaman@auckland.ac.nz

Course descriptions

Visit **https://courses.foe.auckland.ac.nz/course** for detailed course information, or see the back of this handbook.

Courses outlined here for Parts II, III and IV of the Software Engineering specialisation are being taught in 2020. Current students (those enrolled in the BEHONS prior to 2020) will complete their degree under the **2019 Calendar Regulations**. Students entering Part 1 from 2020 will follow the new programmes (see Appendix) and enrol in the new courses as they are introduced year by year.

Part II

120 points comprising:

Semester One			Semester Two		
COMPSYS 201	Fundamentals of Computer Engineering	15	ENGGEN 204	Professional Skills and Communication	15
ENGSCI 211	Mathematical Modelling 2	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 Intelligence	15
COMPSYS 305	Digital Systems Design (previously Digital Systems Design 1)	15	COMPSYS 303	Microcomputers and Embedded Systems	15
SOFTENG 364	Networks and Security (previously 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
			ENGGEN 403	Managing a Business	15
75 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 Specification and Design	15
SOFTENG 701	Advanced Software Engineering Development Methods	15	SOFTENG 761	Advanced Agile and Lean Software Development (previously Agile and Lean Software Development)	15
SOFTENG 750	Software Development Methodologies	15			
SOFTENG 751	High Performance Computing	15			
SOFTENG 754	Advanced Software Requirements Engineering (previously Software Requirements Engineering)	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

Course descriptions

Biomedical Engineering

Part II

BIOMENG 221 (15 Points)

Mechanics of Engineered and Biological Materials

Introduction to the laws of conservation of mass, linear momentum, angular momentum and energy and their application to engineering problems. Topics include control volume analysis, fluid statics, Bernoulli's equation, heat conduction, diffusion, linear elasticity, stresses and strains specific to direct and torsional loading, material constitutive relationships (including anisotropy, nonlinearity, and viscoelasticity), axial and transverse loading, and pressure loading of engineering structures and biomaterials.

Prerequisite: ENGGEN 150, or ENGSCI 111, or B+ or higher in MATHS 108 or 110 or 150 or 153, or B+ or higher in MATHS 120 and 130.

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; finite 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; advective transport of mass and heat.

Prerequisite: BIOMENG 221, ENGSCI 211

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, first and second order systems, characterisation methods, fundamentals of control). Bioinstrumentation design methodology, Biomedical instrumentation design project.

Prerequisite: BIOMENG 241

Part IV

BIOMENG 771 (15 Points)

Musculoskeletal and Orthopaedic Biomechanics

Topics that biomechanical and orthopaedic engineers use in research and industry. Includes guest lectures from practitioners. Orthopaedic engineering topics cover implant design, material choice, implant stress shielding and bone loss, implant wear and bone remodelling. Musculo-skeletal biomechanics topics cover motion capture, inverse kinematics and dynamics, muscle force evaluation, electromyography (EMG), inertial sensors and applications in sports medicine and rehabilitation.

Prerequisite: 15 points from ENGSCI 311, 313, 314

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 201 (15 Points)

(previously CHEMMAT 211)

Process Engineering 1: Introduction

Materials and energy balances with and without chemical reaction, materials and energy balances in multiphase systems such as crystallisation, evaporation, drying, humidification, dehumidi-fication, absorption, distillation, extraction and filtration. An introduction to the most important unit operations in the chemical industry, design concept and safety as applied to processing.

Prerequisite: CHEMMAT 110 or 120 or ENGGEN 140

Restriction: CHEMMAT 211

CHEMMAT 202 (15 Points)

(previously CHEMMAT 212)

Process Engineering 2: Energy and Processing

Introduction to thermodynamics for process engineering. The first and second laws of thermodynamics. Application of thermodynamic concepts in closed systems, flow processes and cycles, refrigeration and liquefaction. 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.

Restriction: CHEMMAT 212

CHEMMAT 203 (15 Points)

(previously CHEMMAT 213)

Process Engineering 3: Transfer Processes

Fluid properties and statics (specific gravity,

viscosity, surface tension, flow types, manometry). Modelling fluid motion (Bernoulli equation. Dimensional analysis and similitude: Reynolds Number, Friction factor, Prandtl number). Flow measurement (pumps/pumping and valves). Heat transfer: including steady state conduction, convection and radiation; and effects of geometry, force and natural convection. Heat transfer processes (correlation with flow processes, heat transfer coefficients). Applications.

Restriction: CHEMMAT 213

CHEMMAT 204 (15 Points)

(previously CHEMMAT 221)

Materials

Solid state transformation – diffusion, vacancies, solidification, 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 alloying elements. Analytical methods: X-ray diffraction and electron microscopy.

Prerequisite: CHEMMAT 121

CHEMMAT 205 (15 Points)

(previously CHEMMAT 232)

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 or equivalent

Restriction: CHEMMAT 231, 232

CHEMMAT 206 (15 Points)

(previously CHEMMAT 242)

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. This course will have an emphasis on problem definition and solution.

Prerequisite: 15 points from ENGGEN 140, CHEM 110, 120

Restriction: CHEMMAT 242

Part III

CHEMMAT 301 (15 Points)

(previously CHEMMAT 312)

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 203 or 213, and CHEMMAT 242 or 206

Restriction: CHEMMAT 312

CHEMMAT 302 (15 Points)

(previously CHEMMAT 313)

Advanced Process Engineering

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

Prerequisite: CHEMMAT 203 or 213

Restriction: CHEMMAT 313, 316, 411

CHEMMAT 303 (15 Points)

(previously CHEMMAT 315)

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 reaction in porous catalysts, effects of external mass transfer resistance, fixed and fluidised bed reactors, gas-liquid reactors. Reactor engineering for biological and electrochemical systems.

Prerequisite: CHEMMAT 202 and 206, or CHEMMAT 212 and 242

Restriction: CHEMMAT 315

CHEMMAT 304 (15 Points)

(previously CHEMMAT 317)

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 201 or 211

Restriction: CHEMMAT 317

CHEMMAT 305 (15 Points)

(previously CHEMMAT 322)

Materials Processing and Performance

Materials processing and performance are critical components of a materials science and engineering degree. This course examines the processing and performance of metals, polymers and ceramics. Topics include metal-making, casting, forming, and forms of degradation, such as corrosion. Emphasis is placed on materials applications for process engineering.

Prerequisite: CHEMMAT 204 or 221

Restriction: CHEMMAT 321, 322, 421

CHEMMAT 306 (15 Points)

(previously CHEMMAT 331)

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 specification of equipment. Process economics and project documentation.

Prerequisite: CHEMMAT 201 or 211, and CHEMMAT 205 or 232

Restriction: CHEMMAT 331, 756

Part IV

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 305 or 322

CHEMMAT 750A (15 Points)

CHEMMAT 750B (15 Points)

Design Project

Specification, 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 efficiency, costing and economics, process start-up and operation.

