UNIVERSITY OF AUCKLAND
Waipapa Taumata Rau

BACHELOR OF ENGINEERING (HONOURS)
UNDERGRADUATE HANDBOOK 2025

Welcome to the Bachelor of Engineering (Honours) programme at the University of Auckland. Nau mai, haere mai, kuhu mai!

Engineers change lives.

And as we seek to transition our society to green energy, build more resilient cities in the face of climate change, and design the next generation of robotic devices that improve the quality of life for thousands, the world looks to us for answers.

In New Zealand's leading engineering programme, you will be surrounded by people rising to that call, and who are excited to push boundaries and learn from each other. And you will do so in our new, state-of-the-art Engineering building. Located at the heart of Auckland city, our labs and facilities, spacious student areas and Multidisciplinary Learning Spaces are all built with you in mind.

As a graduate of our Bachelor of Engineering (Honours) programme and a holder of a Washington Accord accredited degree that is recognised internationally, you will have a passport to solving current global socio-economic challenges on the world stage and be highly sought after by our graduate employers.

I invite you to join us in taking your next steps in changing our world for the better.

Together, we can make a positive difference in our world.

Associate Professor Richard Clarke
Dean of Engineering and Design
The University of Auckland

Contents

Nau mai, haere mai ki Waipapa Taumata Rau

Disclaimer

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

All students at the University of Auckland are addtionally 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.

Dates to remember

Summer School 2025

06 Jan	Summer School begins
12 Jan	Last day to add, change or delete Summer School Courses
27 Jan	Auckland Anniversary Day
06 Feb	Waitangi Day
14 Feb	Lectures end
15 Feb	Study Break
17-19 Feb	Examinations
19 Feb	Summer School ends

Semester One 2025

24+ Feb	Orientation - Semester One
03 Mar	Semester One begins
14 Mar	Last day to add, change or delete Semester One Courses
02 Apr	Last day to delete double semester (A and B) courses
14 - 25 Apr	Mid-semester/Easter break
25 Apr	ANZAC Day
TBC	Autumn Graduation
02 Jun	King's Birthday
06 Jun	Lectures end
09 - 11 Jun	Study Break
12 - 30 Jun	Examinations
30 Jun	Semester One ends
1 - 18 Jul	Inter Semester Break

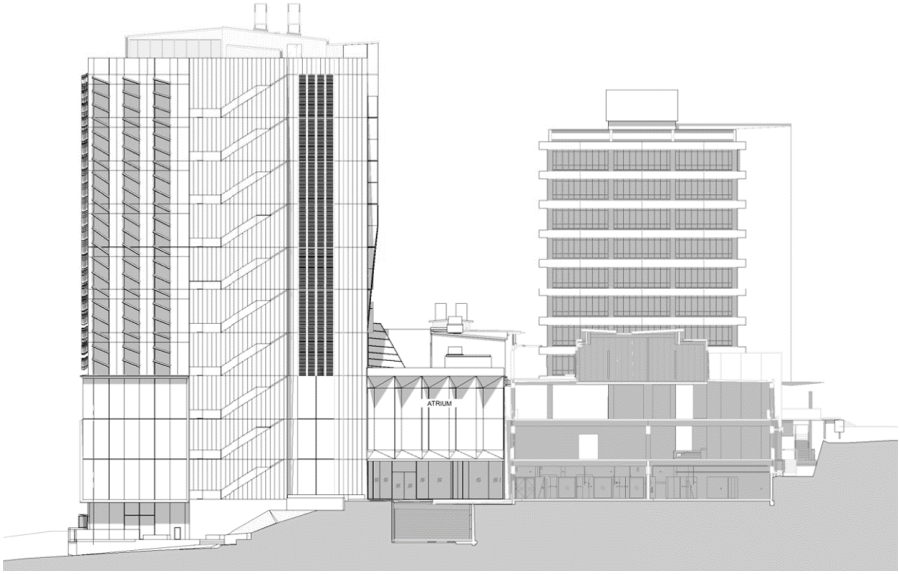
Semester Two 2025

14+ Jul	Orientation - Semester Two
21 Jul	Semester Two begins
01 Aug	Last day to add, change or delete Semester Two Courses
TBC	Open Day
01 - 12 Sep	Mid-semester break
TBC	Spring Graduation
24 Oct	Lectures end
27 Oct	Labour Day
28 - 29 Oct	Study Break
30 Oct - 17 Nov	Examinations
17 Nov	Semester Two ends

Summer School 2026

05 Jan	Summer School begins
02 Mar	Semester One begins

Engineering Buildings: Useful student spaces



Building 405

Level 10	Chemical and Materials Engineering
Level 8	Mechanical and Mechatronics Engineering
Level 7	Electrical, Computer, and Software Engineering
Level 5	Multi-Disciplinary Learning Spaces (MDLS) E&I Rooms and Soldering Workshop: 405-521; 405-522; 405-536; 405-541; 405-552; 405-559; 405-564; 405-569
Level 4	Seminar Rooms: 405-422; 405- 430; Lecture Theatres: 405-460; 405-470
Level 3	MDLS Computer Labs: 405-326; 405-328; 405-336 (BYOD); 405-344 (BYOD); MDLS 3D Printers 405-347
Level 2	MDLS Laser Cutters: 405-221 MDLS Flexible Rooms: 405-222; 405-236; 405-240; 405-249; MDLS Wet Chemistry Rooms: 405-252; 405-268; 405-292; 405-297; 405-298
Level 1	MDLS Wet Non-Chemistry, Dirty Prep Rooms: 405-122; 405-136; 405-139; 405-188; 405-188A

Engineering Building 402

Level 3	Leech Study Area
Level 2	MDLS Flexible Rooms: 402-211; 402-220 402-221; 402-225; 402-231

Engineering Tower B401

Level 11	Civil and Environmental Engineering
Level 4	Lecture Theatres: 401-401; 401-439 Student Engagement Team
Level 3	MDLS Computer Labs 401-301; 401-307; 401-311; 401-312

70 Symonds Street	Engineering Science and Biomedical Engineering

General information and facilities

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, including public holidays.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 Monday to Friday between 7.30am-9.30pm and Saturday 9.00am - 4.15pm.
- You will need your access card to enter and exit the building between 6.00-7.30am and 9.30pm-midnight. During these times, you may enter and exit the building via door 401.300L1/1 (Level 3 leading in from the underpass)or door 401.400L1 (Symonds Street Entry) or door 405.200L1 (Grafton Road entry).
- 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, seven days a week, including public holidays. If you are in the building at this time, you must call Security. A guard will establish why you are still in the building, record your ID number, and will need to inform 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.**

Health and safety

Smoking is prohibited in all University of Auckland 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. 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.auckland.ac.nz/en/engineering/about-the-faculty/facilities/health-and-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 store room 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 the laboratory or workshop in which 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 a 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/technical staff in charge of the facility).