Prerequisite: CHEMMAT 306 or 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)

Biomaterials and Applications

In-depth coverage of biological materials, biomaterials and their applications. Topics include genes, cells, proteins, tissue, organs and joints. Applications include drug delivery, tissue engineering and implant designs. Individual and team research projects apply advanced concepts and methods to design and implement a scaffold or implant prototype.

Prerequisite: BIOMENG 221, or CHEMMAT 204 and 205, or CHEMMAT 221 and 232

Restriction: CHEMMAT 422

CHEMMAT 754 (15 Points)

Materials Performance Enhancement

Materials under extreme service conditions – surface engineering, high-temperature corrosion/oxidation. Nanomaterials and nanotechnology – special properties, synthesis and processing techniques, applications in sensing, catalysis and biomedical areas. Advanced manufacturing technology – additive manufacturing, powder metallurgy, and sustainable/green manufacturing. Selected advanced concepts in materials performance enhancement are taught through research based individual projects.

Prerequisite: CHEMMAT 121, and 305 or 322 or equivalent

Restriction: CHEMMAT 423

CHEMMAT 755 (15 Points)

Materials for Energy and Environmental Applications

Electronic properties of materials. Applications in energy storage. Smart materials and devices – magnetic and dielectric materials, sensors and actuators, recording devices. Materials for environmental applications – photo-catalysis and environmental cleaning, membrane materials, and eco-materials. Core concepts related to energy and environmental applications are extended by individual research projects on selected topics.

Prerequisite: CHEMMAT 121, and 305 or 322 or equivalent

Restriction: CHEMMAT 424

CHEMMAT 756 (15 Points)

Food Process Engineering

Application of engineering principles to food processing. Topics include: heating and thermal processing, cooling, freezing and thawing, evaporation, dehydration, the use of membranes and packaging. Innovative food processes: high pressure, pulsed electric, UV, ultrasounds and ohmic heating/cooking), and fundamental areas of engineering relevant for food processing such as

heat and mass transfer. Process impact on food safety, quality and preservation.

Prerequisite: CHEMMAT 201 or 211, and 15 points from ENGGEN 150, ENGSCI 111, MATHS 108, 110

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

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 identification 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 effective stress, soil strength, compressibility and basic stability analysis.

CIVIL 230 (10 Points)

Fluid Mechanics 1

Fluid properties and definitions. 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.

Prerequisite: CIVIL 211

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.

Prerequisite: CIVIL 211

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. Effective and total stress paths for drained and undrained loading in laboratory tests and field applications. Consolidation. Application of elastic solutions in geomechanics. Geotechnical numerical modelling.

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 energy and flow force, backwater analysis, channel transitions.

Prerequisite: CIVIL 230 or equivalent

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 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 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 systems 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 fire engineering. Techniques in the checking of existing structures and lessons learnt 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

Design and detailing of prestressed and precast

reinforced concrete members subject to axial, flexure, shear, and torsion actions. Design of state-of-art low-damage concrete structural systems. Includes an independent concrete design project and an independent research project on past failures of concrete 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 stiffness method applied to linear, nonlinear and stability analyses. Introduction to variational principles and finite 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.

Prerequisite: CIVIL 322 or equivalent

Restriction: ENVENG 324, CIVIL 422

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 field 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 732 (15 Points)
Coastal Engineering Dynamics

Deriving design conditions, wave pressures and forces, design of structures, beaches and control structures, introduction to coastal modelling.

Prerequisite: CIVIL 431 or 733 or equivalent

CIVIL 733 (15 Points)
Coastal Engineering Design

Waves, wave theories, surf zone processes, sediment transport, dynamics of coastal systems.

CIVIL 734 (15 Points)
River Engineering

Scales; flows; fluvial processes; mixing; ecohydraulics.

CIVIL 741 (15 Points)
Ground Improvements and Geosynthetics Engineering

Advanced ground improvement techniques including: densification, 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 different 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 756 (15 Points)
Capstone Project

Final year team exercise with students in multi-disciplinary civil and environmental roles integrating technical learning into realistic design outcomes. Comprehensive investigation of an open ended, complex, real or synthetic civil engineering problem with simulated professional design office

constrains. Includes technical, economic and environmental impact components to complete a scheme assessment report.

Prequisites: 90 points from Part III courses listed in the BE(Hons) Schedule for Civil Engineering.

CIVIL 758 (15 Points)

Traffic Systems Design

Traffic signal timing analysis. 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 engineering 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, ENGGEN 734

CIVIL 791 (15 Points)

Construction Management

Understanding topics necessary for effective construction management. Using a generic construction project life cycle, essential aspects of construction projects including 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

Restriction: MECHENG 270

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 305, and COMPSYS 209 or ELECTENG 209, and COMPSYS 202 or SOFTENG 281

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-oriented and multi-threaded programming, scripting languages, peer-to-peer communication over internet.

Prerequisite: COMPSYS 202 or SOFTENG 281

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 201, and COMPSYS 202 or SOFTENG 251 or 281

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: COMPSYS 201

Restriction: COMPSCI 313

COMPSYS 305 (15 Points)

Digital Systems Design

(previously Digital Systems Design 1)

Digital Systems implementation technologies with emphasis on hardware description languages and design abstraction levels; structural, architectural and behavioral 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 302-305, ELECTENG 303

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; reconfigurable systems; low-power systems; case studies (speech, image, video algorithms implementation, application specific processor design); individual research projects to analyse the problem, model and implement the required hardware-software components.

Prerequisite: COMPSYS 305

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; verification. Includes a significant individual research project.

Prerequisite: COMPSYS 723, and 202 or SOFTENG 281

COMPSYS 705 (15 Points)

Formal Methods for Engineers

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

Prerequisite: COMPSYS 202 or 281 or ENGSCI 233 or MECHENG 270 or 313 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 or 304 or SOFTENG 370

Restriction: COMPSYS 402, 403, 727

COMPSYS 725 (15 Points)

Distributed Cyber-Physical Systems Design

(previously 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, and COMPSYS 202 or SOFTENG 281

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 intelligence, artificial neural 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

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

Electrostatics (Coulomb's and Gauss's Laws, scalar potential, energy, capacitance, dielectrics), magnetostatics (Biot-Savart and Ampere's Laws, moving conductors, magnetic forces/torques, ferromagnetic hysteresis, inductance, magnetic materials), electromagnetic induction (Faraday's and Lenz's Laws). Transmission lines subjected to pulse excitation, magnetic circuits and single-phase transformers.

Introduction to computational electromagnetics.

Prerequisite: ELECTENG 101

ELECTENG 209 (15 Points)

Analogue and Digital Design

Project-based course introducing the process of electrical engineering design. Students will research a diverse range of practical problems and develop solutions and prototypes, test and evaluate hardware and software solutions, and communicate the design and results.