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 is 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 has been used.

If you have any questions relating to MDLS, please contact the MDLS Core Technical Services Team at **MDLS@uoa.auckland.ac.nz**

Inductions

Many teaching and learning 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 in an induction with a staff member. These inductions are generally facilitated by the 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 are 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

Students should report incidents, injuries and observations to the Student Contact Centre via Ask Auckland or via their academic supervisor.

For emergency assistance contact University Security (24 hours) at 0800 373 7550
More information can be found at: **https://www.auckland.ac.nz/en/health-safety-wellbeing/report-concerns-hazards/injury-incidents-observations-reporting.html**

Faculty support services

Course planning and enrolment advice

The Student Hubs may be your first point of contact for all engineering programme enquiries, including course planning and enrolment advice. **Contact us** or visit us at:

Location: General Library, City Campus, 5 Alfred Street

Opening hours: 8am-10pm Monday-Thursday, 8am-8pm Friday and 9am-8pm Saturday-Sunday (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. This includes support for anxiety and stress, learning needs, financial stress, and unforeseen events.

The Faculty Student Development and 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.

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, it 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)

The SSCC contains two or three 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 academic life, resources and services. The SSCC serves as a liaison between the students and the faculty. Three meetings are usually held per semester, but urgent issues may be brought to the attention of the Chair at any time. You are encouraged to talk to your class representatives to bring matters to the attention of the SSCC. You can email them at: (code)-rep(year of study)@auckland.ac.nz, where 'code' refers to the relevant course, such as 'chemmat'. Part I students can contact their representative at **eng-rep1@auckland.ac.nz**

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 teaching weeks of Semester One and Two.

The service is also provided at Waipārūrū, O'Rorke Hall and University Hall for engineering students living there. Virtual tutoring sessions are also available via Zoom.

For more details, please visit our webpage: **https://www.auckland.ac.nz/en/engineering/current-students/student-support/part-i-assistance-centre.html .**
For information, contact Lil Atalili at **lil.atalili@auckland.ac.nz.**

Part II Assistance Centre

The Faculty employs current high-achieving Part III and IV students to provide free academic assistance and tutoring to Part II students on a drop-in basis

This initiative is available to help you with all your courses throughout Semesters One and Two if you're specialising in the following:

- Civil and Structural Engineering
- Mechanical Engineering
- Mechatronics Engineering
- Electrical and Electronic Engineering
- Computer Systems
- Software Engineering

The Part II Assistance Centre is located in the Leech Study Area in Level 3, Building 401 of the Engineering building. Virtual tutoring sessions are also available via Zoom.

For more details, please visit our webpage: **https://www.auckland.ac.nz/en/engineering/current-students/student-support/part-ii-assistance-centre.html** .
For information, contact Lili Posada at **lili.posada@auckland.ac.nz**.

Practical Work Assistance Centre

If you are after support for any aspects of ENGGEN 499, pop along to the Practical Work Assistance Centre to chat with a student mentor. Mentors can help with anything from where to get CV help, their personal experience, questions about report writing and where to hunt for internships. Keep an eye out on your emails from Courtney King for information on when and where the Assistance Centre will be running.

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 information, contact Kerry Tuaopepe at **k.tuaopepe@auckland.ac.nz.**

Scholarships and prizes

More than 40 scholarships ranging from $1,000 to $10,000 are gifted annually by individuals, societies, businesses and industry to promising undergraduate engineering students.

The Faculty 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 up to $2,500 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 18 January

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

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. All course outlines can be accessed at **https://courseoutline.auckland.ac.nz/dco**

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

Grading and Honours

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

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

Where Pi is the points for course i and gi 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.

Missed exams or tests

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.

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.

As part of your application, you will need to provide a statement about how your test or exam has been impacted by such circumstances arising.

Applications for aegrotat or compassionate consideration must be submitted within seven days of your test or exams (inclusive).

For more information visit: **https://www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/during-exams/aegrotat-compassionate-consideration/application-process.html**

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 **https://uoa.custhelp.com/app/answers/detail/a_id/10972**

Contact the The Faculty 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" 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 (Part IV courses can not be conceded).
- 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. **https://www.auckland.ac.nz/en/students/academic-information/exams-and-final-results/before-exams/sitting-your-test-or-exam-under-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 Student Hubs)

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 The Faculty Student Engagment Team for more information.

Withdrawal

A withdrawal is when you drop a course after the deadline for changing your enrolment.

You can find more information about the enrolment deadlines by: **https://www.auckland.ac.nz/en/study/applications-and-admissions/enrolment/changing-your-enrolment/changing-your-enrolment-after-the-enrolment-deadline/withdrawing-from-a-course.html**

Admission

Admission to Part I

Places available in Part I (first year) of the BE(Hons) are limited and subject to selection. For further information, including entry requirements and alternative pathways, visit **www.auckland.ac.nz/foe-entry-pathways**.

Admission to Part II

Part II of the BE(Hons) programme is divided into ten 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*.

*In 2021 a new specialisation called Structural Engineering was added. At Part II, Civil and Structural share the same courses and have a combined maximum of 290 places. Some flexibility will be allowed around numbers, and may take up to 105 places into Structural, or up to 185 into Civil. Because the two specialisations share the same Part II courses, there will be some opportunity for Civil and Structural students to swap between specialisations at the end of Part II.

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, or Bachelor of Technology 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, ACADINT A01 Academic Integrity Course and WTRENG 100 Waipapa Taumata Rau without exemption (more information on page 16). 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 at Part I, including ENGSCI 111
- 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 and Electrical and Electronic; ENGGEN 121 for Civil, Mechanical , Mechatronics and Structural; and ENGGEN 131 for Biomedical, Engineering Science and Software)
- Completed requirements for ENGGEN 199
- Completed requirements for ACADINT A01
- Completed your Waipapa Taumata Rau course

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 Waipapa Taumata Rau 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 subsequent) choice/s.

If you fail up to 30 points of courses in Part I, you are advised to repeat them in 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 in 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**.