Prerequisite: COMPSYS 201, and ELECTENG 202 or 291

ELECTENG 210 (15 Points)

Electronics 1

Semiconductor devices and applications, diodes, bipolar junction transistors and operational amplifiers. 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 as amplifiers and switching circuits. Biasing, coupling and bypass techniques. Operational amplifiers, 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)
Applied Electronics

(previously Electronics 2)

An advanced treatment of electronic circuits including a rigorous treatment of feedback, device limitations, noise effects, stability, and design considerations. Emphasis on common practical circuits taken from analog and switching applications.

Prerequisite: ELECTENG 202 or 291, and 210 or 292

ELECTENG 307 (15 Points)
Fields and Waves

(previously Transmission Lines and Systems)

Transmission lines subjected to AC excitation, the Smith chart, introduction to matching network design and introduction to antennas for radio systems. Maxwell's equations in differential and integral form, divergence and Stokes' theorems, skin effect and uniform plane waves (lossless/lossy media, reflection and transmission, polarisation). Case studies in computational electromagnetics.

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: COMPSYS 201, ELECTENG 209, and ELECTENG 202 or 291, and COMPSYS 202 or SOFTENG 281

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

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, 310, 311

Restriction: ELECTENG 401

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

ELECTENG 701 (15 Points)
Mobile Wireless Engineering

(previously Wireless Communications)

Aspects of the design and planning of mobile radio systems. Radio propagation for mobile radio systems (multipath, narrowband and wideband channels, channel characterisation and measurements), propagation modelling (free-space, plane-earth, diffraction). Frequency reuse and interference, outage probabilities, system performance evaluation,space diversity, MIMO and millimetre-wave systems.

Prerequisite: ELECTENG 307 or 721 or 737

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 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 722

ELECTENG 721 (15 Points)

Radio Engineering

(previously Radio Systems)

Matching networks, waveguides, transmitter/receiver design, noise, non-linear behaviour, antennas, applications in computational electromagnetics. Fundamentals of radio propagation, tropospheric effects, diffraction, link budgets, point-to-point link design, multipath propagation, introduction to area coverage (mobile radio) systems. Introduction to radar systems, the radio spectrum and exposure standards.

Prerequisite: ELECTENG 307

Restriction: ELECTENG 421, 737

ELECTENG 722 (15 Points)

Modern Control Systems

(previously 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, Lyapunov's method of stability analysis, design of controllers for non-linear systems. Variable structure systems.

Prerequisite: ELECTENG 303 or 332

Restriction: ELECTENG 422, MECHENG 720, 724

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 figure. Traffic theory. Digital networks and OSI model.

Prerequisite: ELECTENG 303 or 331, and 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 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 filtering; matched filter 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)

Digital Signal Processing

(previously Signal Processing)

Analysis and manipulation of discrete-time signals and systems. Spectral representations and analysis using the z-transform, discrete Fourier transform and fast Fourier transform. Introduction to stochastic processes. Hardware systems for processing digital signals.

Prerequisite: ELECTENG 303 or 331 or ENGSCI 311 or 313

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 rectifiers and PWM converters with application to conventional and brushless DC motors.

Prerequisite: ELECTENG 305, 310, 311

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 electrification, 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 filter implementations.

Prerequisite: ELECTENG 303 or 331

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 731

Restriction: ELECTENG 703

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 programming language C.

Restriction: ENGSCI 233, 331

ENGGEN 140 (15 Points)

Energy and Society

How will we power the modern world? An introduction to chemistry and biology and their application to solving problems in energy, its transformation and use. Treatment of associated risks and uncertainties applied to decision making in energy will develop understanding of perspective taking, the social licence to operate, and the role of professional engineering skills in the community and society.

Part II

ENGGEN 204 (15 Points)

Professional Skills and Communication

A system-wide view of the role of the professional engineer in society and business. The skills of advocacy, and individual and group-based communication are put into practice. 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 management, and regulatory issues.

Prerequisite: ENGGEN 199, 204

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 sectors 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, or BUSINESS 101 and 102 or PROPERTY 231 or SCIGEN 201 or LAW 241 or MUS 186

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 specification, 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)

Engineering Product Development

Advanced topics in the engineering design and development of new manufactured products, taking an integrated approach including technical, commercial, and user aspects. Theory is linked to practice through multidisciplinary teams engaging in projects and case studies.

Prerequisite: B grade or higher in ENGGEN 303

Restriction: ENGGEN 404, 405, 410, 701, MGMT 305

Engineering Science

Part I

ENGSCI 111 (15 Points)

Mathematical Modelling 1

Introduction to mathematical modelling. Differentiation and integration (polynomials, trigonometric, exponential, logarithmic, and rational functions). Integration by parts, substitution and partial fractions. Differential 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 differential 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: ENGGEN 150, or ENGSCI 111, or a B+ or higher in MATHS 108 or 110 or 150 or 153, or a B+ or higher in MATHS 120 and 130

Restriction: ENGSCI 213

ENGSCI 233 (15 Points)

Computational Techniques and Computer Systems

Introduction to computer architecture and computational techniques. Data representation, memory, hardware, interfacing, and limitations Numerical computation and algorithms, coding design and paradigms.

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

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 Stage I in Statistics or Mathematics or Engineering

Restriction: STATS 255

ENGSCI 263 (15 Points)

Engineering Science Design I

Introduction to concepts of model design for engineering problems, including model formulation, solution procedures, validation, and shortcomings, with examples from topics in computational mechanics, operations research and data science. Further development of problem-solving skills and group project work. The use of computational models to support design-focused decision making while considering ethical and societal factors.

Prerequisite: ENGGEN 115, and ENGGEN 150 or ENGSCI 111

Corequisite: ENGSCI 211 or 213

Part III

ENGSCI 311 (15 Points)

Mathematical Modelling 3

A selection from: ordinary differential equations, systems of equations, analytical and numerical methods, non-linear ODEs, partial differential 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 differential 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 differential 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

Methods for computing numerical solutions of mathematical models and data analytics problems with focus on translating algorithms to computer code. A selection of topics from numerical solution of linear and non-linear equations, eigen problems, ordinary and partial differential equations, databases, inverse problems and parameter estimation.

Prerequisite: ENGSCI 233

Corequisite: ENGSCI 311 or 313 or 314

ENGSCI 343 (15 Points)

Mathematical and Computational Modelling in Mechanics

Development of macroscopic models of physical systems using fundamental mathematical techniques and physical laws. Topics include vector and tensor calculus including indicial notation and integral theorems, conservation laws, control volumes and constitutive equations, continuum assumptions, isotropy and homogeneity. Possible applications include deformation, strain and stress, fluid flow, electromagnetism, reactive chemical transport, and kinetics.