Places available in 2025 are:

Biomedical Engineering	35
Chemical and Materials Engineering	85
Civil Engineering	185*
Computer Systems Engineering	100
Electrical and Electronic Engineering	100
Engineering Science	80
Mechanical Engineering	125
Mechatronics Engineering	100
Software Engineering	120
Structural Engineering	**105***

Contact for academic issues

Associate Dean (Academic)
Dr Michael Hodgson
Room 405.943, 20 Symonds Street
ma.hodgson@auckland.ac.nz

We're here to help you succeed!

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 (Academic) on a semester-by-semester basis.

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 four classes: First Class, Second Class (First Division), Second Class (Second Division) and Third Class*.

Your class of Honours will depend upon you achieving the following GPA:

- **First Class Honours:**
  $7.0 \leq HGPA$
- **Second Class Honours (First Division):**
  $5.5 \leq HGPA < 7.0$
- **Second Class Honours (Second Division):**
  $4.0 \leq HGPA < 5.5$
- **Third Class Honours*:**
  $HGPA < 4.0$

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 or Third Class Honours.

Study in the first year

Part I

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

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

Conjoint degree

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, or are considering postgraduate studies.

Part I of the BE(Hons) conjoint consists of at least 105 points, and the Waipapa Taumata Rau course.

Part I - BE(Hons) — 120 points

Semester One	Semester Two
ENGGEN 140 Fundamentals of Engineering in Society	CHEMMAT 121 Materials Science
ENGGEN 121 Engineering Mechanics	ELECTENG 101 Electrical and Digital Systems
ENGSCI 111 Mathematical Modelling 1	ENGGEN 131 Intro to Engineering Computation and Software Development
WTRENG 100 Waipapa Taumata Rau	ENGGEN 115 Principles of Engineering Design
ENGGEN 199 (0 points) English Language Competency	
ACADINT A01 (0 points) Academic Integrity Course	

- All courses listed in tables above are 15 points unless otherwise stated
- Visit **https://uoaengineering.github.io/courseviewer/** for detailed course information, or see the back of this handbook
- *conjoint students may choose a Waipapa Taumata Rau course from either faculty

Part I - BE(Hons) conjoint

Semester One	Semester Two
ENGGEN 140 Fundamentals of Engineering in Society	CHEMMAT 121 Materials Science
ENGGEN 121 Engineering Mechanics	ELECTENG 101 Electrical and Digital Systems
ENGSCI 111 Mathematical Modelling 1	ENGGEN 131 Intro to Engineering Computation and Software Development
	ENGGEN 115 Principles of Engineering Design
Waipapa Taumata Rau Course* (Semester One or Two)	
CONJOINT Course (Semester One or Two)	
ENGGEN 199 (0 points) English Language Competency	
ACADINT A01 (0 points) Academic Integrity Course	

Further conjoint information is on page 22

MAX MATHS 199 or STAR MATH 199 students

Students who obtain a B+ or better as part of the MAX (Mathematics acceleration and extension) or STAR programme can choose to cross credit their MATHS 199 from The University of Auckland or or MATH 199 coursefrom the The University of Canterbury towards their engineering degree and can then enrol in an approved Part II course during their first year in engineering*. Those who received a grade lower than a B+ are required to enrol in the standard first year engineering courses.

Course	Grade required to cross credit	Course MAX/STAR replaces	Alternative course to fill part 1*
STAR MATH 199	B+ or better	ENGSCI 111	ENGSCI 211
MAX MATHS 199	B+ or better	ENGGEN 131	ENGGEN 204

MAX students can contact Peter Bier for part 1 engineering course advice by emailing **p.bier@auckland.ac.nz**.

*** Those students enrolled in a conjoint degree may wish to consider completing a course from their other degree other than the suggested alternatives above.**

Summer Start Programme for MAX or STAR Students

In Summer Start, ENGSCI 111 or ENGGEN 131 are available to students who have accepted offers into the BE(Hons) or conjoint programmes, or have completed MATH 199 via MAX or MATHS 199 via STAR.

MAX students who recieved a grade higher than a B+ for MATHS 199 have the option of taking ENGSCI 111 early via the Summer Start Programme.

STAR students who recieved a grade higher than a B+ for MATH 199 have the option of taking ENGGEN 131 early via the Summer Start Programme.

Enrolment - Part I Students

After you have accepted your offer of place, you can enrol in your courses through Student Services Online. Instructions on how to do this can be found at **https://www.auckland.ac.nz/en/study/applications-and-admissions/enrolment.html**

It is recommended that you complete your enrolment as early as possible 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.**

Waipapa Taumata Rau core courses

From 2025, each new first year student will be required to complete a Waipapa Taumata Rau core course in their Faculty.

Waipapa Taumata Rau core courses focus on understanding knowledge systems relevant to that faculty and the significance of place-based knowledge, including Te Tiriti o Waitangi.

The Waipapa Taumata Rau core courses are considered foundational learning for all undergraduate students, so they need to be taken in the first year of study. This will ensure students gain essential skills and capabilities needed to ensure success as they move through their degree. Completion is required to progress into your second year of study where you will have opportunities to build on what you have learned.

Conjoint students have the option to select either the Engineering Waipapa Taumata Rau core course or the Waipapa Taumata Rau core course offered by the faculty you are doing your conjoint with.

Every Waipapa Taumata Rau course will use a course code that starts with 'WTR', for example WTRBUS (Business & Economics), **WTRENG (Architecture, Design, Engineering, Planning)**, WTRMHS (Medical & Health Sciences), and WTRSCI (Science). Look for the subject code that references the faculty delivering your programme.

Refer to **www.auckland.ac.nz/en/study/study-options/undergraduate-study-options/waipapa-taumata-rau-course.html** for more details.

Academic English Language Requirement (AELR)

The Academic English Language Requirement (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 Part II level.

In order to fulfil the requirements of ENGGEN 199, first you must complete the 30 minute Diagnostic English Language Needs Assessment (DELNA) screening. For most students, completing this screening will be sufficient.

ENGGEN 199 is not graded, except for an indication of whether you have completed (CPL) the requirments.

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.
We strongly encourage you to book and complete a screening during Orientation. Visit **www.delna.auckland.ac.nz** for more information.

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.**
Electives not listed in your degree structure will require approval from your department course advisor.
If you fail a course, you will only be able to enrol in the remaining courses for your current 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, Faculty Academic Services staff will enrol you in the appropriate course(s).
Only in exceptional circumstances will a student be permitted to enrol for Part III before Part I has been completed, or to enrol for Part IV before Part II has been completed.

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 programme of study other than Engineering. Requests to repeat failed courses at Part II - IV for a third time will be assessed against the student's 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 Student Hubs for advice

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.

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**.