Prerequisite: BIOMENG 221 or MECHENG 242, 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: ENGSCI 255 or STATS 255

Restriction: OPSRES 385

ENGSCI 363 (15 Points)

Engineering Science Design II

Application of computational engineering methods combined with optimisation techniques to complex engineering design problems. Group-based integrated design, prototype and test projects that include consideration of societal, ethical and professional engineering factors.

Prerequisite: *BIOMENG 241 or ENGSCI 263*

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 15 points from 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 topic 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 methods of characteristics, similarity solutions, differential equations, integral transforms,

asymptotic expressions, theory of waves, special functions, non-linear ordinary differential equations, calculus of variations, tensor analysis, complex variables, wavelet theory and other modules offered from year to year.

Prerequisite: 15 points from ENGSCI 311, 313, 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: 15 points from ENGSCI 311, 313, 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)

Waves and Fracture

Advanced topics in mechanics including: waves and wave motion with applications to acoustics, optics, fluid flow problems and shock discontinuities using numerical methods. Fracture: modes of, displacement discontinuity in linear elasticity, stress intensity factor, spectral solution methods, finite friction. Applications include: hydraulic fracturing, earthquakes, macroscale strength of materials.

Prerequisite: BIOMENG 321 or ENGSCI 343

ENGSCI 753 (15 Points)

Computational Techniques in Mechanics and Bioengineering

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

Prerequisite: ENGGEN 131 or equivalent, and 15 points from ENGSCI 311, 313, 314

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.

Prerequisite: COMPSCI 101 or ENGGEN 131

ENGSCI 761 (15 Points)

Integer and Multi-objective Optimisation

Computational methods for solving optimisation problems. Algorithms for integer programming including branching, bounding, cutting and pricingstrategies. 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

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: 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.

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 design and air pollution control.

Restriction: 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, 333

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 topics covered include response to different 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

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 fitting 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)

Introduction to Mechatronics

Introduces mechatronics to mechanical and mechatronics engineers. Covers sensors and actuators, analogue and digital circuit elements for signal processing and 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: ENGGEN 121 or 150

MECHENG 235 (15 Points)

Design and Manufacture 1

The engineering design process as a teamwork and problem-solving activity involving analysis, synthesis, evaluation and critical thinking. Design methodology and communicating design intent through written and graphical means. Introduction to selected motive power sources, machine elements for mechanical power systems, and production and fabrication processes

Prerequisite: ENGGEN 115

MECHENG 236 (15 Points)

Design and Manufacture 2

Machine elements and their use in engineering design, including internal combustion engines, clutches, brakes, and basic hydraulic and pneumatics systems and components. Material-based production processes and fabrication methods. Design reliability and safety. Basic principles of "Design for X".

Prerequisite: MECHENG 235

MECHENG 242 (15 Points)

Mechanics of Materials 1

Principles of elastic material behaviour in the design of load carrying elements. 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.

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, specification methods, software architecture, software development environments, software quality, modularity, maintenance, reusability and reliability; models of software development.

Restriction: COMPSYS 202

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

Mechatronics engineering and its elements, including sensors, actuators and computer interfacing. The design of mechatronic systems. Topics include interfacing, signal conditioning and processing, sensors, actuators, control technologies, software, systems modelling, simulation, analysis and design.

MECHENG 313 (15 Points)

Real Time Software Design

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

Prerequisite: MECHENG 270

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 dynamics - 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, linear momentum, angular momentum and energy equations. Application to internal and external flows, boundary layers, pumps, turbines and lifting bodies. Experimental and numerical methods, dimensional analysis, similarity, and flow measurement.

Prerequisite: MECHENG 211, 222

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

MECHENG 340 (15 Points)

Mechanics of Materials 2

Complex material behaviour and structural analysis, extending capability from two to three dimensions. States of stress and strain at a point in a general three-dimensional stress system. Generalised stress–strain relations for linearly elastic isotropic materials. Failure theories for ductile and brittle materials, elementary plasticity, and fatigue. Analytical techniques and numerical analysis of complex mechanical elements.

Prerequisite: MECHENG 242

MECHENG 352 (15 Points)

Manufacturing Systems

An introduction to the procedures and technological aspects of a typical manufacturing system; basic concepts and practice of plant and work design, automation, CADCAM, planning and simulation; selected IoT technologies; and project-based introduction to the tools and techniques applied by professional engineers in a modern manufacturing setting.

Restriction: MECHENG 351

MECHENG 370 (15 Points)

Electronics and Signal Processing

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.

Prerequisite: 15 points from ELECTENG 101, 208, MECHENG 201

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: 15 points from ELECTENG 101, 208, MECHENG 201

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 topic assigned by the Head of Department of Mechanical Engineering leading to an oral presentation, a poster display and a written report.

Prerequisite: 75 points from Part III courses in the BE(Hons) Schedule.

Restriction: MECHENG 407, 408, 461, 462, 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, filtering and integrity, etc.

Prerequisite: MECHENG 312, 322

MECHENG 706 (15 Points)

Mechatronics Design

A range of projects that demonstrate the application and integration of engineering

knowledge to create practical intelligent devices, machines and systems. AI based control techniques will be introduced.

Prerequisite: MECHENG 312, 322

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; automated assembly; design for automation; and Industry 4.0 (such as machine-to-machine communications and data analysis). Students will participate in a number of hands-on labs throughout the course.

Prerequisite: MECHENG 270

Restriction: MECHENG 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

MECHENG 713 (15 Points)

Energy Technology

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

Prerequisite: MECHENG 311

MECHENG 715 (15 Points)

Building Services

Principles and practice of heating, ventilation, air-conditioning 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

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 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 filters. Applications in MATLAB/Simulink and with physical systems.

Prerequisite: MECHENG 322

Restriction: ELECTENG 722, MECHENG 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 fields and acoustic properties of rooms. Philosophy of annoyance. Legal and Standards requirements. Sound fields in enclosures. Mass Law. General insulation equation. Materials as absorbers and reflectors, room acoustics, requirements in auditoria, sound system design principles and transducer performance.

Electro-acoustics and audio signal processing.

Prerequisite: MECHENG 325

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

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

Restriction: MECHENG 728

MECHENG 736 (15 Points)

Biomechatronic Systems

Mechatronic principles and techniques for measuring, assisting, augmenting and mimicking biological systems. Topics include: brain machine interfaces, sensors and actuators,biomechanics and motion control, wearable and assistive devices, bioinstrumentation, soft robotic technologies, human factors, safety/ethical aspects, and biomechatronic design principles. Significant hands-on experience through the design, modelling and development of paradigmatic biomechatronic systems.

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 finite element analysis of composite laminates and structures. Analysis and design of sandwich structures.

Prerequisite: MECHENG 340

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, profile extrusion, sheet extrusion; blown-film extrusion, filament extrusion, blow moulding.