Workshop Practice (SPECIALISATION 299)

299 Workshop Practice is a compulsory requirement for the BEHONS degree and is carried out in Part II of your programme.

All students complete a core module in which you will learn about health and safety in the workplace and tool use; by building a brushless DC electric motor. Students are required to attend all sessions in-person.

"Digital Tools" sessions (3D printing, circuit board soldering and laser cutting) are held at City campus, while "Mechanical Tools" sessions (sheet metal cutting, drilling and folding, tapping and assembly) are conducted in the Student Workshop at Newmarket campus.

Students s pecialising in Biomedical, Mechanical and Mechatronics will complete an additional module covering milling, lathes, and welding.

Students can find information on our website: **www.engineering.auckland.ac.nz/workshop-practice**. Part II students will also be added to a Canvas page containing further information.

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

Please note: Resit fees may apply if you do not attend your enrolled 299 Workshop Practice.

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.

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 cannot meet the requirements to graduate until both Workshop Practice (ENGGEN 299 or specialisation equivalent) 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 and FAQs 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(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 through the Practical Work Portal prior to, or during the first week of employment, so the Employer Liaison Manager can validate the company. If you miss this deadline please **contact us**.
- All completed practical hours and tasks must be verified online by your supervisor through the Practical Work Portal. In the unlikely event that your supervisor doesn't have an email address you may request a pdf certificate to be attached to your report by contacting us.
- **Report:** A separate report is required for each company.
- **Due dates:** Check the Practical Work web page for submission dates, especially around dates to make sure you are eligible to attend graduation ceremonies. See **www.engineering.auckland.ac.nz/practical-work.**
- **Exemptions:** If you have substantial industry experiences before entering the BE(Hons) programme at the University of Auckland, you may be exempt from completing further hours to meet the practical work requirement. You may register your work retrospectively at the Practical Work portal (please refer to the Practical Work Process Manual on how to use the portal). Getting your hours signed off and submitting a report are the same as the other students.

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 the 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

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.
- Please refer to the Practical Work web page for the required content and further details on the structure of the practical work reports. Visit **www.engineering.auckland.ac.nz/practical-work.**

The Practical Work Committee for 2025

Practical Work Committee Chair: Dr Conrad Zorn (conrad.zorn@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)
Dr Thomas Loho (thomas.loho@auckland.ac.nz

Civil and Environmental Engineering:
Dr Conrad Zorn (conrad.zorn@auckland.ac.nz)

Computer Systems, Electrical and Electronic, and Software Engineering:
Associate Professor Waleed Abdulla (w.abdulla@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)

Additional Amenities

Student Collaboration Spaces

There are multiple Student Collaboration Spaces in Building 405 which can be used for group project dicussions and presentations. Collaboration Spaces can be found in the following locations: 405-321 , 405-323, 405-325, 405-421, 405-423, 405-425, 405-427. These spaces can be booked by using the tablet outside the Collaboartion rooms.

Leech Study area

The Leech Study Area is a space for Engineering students to complete individual or group work.

Is it located on Level 3 of Building 401.

Smart Lockers

There are Smart lockers located across the Engineering building

Lockers can be used during the day between the hours of 7.30am to midnight. Smaller lockers can be used for up to 3 hours and larger lockers can be used for the day. These lockers are for daily use only need to be cleared and released by the end of day.

Access to these lockers is granted at the same time as building access by providing the barcode on your student ID card. If you have any issues accessing the lockers, please contact the Facilities Team at foe-facilities@auckland.ac.nz.

The lockers can be founds in the following locations: B405 Level 1 Lift Lobby, B405 Level 2 Opposite of MDLS Flexi 5-6, B401 L2 Lift Lobby at MDLS Flexi 1, B405 L3 North Corridor at MDLS Computer 5 & 6

Printing, Copying and Scanning

For your convenience, there are multiple Follow-Me printers, installed on most levels of B405. In B405 Levels 1-3 and 5 printers can be found in the central atrium areas and on Levels 6-11 in the print resource rooms.

Examples of practical work		
	General Engineering	Sub-professional Engineering
Biomedical 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.	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	Work associated with skilled tradespeople, involving machining, structures, building construction, design, welding, quality control, production assembly, or electronics.	Work associated with professional engineers in your specialisation, 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.
Civil and Structural 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.	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	Work associated with skilled tradespeople, involving the fabrication, manufacture, installation, maintenance, and configuration of mechanical, electrical and computer systems.	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.

Examples of practical work		
	General Engineering	Sub-professional Engineering
Electrical and Electronic 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.	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	Work associated with skilled tradespeople, including laboratory work; mechanical installation or maintenance; computer or testing; data gathering or analysis; assistance in software or website development; surveying or construction site work.	Work associated with professional engineers, involving product design; systems/applications analysis; analysis of optimisation and simulation models; or software development.
Mechanical 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.	Work associated with professional engineers, involving design, draughting, inventory control, production planning, administrative/managerial processes, and coordinating labour.
Mechatronics Engineering	Work associated with skilled tradespeople involving hand and machine tools for metal cutting/ forming; manufacturing/ assembly of mechanical components or equipment; fabrication, manufacture maintenance of electrical components and configuration of computer systems.	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	Work associated with skilled tradespeople involving the fabrication, manufacture, installation, maintenance and configuration of mechanical, electrical and computer systems.	Work associated with professional engineers involving the installation of software systems; design, implementation/ testing of software systems; backup and system support; network configuration; computer security and web services.

Conjoint 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 Waipapa Taumata Rau courses.

Combinations currently available

- BE(Hons)/Bachelor of Arts (BA)
- BE(Hons)/Bachelor of Commerce (BCom)
- BE(Hons)/Bachelor of Design(BDes)
- BE(Hons)/Bachelor of Music (BMus)
- BE(Hons)/Bachelor of Science (BSc)

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

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

Approval required*

Biomedical Engineering:

- BSc in Physiology or Pharmacology

Computer Systems Engineering:

- BSc in Computer Science

Electrical and Electronic Engineering:

- BSc in Physics

Engineering Science:

- BA or BSc in Mathematics
- BSc in Applied Mathematics
- BSc in Physics
- BA or BSc in Statistics
- BA in Logic and Computation
- BSc in Logic and Computation

Software Engineering:

- BA in Logic and Computation
- BSc in Logic and Computation

**Approval required from your Specialisation Advisor to plan courses taken*

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 Waipapa Taumata Rau course in the Engineering component of the conjoint degree
- Omitting a 15 points elective course at Part II or III
- Completing a course (or courses) in your other component degree that covers content related to ENGGEN 303, so you do not do ENGGEN 303. (These courses are noted on the conjoint planners, see later in this section).
- Omitting 15 points from Part IV electives

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 apply for your preferred Engineering specialisation at the end of Part I, alongside 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 on the Faculty 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 Student Hubs to ensure you are enrolling in the correct courses, or see the tables for your specialisation later in this handbook.