Prerequisite: MECHENG 340

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: Grade of B or higher in ENGGEN 303

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 251 or 281

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 verification 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

Stage 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, and 254 or 283, and 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 architecture level development, including middleware.

Prerequisite: COMPSYS 302 or SOFTENG 283

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 interface, 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, SQL and programming languages, Entity-Relationship model, Normalisation, Query processing, Query optimisation, Distributed databases, Transaction management, Concurrency control, Database recovery.

Prerequisite: COMPSCI 225 or SOFTENG 211 or SOFTENG 284

Restriction: COMPSCI 351

SOFTENG 364 (15 Points)

Networks and Security

(previously Computer Networks)

Physical networks, TCP/IP protocols, switching methods, network layering and components, network services. Information security, computer and network security threats, defence mechanisms and encryption.

Prerequisite: COMPSYS 201, and SOFTENG 251 or 281

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 files, 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, and SOFTENG 250 or 281

Restriction: COMPSCI 340

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

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 interface 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: COMPSCI 732

SOFTENG 751 (15 Points)

High Performance Computing

Advanced parallel and high performance computing concepts and techniques such as parallel system architecture; parallelisation concepts, algorithms and methodology; parallel programming paradigms and technologies. Core concepts and skills are deepened by a hands-on research project in which a challenging parallel computing problem is analysed and solved.

Prerequisite: 15 points from SOFTENG 306, COMPSYS 302, MECHENG 313, or 30 points at Stage III in Computer Science

SOFTENG 752 (15 Points)

Formal Specification and Design

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

Prerequisite: SOFTENG 306

SOFTENG 753 (15 Points)

Bayesian Machine Learning

Examines classic and state of the art algorithms in the field of machine learning. Topics will include: Bayesian classification, regression and state estimation; clustering and mixture models; kernel-based methods; sequential models; graphical models; neural networks and deep architectures.

Prerequisite: ENGSCI 211 or 213, and SOFTENG 251 or 281

SOFTENG 754 (15 Points)

Advanced Software Requirements Engineering

(previously Software Requirements Engineering)

Advanced software engineering concepts focusing on techniques for requirements analysis and requirements engineering (RE) of software systems. Topics will include: requirements elicitation, analysis, specification, validation, verification, user experience design, test-driven development, and continuous integration.

Prerequisite: COMPSYS 302 or SOFTENG 251 or 281

SOFTENG 761 (15 Points)

Advanced Agile and Lean Software Development

(previously 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

APPENDIX - Degree changes from 2021

Some changes are coming to a number of BE(Hons) specialisations in 2020, but will not come into effect until students enter Part II in 2021. This is shown in the following.

Civil Engineering

Only Part II changes will be occuring in 2021 (Part III in 2022, Part IV in 2023)

Part II	
Semester One	**Semester Two**
CIVIL 202	CIVIL 200
CIVIL 203	ENGGEN 204
ENGSCI 211	ENVENG 200
STRCTENG 200	STRCTENG 201

Part III	
Semester One	**Semester Two**
CIVIL 300	CIVIL 302
ENGGEN 303	CIVIL 303
ENVENG 300	ENGSCI 311
STRCTENG 304	Elective
Elective Options:	
	CIVIL 301
	CIVIL 304
	CIVIL 305
Or another approved stage III course	

Part IV	
Semester One	**Semester Two**
CIVIL 705A	CIVIL 705B
CIVIL 791	CIVIL 756
Elective	CIVIL 790
Elective	ENGGEN 403
Elective Options:	
CIVIL 700	
CIVIL 722	
CIVIL 726	
CIVIL 729	
CIVIL 731	
CIVIL 733	
CIVIL 735	
CIVIL 736	
CIVIL 741	
CIVIL 750	
CIVIL 782	
ENVENG 701	
ENVENG 740	
ENVENG 747	
Or an approved 700 level course	

* Students are also required to complete ENGGEN 299 Workshop Practice in Part 2 and ENGGEN 499 Practical Work before and during Part IV

**Please note these tables are advisory and are subject to change

Structural Engineering

Only Part II changes will be occuring in 2021 (Part III in 2022, Part IV in 2023)

Part II	
Semester One	**Semester Two**
CIVIL 202	CIVIL 200
CIVIL 203	ENGGEN 204
ENGSCI 211	ENVENG 200
STRCTENG 200	STRCTENG 201

Part III	
Semester One	**Semester Two**
CIVIL 300	ENGSCI 311
ENGGEN 303	STRCTENG 302
STRCTENG 300	STRCTENG 303
STRCTENG 301	Elective
Elective Options:	
	CIVIL 301
	CIVIL 302
	CIVIL 303
	CIVIL 305
Or another approved stage III course	

Part IV	
Semester One	**Semester Two**
CIVIL 705A	CIVIL 705B
STRCTENG 700	CIVIL 756
STRCTENG 701	CIVIL 790
Elective	ENGGEN 403
Elective Options:	
CIVIL 700	
CIVIL 722	
CIVIL 726	
CIVIL 729	
CIVIL 731	
CIVIL 733	
CIVIL 735	
CIVIL 736	
CIVIL 741	
CIVIL 750	
CIVIL 782	
ENVENG 701	
ENVENG 740	
ENVENG 747	
Or an approved 700 level course	

* Students are also required to complete ENGGEN 299 Workshop Practice in Part 2 and ENGGEN 499 Practical Work before and during Part IV

**Please note these tables are advisory and are subject to change

Computer Systems

Only Part II changes will be occuring in 2021 (Part III in 2022, Part IV in 2023)

Part II	
Semester One	**Semester Two**
COMPSYS 201	**COMPSYS 209**
ELECTENG 291	**ELECTENG 292**
ENGSCI 211	**ENGGEN 204**
SOFTENG 281	**Elective**
Elective Options:	
	ELECTENG 204
	SOFTENG 283

Part III	
Semester One	**Semester Two**
COMPSYS 305	**COMPSYS 301**
ENGGEN 303	**Elective A**
ENGSCI 313	**Elective A**
Elective B	**Elective A or B**
Elective A Options:	
	COMPSYS 303
	COMPSYS 304
	COMPSYS 306
Electives B Options:	
COMPSYS 302	ELECTENG 305
SOFTENG 350	ELECTENG 331
	ELECTENG 332
	SOFTENG 325
	SOFTENG 364
Or other approved 300 level course	

Part IV	
Semester One	**Semester Two**
COMPSYS 700A	**COMPSYS 700B**
COMPSYS 770	**ENGGEN 403**
Elective A	**Elective A**
Elective A or B	**Elective A or B**
Elective A Options:	
COMPSYS 701	COMPSYS 704
COMPSYS 723	COMPSYS 705
COMPSYS 726	COMPSYS 725
Elective B Options:	
ELECTENG 722	ELECTENG 704
ELECTENG 732	ELECTENG 726
ELECTENG 733	SOFTENG 761
ELECTENG 734	ELECTENG 704
SOFTENG 701	ELECTENG 726
SOFTENG 751	SOFTENG 761
Or other approved 700 level course	

* Students are also required to complete ENGGEN 299 Workshop Practice in Part 2 and ENGGEN 499 Practical Work before and during Part IV

**Please note these tables are advisory and are subject to change

Electrical and Electronic Engineering

Only Part II changes will be occuring in 2021 (Part III in 2022, Part IV in 2023)

Part II	
Semester One	**Semester Two**
COMPSYS 201	ELECTENG 204
ELECTENG 291	ELECTENG 209
ENGSCI 211	ENGGEN 204
SOFTENG 281	Elective
Elective Options:	
	ELECTENG 292
	SOFTENG 283
	SOFTENG 284

Part III	
Semester One	**Semester Two**
ELECTENG 310	ELECTENG 311
ENGGEN 303	Elective A
ENGSCI 313	Elective A
Elective B	Elective A or B
Elective A Options:	
	ELECTENG 305
	ELECTENG 309
	ELECTENG 331
	ELECTENG 332
Elective B Options:	
COMPSYS 302	COMPSYS 303
COMPSYS 305	COMPSYS 304
ELECTENG 307	COMPSYS 306
SOFTENG 350	SOFTENG 325
	SOFTENG 364
Or other approved stage II course	

Part IV	
Semester One	**Semester Two**
ELECTENG 700A	ELECTENG 700B
ELECTENG 770	ENGGEN 403
Elective	Elective
Elective	Elective
Elective Options:	
COMPSYS 723	COMPSYS 704
COMPSYS 726	COMPSYS 725
ELECTENG 721	ELECTENG 701
ELECTENG 722	ELECTENG 703
ELECTENG 731	ELECTENG 704
ELECTENG 732	ELECTENG 726
ELECTENG 733	ELECTENG 735
ELECTENG 734	ELECTENG 736
	ELECTENG 738
Or other approved 700 level course	

* Students are also required to complete ENGGEN 299 Workshop Practice in Part 2 and ENGGEN 499 Practical Work before and during Part IV

**Please note these tables are advisory and are subject to change

Software Engineering

Only Part II changes will be occuring in 2021 (Part III in 2022, Part IV in 2023)

Part II	
Semester One	**Semester Two**
COMPSYS 201	**ENGGEN 204**
ENGSCI 211	**SOFTENG 206**
SOFTENG 281	**SOFTENG 283**
Elective	**Elective**
Elective Options:	
ELECTENG 291	ELECTENG 204
SOFTENG 282	ELECTENG 292
	SOFTENG 284

Part III	
Semester One	**Semester Two**
ENGGEN 303	**SOFTENG 306**
SOFTENG 350	**SOFTENG 325**
Elective A	**Elective A**
Elective A or B	**Elective A or B**
Elective A Options:	
SOFTENG 310	SOFTENG 364
SOFTENG 351	SOFTENG 370
Elective B Options:	
COMPSCI 373	COMPSCI 367
COMPSYS 305	COMPSYS 303
ENGSCI 313	COMPSYS 304
	COMPSYS 306
	ELECTENG 305
	ELECTENG 331
	ELECTENG 332
Or other approved stage III course	

Part IV	
Semester One	**Semester Two**
SOFTENG 700A	**SOFTENG 700B**
SOFTENG 770	**ENGGEN 403**
Elective	**Elective**
Elective	**Elective**
Elective Options:	
COMPSYS 723	COMPSYS 705
COMPSYS 726	SOFTENG 702
ELECTENG 733	SOFTENG 752
ENGSCI 760	SOFTENG 753
SOFTENG 701	SOFTENG 761
SOFTENG 750	
SOFTENG 751	
SOFTENG 754	
Or other approved 700 level course	

* Students are also required to complete ENGGEN 299 Workshop Practice in Part 2 and ENGGEN 499 Practical Work before and during Part IV

**Please note these tables are advisory and are subject to change

Course descriptions

New course offerings from 2021

Computer Systems

Part II

COMPSYS 209 (15 Points)

Computer Systems Design

Project-based course introducing real-world design aspects of hardware and software components of computer systems using appropriate design methodology. Practical skills will be gained in computer aided design tools, printed circuit board design and construction.

Prerequisite: COMPSYS 201, ELECTENG 291, SOFTENG 250 or 281

Restriction: ELECTENG 209

Part III

COMPSYS 306 (15 Points)

Artificial Intelligence and Machine Learning

Fundamentals of artificial intelligence, including topics from artificial neural networks, fuzzy models, genetic algorithms. Using machine learning as an application of artificial intelligence to use data for training and inference, including topics from convolutional neural networks, deep learning, pattern classification and recognition.

Prerequisite: COMPSYS 201, and COMPSYS 202 or SOFTENG 281

Part IV

COMPSYS 770 (15 Points)

Capstone Project

Final year team exercise with students in multi-disciplinary roles, with focus on computer systems engineering and integrating technical learning into realistic design outcomes. Comprehensive investigation of an open ended, complex, real or synthetic computer, electrical and software engineering problem with simulated professional design office constraints. Includes technical, economic and environmental impact components to complete a scheme assessment report.

Prerequisite: Prerequisite: 75 points from Part III courses listed in the BE(Hons) Schedule for the Computer Systems Engineering specialisation

Civil Engineering

Part II

CIVIL 200 (15 Points)

Introduction to Geotechnical Engineering

The basic concepts and principles governing the mechanical behaviour of soil. Engineering geology, site investigation and soil classification. The principle of effective stress, permeability and seepage, and soil shear strength.

Restriction: CIVIL 220, 331

CIVIL 202 (15 Points)

Fluid Mechanics and Pipe Flow

Fluid properties and definitions, hydrostatics and stability of floating bodies. Fluid flow, energy, continuity and momentum relationships. Dimensional analysis and similarity. Pipe flow: Fluid resistance, friction factor, steady-state pipe flow, simple pipe systems and pipe network analysis, waterhammer

Restriction: CIVIL 230, 331

CIVIL 203 (15 Points)

Transport Design and Geomatics

Introduction to Transportation Engineering (mobility for people and goods, sea, land and air transportation systems). Design and construction of longitudinal infrastructure (plans,longitudinal sections and cross sections, earthworks, quantities, mass haul). Transport geometric design (horizontal, vertical and cross sectional design). Geomatic surveying systems (levelling, theodolites, GPS, drones, digital topographical survey systems and remote sensing).

Restriction: CIVIL 201, 360

Part III

CIVIL 300 (15 Points)

Geotechnical Engineering

Compaction, settlement and rate of consolidation. Stability analysis in geotechnical engineering, including slope stability, earth pressures on retaining structures and bearing capacity of shallow foundations.