Enrolment - 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 specilisation in the following year, and should try to focus on keeping your GPA high in your Engineering courses.

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

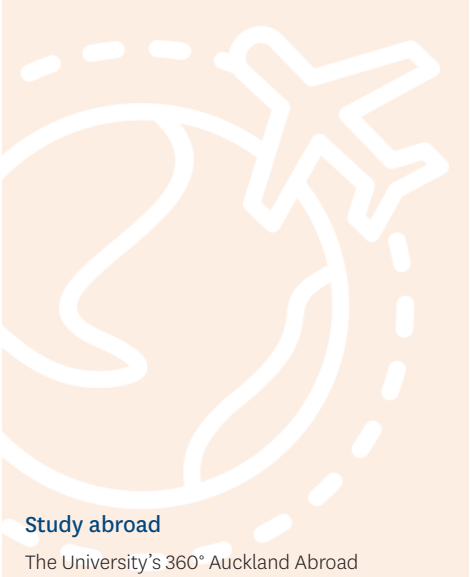
Further opportunities for undergraduate students

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's initiative for Part II and III students to develop non-academic skills relevant to an engineering career. It involves leadership development workshops, networking opportunities and internships. Former Vice Chancellor, and Faculty 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".
- Please note there are also Virtual opportunities.

For more information visit

www.engineering.auckland.ac.nz/student-exchange or **www.auckland.ac.nz/360**.

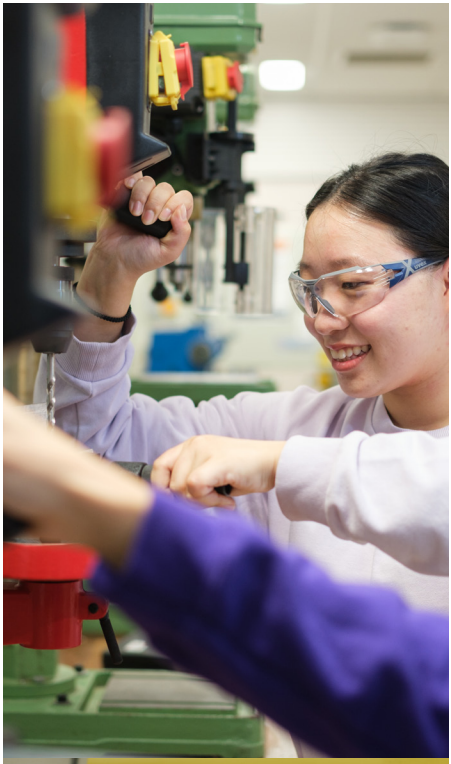
Beyond your degree

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, 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**.



auckland.ac.nz/esb

Biomedical Engineering

Pūhanga Koiora Rongoā

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 the areas that interest you most, such as:

- biomedical imaging
- biotechnology
- medical devices
- computational physiology
- 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
- cardiac diagnostic imaging

You will have excellent facilities and outstanding expertise at your fingertips within the Engineering Building, the Auckland Bioengineering Institute, the Faculty of Medical and Health Sciences, and the Faculty of Science.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/biomedical-engineering.html

Undergraduate course advisor

Dr Vinod Suresh

v.suresh@auckland.ac.nz

"I've always been interested in biology and physics... I wanted to know how the human body worked and maybe how I could help improve it, using science and engineering. Because of this, coming into university I always knew I wanted to pursue Biomedical Engineering."

Misha Garg

Biomedical Engineering student

Courses outlined here for Parts II, III and IV of the Biomedical Engineering specialisation are being taught in 2025

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
BIOMENG 221 Mechanics of Engineered and Biological Materials	BIOMENG 241 Instrumentation and Design	BIOMENG 321 Continuum Modelling in Bioengineering	ENGSCI 314 Mathematical Modelling 3ES	ENGSCI 700A Research Project	ENGSCI 700B Research Project
BIOSCI 107 Biology for Biomedical Science: Cellular Processes and Development	BIOMENG 261 Tissue and Biomolecular Engineering	BIOMENG 341 Bio-instumentation and Design	ENGSCI 331 Computational Techniques 2	BIOMENG 791 Advanced Biomedical Engineering Design	ENGGEN 403 Systems Thinking
ENGSCI 211 Mathematical Modelling 2	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	MEDSCI 309 Biophysics of Nerve and Muscle	Elective	Elective
ENGSCI 233 Computational Techniques and Computer Systems	MEDSCI 142 Biology for Biomedical Science: Organ Systems	MEDSCI 205 The Physiology of Human Organ Systems	Elective	Elective	Elective

Part III Elective Options:		Part IV Elective Options:	
Semester One	Semester Two	Semester One	Semester Two
CHEM 380	CHEM 392	CHEMMAT 723	BIOMENG 771
ENGSCI 355	COMPSYS 303	CHEMMAT 753	CHEMMAT 757
ENGSCI 391	ENGSCI 309*	CHEMMAT 754*	COMPSYS 705
MECHENG 313	ENGSCI 344	ELECTENG 722	MATHS 764*
MEDSCI 318	EXERSCI 303	ELECTENG 733	MATHS 765
	MATHS 362	ENGSCI 711	MEDSCI 737
	MECHENG 352	ENGSCI 712	
	MECHENG 371	ENGSCI 740	
	MEDSCI 312	MECHENG 743	
	MEDSCI 314	MEDSCI 703	
Or other approved course above stage II		Or up to 30 points from other approved 700 level courses	

Please note:

- Students are also required to complete BIOMENG 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook
- 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**

auckland.ac.nz/chemmat

Chemical and Materials Engineering

Pūhanga Matū

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 is aimed at providing a real-world skills advantage for our graduates.

Throughout your specialisation you will gain the solid grounding to become problem-solving engineers. Some of the typical problems include those around future energy, sustainable engineering, food, water, and the innovative materials for advanced technology to name a few. In this degree accredited both by Engineering NZ and the internationally-recognised Institution of Chemical Engineers, we will train you in engineering topics such as process, materials, design, and systems engineering.