Prerequisite: CIVIL 200

Restriction: CIVIL 322

CIVIL 301 (15 Points)

Foundation Engineering

Design of foundations, both shallow and pile, for buildings and other structures. Assessment of foundation ultimate capacity and working load settlement. Site investigation methods, with particular emphasis on the use of penetrometer tests to estimate soil parameter values. Current foundation construction methods. Design of embedded retaining walls. Special aspects of house foundation design and construction. Observed foundation performance.

Prerequisite: CIVIL 300, and STRCTENG 300 or 301 or 304

Restriction: CIVIL 721

CIVIL 302 (15 Points)

Hydrology and Open Channel Flow

Engineering hydrology: Hydrologic processes, analysis of rainfall-runoff relationships, statistical analysis of hydrological data, groundwater flow. Open channel flow: energy and momentum, uniform flow and flow resistance, critical flow, specific energy and flow force, backwater analysis, channel transitions

Prerequisite: CIVIL 202

Restriction: CIVIL 331, ENVENG 333

CIVIL 303 (15 Points)

Transport Operations and Pavements

Traffic engineering, transportation planning and road pavement design. Topics include the main transport planning and traffic design techniques, criteria and fundamentals used in transportation engineering practice, traffic studies, public transport and active modes and transport modelling (micro and macro simulation). Additionally, pavement design, surfacings, traffic loading, mechanistic approaches and rehabilitation of road pavements are included.

Prerequisite: CIVIL 203

CIVIL 304 (15 Points)
Climate Adaptation Design

Fundamental understanding of the impact of climate change on horizontal infrastructure and the adaptation design and strategies to respond to these changes. Topic areas include the impact of climate on infrastructure, vulnerability studies and adaptation design and management techniques. Studies in knowledge areas of design, management and resilience of transport (roads, ports and wharves), water provision, stormwater and wastewater systems.

Prerequisite: CIVIL 203

Corequisite: CIVIL 303

Restriction: CIVIL 360, 759

CIVIL 305 (15 Points)
Construction Informatics

The application of digital and automation technologies (such as building information modelling, virtual reality/augmented reality, internet of things, laser scanning, drones, artificial intelligence, big data, robotics) in civil engineering and management.

Part IV

CIVIL 700 (15 Points)
Geotechnical Analysis

Shear strength of soil – triaxial testing, measurement of pore water pressures, and interpretation of test data for use in analysis. Introduction to numerical modelling in geotechnical engineering. The use of traditional methods versus numerical modelling in design.

Prerequisite: CIVIL 300

Restriction: CIVIL 324

CIVIL 729 (15 Points)
Humanitarian Engineering

Evaluate frameworks used in the humanitarian engineering field to assist with human crises, including shelter, standards, law, human rights, resilience, appropriate engineering. Rapid assessments, application of minimum international standards for engineering, engineered shelter solutions, water, sanitation and hygiene and the engineering management of humanitarian crises.

CIVIL 735 (15 Points)
Transport Modelling and Design

The planning, modelling, design and operation of current and future transport systems. Topics include transport models and their applications, Intelligent Transport Systems and emerging technologies, transport planning process and travel demand modelling. Transport models are developed to plan, design and manage transport networks based on fundamental modelling concepts, New Zealand specifications and international best practices.

Prerequisite: CIVIL 303

Restriction: CIVIL 758

CIVIL 736 (15 Points)
Transport Safety and Mobility

Develop a sound understanding of safety and mobility of transport systems. Transport safety topics include safe systems, crash reduction studies, road safety audits and at-grade intersection geometric design, economic appraisal methods and transport infrastructure funding. Planning for transport mobility and sustainable transport systems, public transport systems, active modes and travel behaviour.

Prerequisite: CIVIL 203

Restriction: CIVIL 759

Electrical and Electronic Engineering

Part II

ELECTENG 291 (15 Points)

Fundamentals of Electrical Engineering

AC and DC circuit analysis in the context of linear electrical and electronic systems. Time and frequency domain approaches to describing and analysing electrical networks and systems.

Prerequisite: ELECTENG 101

Restriction: ELECTENG 202

ELECTENG 292 (15 Points)

Electronics

Electronic devices and circuits for solving engineering problems. Analysis of linear and non-linear microelectronic circuits and their practical applications.

Prerequisite: ELECTENG 291

Restriction: ELECTENG 210

Part III

ELECTENG 331 (15 Points)

Signals and Systems

Introduction to continuous-time and discrete-time signals and systems. Spectral analysis and representation of analog and digital signals, and linear, time-invariant systems. Conversion between analog and digital signals. Systems for manipulating and filtering signals in hardware and software.

Prerequisite: ELECTENG 291

Restriction: ELECTENG 303

ELECTENG 332 (15 Points)

Control Systems

Introduction to modelling in the time-domain and frequency domain. The fundamental body of knowledge underlying the control and enhancement of system behaviour, with application to the analysis and control of systems.

Prerequisite: ELECTENG 291

Restriction: ELECTENG 303

Part IV

ELECTENG 770 (15 Points)

Capstone Project

Final year team exercise with students in multi-disciplinary roles, with focus on electrical and electronic engineering, integrating technical learning into realistic design outcomes. Comprehensive investigation of an open-ended, complex, real or synthetic computer, electrical and software engineering problem with simulated professional design office constraints. Includes technical, economic and environmental impact components to complete a scheme assessment report.

Prerequisite: 75 points from Part III courses listed in the BE(Hons) Schedule for the Electrical and Electronic Engineering specialisation

Environmental Engineering

Part II

ENVENG 200 (15 Points)

Fundamentals of Environmental Engineering

Introduction to environmental engineering principles. Role of environmental engineers in the twenty-first century. Environmental measurements, environmental standards and impact assessment.

Material mass balance. Drinking water, wastewater and stormwater treatment. Air quality parameters. Solid waste management. Sustainability Environmental Impact Assessment.

Prerequisite: ENGGEN 140

Restriction: ENVENG 244

ENVENG 300 (15 Points)

Natural and Built Environment Processes

Chemical and Biological treatment processes. Surface water quality modelling. Soil chemistry. Contaminant fate and transport in soil and groundwater. Contaminated sites remediation.

Prerequisite: ENGGEN 200

Restriction: ENVENG 341

Software Engineering

Part II

SOFTENG 281 (15 Points)

Fundamentals of Software Engineering 1

Object-oriented programming: Computer programming using objects as the mechanism for modularity, abstraction, and code reuse. Instance variables, methods, and encapsulation. Review of control structures for conditionals and iteration. Basic data structures including stacks, queues, array lists, linked lists, basic binary trees. Introduction to algorithms including sorting and searching. Interfaces, inheritance, polymorphism, and abstract classes. Exception handling.