With a BE(Hons) in Chemical and Materials Engineering, you will have skills that are particularly important to industries typical to chemical engineering – e.g. food production, pharmaceuticals, cosmetics, steel, polymers, ceramics, and waste treatment and resource recovery.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/chemical-materials-engineering.html

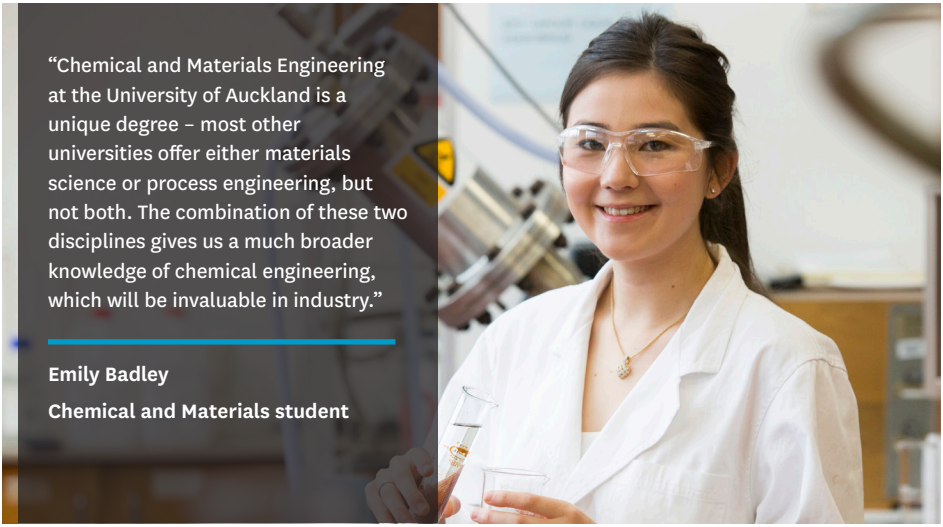
Undergraduate course advisor

Prof. Wei Gao

w.gao@auckland.ac.nz

Amanda Di Ienno

a.diienno@auckland.ac.nz



Courses outlined here for Parts II, III and IV of the Chemical and Materials Engineering specialisation are being taught in 2025.

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
CHEMMAT 201 Process Engineering 1: Introduction	CHEMMAT 202 Process Engineering 2: Energy and Processing	CHEMMAT 301 Transfer Processes 2	CHEMMAT 302 Advanced Process Engineering	CHEMMAT 750A Design Project	CHEMMAT 750B Design Project
CHEMMAT 204 Materials	CHEMMAT 203 Process Engineering 3: Transfer Processess	CHEMMAT 305 Materials Processing and Performance	CHEMMAT 303 Chemical Reactor Engineering	CHEMMAT 751A Research Project	CHEMMAT 751B Research Project
CHEMMAT 206 Applied Chemistry	CHEMMAT 205 Process Design 1	CHEMMAT 306 Process Design 2	ENGSCI 311 Mathematical Modelling 3	CHEMMAT 752 Process Dynamics and Control	ENGGEN 403 Systems Thinking
ENGSCI 211 Mathematical Modelling 2	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	Elective	Elective	Elective

Part III Elective Options:	
Semester One	Semester Two
CHEMMAT 723	CHEMMAT 304
	CHEMMAT 720
	CHEMMAT 725
	CHEMMAT 754*
	CHEMMAT 755*
	CHEMMAT 757
Or other approved 700 level courses	

Part IV Elective Options:	
Semester One	Semester Two
CHEMMAT 723	CHEMMAT 720
CHEMMAT 724	CHEMMAT 725
CHEMMAT 753	CHEMMAT 757
CHEMMAT 756	CHEMMAT 758
CHEMMAT 760	CHEMMAT 759
CHEMMAT 763	CHEMMAT 773
CHEMMAT 772	CHEMMAT 778
ENGGEN 705	ENGGEN 701*
	GEOTHERM 785
Or other approved 700 level courses	

Please note:

- Students are also required to complete CHEMMAT 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/cee

Civil Engineering

Pūhanga Metarahi

What will I study?

In Part II of the Civil Engineering specialisation, you will learn the fundamentals of:

- environmental principles
- fluid mechanics
- geotechnical engineering
- structural mechanics and engineering materials
- geomatics and transport design

In Parts III and IV, you will be able to tailor your electives to focus on a particular specialisation, or maintain a broad coverage across civil engineering if preferred.

Regardless of your focus, you will learn how to apply technical maths and science knowledge to the designs of major civil infrastructure and construction projects, while practising skills in teamwork, management, creativity and communication.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/civil-engineering.html

Undergraduate course advisors

Direct Entry: Dr Doug Wilson
dj.wilson@auckland.ac.nz

Part II: Dr Febelyn Reguyal
f.reguyal@auckland.ac.nz

Parts II/III and III: Dr Lucas Hogan
lucas.hogan@auckland.ac.nz

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

The courses shown below are for students commencing Part II in 2021 or later. Students enrolled in the BE(Hons) prior to 2020 will complete their degree under the 2019 Calendar Regulations. See Appendix for more details.

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
CIVIL 202 Fluid Mechanics and Pipe Flow	CIVIL 200 Intro to Geotechnical Engineering	CIVIL 300 Geotechnical Engineering	CIVIL 302 Hydrology and Open Channel Flow	CIVIL 705A Research Project	CIVIL 705B Research Project
CIVIL 203 Transport Design and Geomatics	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	CIVIL 303 Transport Operations and Pavements	CIVIL 791 Construction Management	CIVIL 756 Capstone Project
ENGSCI 211 Mathematical Modelling 2	ENVENG 200 Fundamentals of Environmental Engineering	ENVENG 300 Natural and Built Environmental Processes	ENGSCI 311 Mathematical Modelling 3	Elective	ENGGEN 403 Systems Thinking
STRCTENG 200 Introductory Structural Mechanics	STRCTENG 201 Civil Engineering Materials and Design	STRCTENG 304 Structural Design for Civil Engineers	Elective	Elective	CIVIL 790 Civil Engineering Administration

Part III Elective Options:

Semester Two
- CIVIL 301
- CIVIL 304
- CIVIL 305
- ENVENG 331

Or other approved stage III courses

Part IV Elective Options:

Semester One
- CIVIL 700
- CIVIL 722
- CIVIL 726
- CIVIL 729
- CIVIL 731
- CIVIL 733
- CIVIL 735
- CIVIL 736
- CIVIL 750
- CIVIL 782
- ENVENG 701
- ENVENG 740
- ENVENG 747*

Or an approved 700 level course

Please note:

- Students are also required to complete CIVIL 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/ecse

Computer Systems Engineering

Pūnaha Rorohiko

What will I study?