Prerequisite: COMPSCI 101 or ENGGEN 131

Restriction: SOFTENG 250, 251

SOFTENG 282 (15 Points)

Fundamentals of Software Engineering 2

Data structures including complex trees, hash tables; graph representations and algorithms, including minimum spanning trees, traversals, shortest paths; introduction to algorithmic design strategies; correctness and performance analysis.

Prerequisite: COMPSCI 101 or ENGGEN 131

Restriction: SOFTENG 251

SOFTENG 283 (15 Points)

Fundamentals of Software Engineering 3

Software verification and validation. Static and dynamic quality assurance activities as part of the software lifecycle. Unit, integration, system, and usability testing. Metrics to quantify strength oftesting and complexity of programs. Techniques for requirements analysis and engineering of software systems including requirements elicitation, analysis, specification, validation, verification. Modelling paradigms including information, behaviour, domain, function and constraint models. Specification languages.

Prerequisite: SOFTENG 251 or 281

Restriction: SOFTENG 254

SOFTENG 284 (15 Points)

Fundamentals of Software Engineering 4

Theoretical foundations of software engineering, including 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: SOFTENG 251 or 281

Restriction: SOFTENG 211

Part III

SOFTENG 310 (15 Points)

Software Evolution and Maintenance

Design and maintenance of multi-version software, debugging techniques, design and documentation for software re-use, programme migration and transformation, refactoring, tools for software evolution and maintenance.

Prerequisite: SOFTENG 254 or 283

Part IV

SOFTENG 770 (15 Points)

Capstone Project

Final year team exercise with students in multi-disciplinary roles, with focus on software engineering, integrating technical learning into realistic design outcomes. Comprehensive investigation of an open ended,complex, real or synthetic computer, electrical and softwareengineering problem with simulated professional design office constraints. Includes technical, economic and environmental impact components to complete a scheme assessment report.

Prerequisite: 75 points from Part III courses listed in the BE(Hons) Schedule for the Software Engineering specialisation

Structural Engineering

Part II

STRCTENG 200 (15 Points)

Introductory Structural Mechanics

Introduction to structural analysis for civil engineers. Equilibrium, internal actions and deformations, structural forms, structural systems, analysis of determinate systems, plane section properties, elasticity, engineering beam theory, failure theories. Prepares students to embark on further studies in structural design.

Prerequisite: ENGGEN 121

Restriction: CIVIL 210

STRCTENG 201 (15 Points)

Civil Engineering Materials and Design

Properties and manufacturing of civil engineering material including concrete, steel, timber structural products and roading material. Design principles and examples for concrete, steel and timber members.

Restriction: CIVIL 250

Part III

STRCTENG 300 (15 Points)

Design Loads and Dynamic Response of Structures

Determination of design loads according to AS/NZS1170 and the response of structures under dynamic loadings.

Prerequisite: CIVIL 210 or STRCTENG 200

Restriction: CIVIL 314

STRCTENG 301 (15 Points)

Timber Structures Design

Structural analytical techniques including computer based approaches to simple indeterminate structures. Design procedures for members and structural systems of timber and engineered wood products. Design project.

Prerequisite: CIVIL 210 or STRCTENG 200

Restriction: CIVIL 312

STRCTENG 302 (15 Points)

Steel Structures Design

Mechanical properties of steel and contextualizes the application of steel and steel/concrete into buildings and bridges. Comprehensive introduction to design of structural steel members and connections and their use in structures. Application to vertical load carrying systems and steel building behaviour in earthquake and fire.

Prerequisite: CIVIL 210 or STRCTENG 200

Restriction: CIVIL 313

STRCTENG 303 (15 Points)

Concrete Structures Design

Design of reinforced concrete members including beams, columns, walls, foundations. Introduction to prestressed and precast concrete design and applications. Use of the NZ Concrete Structures Standard, NZS 3101.

Prerequisite: CIVIL 210 or STRCTENG 200

Restriction: CIVIL 313

STRCTENG 304 (15 Points)

Structural Design for Civil Engineers

Structural loading for gravity and wind in accordance with the loading code AS/NZS1170. Design principles and examples for concrete and timber members and design for timber framed buildings using NZS3604. Introduction to seismic building behaviour at a conceptual level.

Prerequisite: CIVIL 210 or STRCTENG 200

Restriction: CIVIL 312, 313

Part IV

STRCTENG 700 (15 Points)

Low Rise Structures Design

Structural systems for low-rise buildings, including seismic design and analysis techniques. Design and detailing of low-rise structures in structural steel, reinforced concrete, reinforced masonry, and timber. Strut and tie design for reinforced concrete. Introduction to fire engineering. Techniques in the checking of existing structures and lessons learnt from failures.

Prerequisite: STRCTENG 302, and CIVIL 313 or STRCTENG 303

Restriction: CIVIL 713

STRCTENG 701 (15 Points)

Multistorey Structures Design

Techniques for the design of multistorey 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.

Prerequisite: STRCTENG 302, and CIVIL 313 or STRCTENG 303

Restriction: CIVIL 714

Key dates

Summer School 2020	
Summer School begins	Monday 6 January
Last day to add, change or delete Summer School courses	Sunday 12 January
Auckland Anniversary Day	Monday 27 January
Waitangi Day	Thursday 6 February
Lectures end	Friday 14 February
Study Break	Saturday 15 February
Examinations	Monday 17 - Wednesday 19 February
Summer School ends	Wednesday 19 February

Semester One 2020	
Orientation – Semester One	In week beginning 24 February
Semester One begins	Monday 2 March
Last day to add, change or delete Semester One courses	Friday 13 March
Last day to add or delete double semester (A and B) courses	Friday 27 March
Mid-semester/Easter break	Friday 10 - Monday 27 April
ANZAC Day	Monday 27 April
Autumn Graduation	Monday 4, Wednesday 6, Friday 8 May
Queen's Birthday	Monday 1 June
Lectures end	Friday 5 June
Study break	Monday 8 - Wednesday 10 June
Examinations	Thursday 11 June - Monday 29 June
Semester One ends	Monday 29 June
Inter Semester Break	Tuesday 30 June - Friday 17 July

Semester Two 2020	
Orientation – Semester Two	In week beginning 13 July
Semester Two begins	Monday 20 July
Last day to add, change or delete Semester Two courses	Friday 31 July
Last day to add or delete double semester (A and B) courses	Friday 14 August
Open Day	Saturday 29 August
Mid-semester break	Monday 31 August - Friday 11 September
Spring Graduation	Tuesday 22 September
Lectures end	Friday 23 October
Labour Day	Monday 26 October
Study break	Tuesday 27 - Wednesday 28 October
Examinations	Thursday 29 October - Monday 16 November
Semester Two ends	Monday 16 November

2021	
Summer School begins	Wednesday 6 January
Semester One begins	Monday 1 March

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