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.

You will undertake stimulating project work and be exposed 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
- artificial intelligence and machine learning
- instrumentation

All of this is supplemented with a solid grounding in electrical and electronic engineering.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/computer-systems-engineering.html

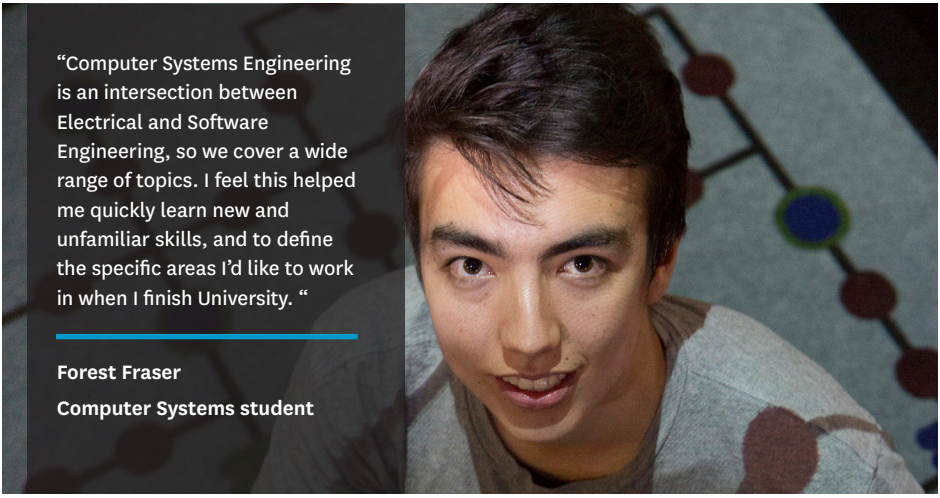
Undergraduate course advisor

Dr Avinash Malik

avinash.malik@auckland.ac.nz

Choosing Part II Electives:

Students should carefully consider their electives in Part II, as this could enable the completion of the requirements for three specialisations (Electrical and Electronic, Computer Systems, and Software Engineering), thus providing the potential to change specialisations at the end of Part II.



"Computer Systems Engineering is an intersection between Electrical and Software Engineering, so we cover a wide range of topics. I feel this helped me quickly learn new and unfamiliar skills, and to define the specific areas I'd like to work in when I finish University. "

Forest Fraser

Computer Systems student

The courses shown below are for students commencing Part II in 2021 or later. Students enrolled in the BE(Hons) prior to 2020 will complete their degree under the 2019 Calendar Regulations. See Appendix for more details.

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
COMPSYS 201 Fundamentals of Computer Engineering	COMPSYS 209 Computer Systems Design	COMPSYS 305 Digital Systems Design	COMPSYS 301 Design: Hardware Software Systems	COMPSYS 700A Research Project	COMPSYS 700B Research Project
ELECTENG 291 Fundamentals of Electrical Engineering	ELECTENG 292 Electronics	ENGGEN 303 Innovation and Business Cases	Elective A	COMPSYS 770 Capstone Project	ENGGEN 403 Systems Thinking
ENGSCI 211 Mathematical Modelling 2	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGSCI 313 Mathematical Modelling 3ECE	Elective A	Elective A	Elective A
SOFTENG 281 Object-Oriented Programming	Elective	Elective B	Elective A or B	Elective A or B	Elective A or B

Part II Elective Options:

Semester Two
ELECTENG 204
SOFTENG 283
SOFTENG 284

Part III Elective A Options:

Semester Two
COMPSYS 303
COMPSYS 304
COMPSYS 306

Part III Elective B Options:

Semester One	Semester Two
COMPSYS 302	ELECTENG 305
SOFTENG 350	ELECTENG 331
	ELECTENG 332
	SOFTENG 325
	SOFTENG 364

Part IV Elective A Options:

Semester One	Semester Two
COMPSYS 701	COMPSYS 704
COMPSYS 721	COMPSYS 705
COMPSYS 723	COMPSYS 725*
	COMPSYS 726

Part IV Elective B Options:

Semester One	Semester Two
COMPSYS 732	ELECTENG 704
ELECTENG 722	ELECTENG 706*
ELECTENG 732*	ELECTENG 726
ELECTENG 733	MECHENG 726
ELECTENG 734	SOFTENG 761
SOFTENG 701	
SOFTENG 751	

Or other approved 700 level course

Please note:

- Students are also required to complete COMPSYS 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/ecse

Electrical and Electronic Engineering

Pūhanga Hiko me te Tāhiko

What will I study?

In Part II, Electrical and Electronic Engineering students study core principles of analog and digital circuit analysis, software engineering, electromagnetics, circuit design, engineering mathematics, and much more.

The courses in Part III build on these fundamentals as you develop more specialised skills and knowledge, such as:

- Applied electronics
- Control systems
- Electrical power systems
- Signal processing
- Electromagnetic waves and fields

The flexible degree structure lets you add courses from computer systems and software engineering to broaden your degree. At all times there is a strong emphasis on practical design with industry-based projects.

These specialised courses prepare you for advanced study at Part IV where you have ample choice to focus on topics of interest to you.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/electrical-electronic-engineering.html

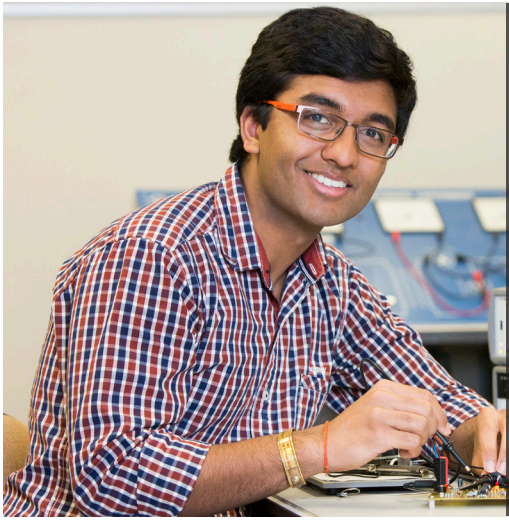
Undergraduate course advisor

Dr William Lee

william.lee@auckland.ac.nz

Choosing Part II Electives:

Students should carefully consider their electives in Part II, as this could enable the completion of the requirements for three specialisations (Electrical and Electronic, Computer Systems, and Software Engineering), thus providing the potential to change specialisations at the end of Part II.



"One of the things that stands out to me in my studies is the different ways of thinking to solve engineering problems. We don't just consider economic impacts but also environmental, social and cultural aspects. The lecturers and teaching assistants here are outstanding. They genuinely care and want students to succeed. They really go out of their way to help us develop as engineers."

Murali Krishna Magesan

Electrical and Electronic student

The courses shown below are for students commencing Part II in 2021 or later. Students enrolled in the BE(Hons) prior to 2020 will complete their degree under the 2019 Calendar Regulations. See Appendix for more details.

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
COMPSYS 201 Fundamentals of Computer Engineering	ELECTENG 204 Engineering Electro-magnetics	ELECTENG 310 Electrical Engineering Design 1	ELECTENG 311 Electrical Engineering Design 2	ELECTENG 700A Research Project	ELECTENG 700B Research Project
ELECTENG 291 Fundamentals of Electrical Engineering	ELECTENG 209 Analogue and Digital Design	ENGGEN 303 Innovation and Business Cases	Elective A	ELECTENG 770 Captsone Project	ENGGEN 403 Systems Thinking
ENGSCI 211 Mathematical Modelling 2	ENGGEN 204 Professional Skills, Commu-nication and Collaboration	ENGSCI 313 Mathematical Modelling 3ECE	Elective A	Elective	Elective
SOFTENG 281 Object-Oriented Programming	Elective	Elective B	Elective A or B	Elective	Elective

Part II Elective Options:

Semester Two
ELECTENG 292
SOFTENG 283
SOFTENG 284

Part III Elective A Options:

Semester Two
ELECTENG 305
ELECTENG 309
ELECTENG 331
ELECTENG 332

Part III Elective B Options:

Semester One	Semester Two
COMPSYS 302	COMPSYS 303
COMPSYS 305	COMPSYS 304
ELECTENG 307	COMPSYS 306
SOFTENG 350	SOFTENG 325
	SOFTENG 364

Or other approved course above stage II

Part IV Elective A Options:

Semester One	Semester Two
COMPSYS 721	COMPSYS 705
COMPSYS 723	COMPSYS 725*
ELECTENG 721	COMPSYS 726
ELECTENG 722	ELECTENG 701*
ELECTENG 731	ELECTENG 703
ELECTENG 732*	ELECTENG 704
ELECTENG 733	ELECTENG 724*
ELECTENG 734	ELECTENG 726
	ELECTENG 735*
	ELECTENG 736*
	ELECTENG 738
	MECHENG 726

Or other approved 700 level course

Please note:

- Students are also required to complete ELECTENG 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/esb

Engineering Science

Pūtaiao Pūhanga

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 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 uses mathematics, physics and computers to anlayse and make predictions about the physical world around us - for instance, how to design a rocket to minimise weight and withstand high thermal loads, or how to alleviate climate-induced flooding of coastal areas. Other study areas include:

- environmental modelling
- biomedical engineering
- data analytics
- financial mathematics

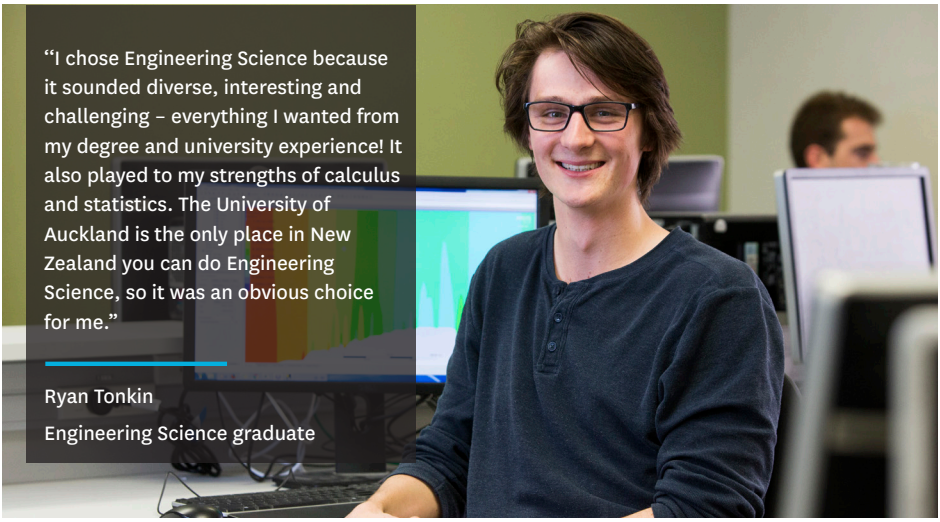
The diverse range of options available throughout your degree will directly contribute to your own professional versality.

Keen to find out more?

Find out more online at https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/engineering-science.html

Undergraduate course advisor

Kevin Jia
engsci-undergrad-adviser@auckland.ac.nz



Courses outlined here for Parts II, III and IV of the Engineering Science specialisation are being taught in 2025

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
BIOMENG 221 Mechanics of Engineered and Biological Materials	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	ENGSCI 314 Mathematical Modelling 3ES	ENGSCI 700A Research Project	ENGSCI 700B Research Project
ENGSCI 211 Mathematical Modelling 2	ENGSCI 263 Engineering Science Design 1	ENGSCI 343 Mathematical and Computational Modelling in Mechanics	ENGSCI 331 Computational Techniques 2	ENGSCI 773 Capstone Project	ENGGEN 403 Systems Thinking
ENGSCI 233 Computational Techniques and Computer Systems	Elective	ENGSCI 355 Simulation Modelling for Process Design	ENGSCI 344 Computational Design for Physical Systems	Elective	Elective
ENGSCI 255 Modelling and Analytics in Operations Research	Elective	ENGSCI 391 Optimisation in Operations Research	Elective	Elective	Elective

Part II Elective Options:

Semester One	Semester Two
COMPSCI 225	BIOMENG 241
SOFTENG 281	BIOMENG 261
STATS 210	COMPSCI 220
	COMPSCI 225
	COMPSCI 230
	ENVPHYS 200
	ENGSCI 205
	MECHENG 211
	MECHENG 222
	MECHENG 270
	STATS 210

Or other approved course above stage I

Part III Elective Options:

Semester One	Semester Two
BIOMENG 341	ENGSCI 309*
	MECHENG 325
	STATS 325
	STATS 369

Or other approved course above stage II

Part IV Elective Options:

Semester One	Semester Two
ENGSCI 711	BIOMENG 771
ENGSCI 712	ENGSCI 721
ENGSCI 740	ENGSCI 755*
ENGSCI 760	ENGSCI 761
	ENGSCI 763
	GEOTHERM 785

Up to 15 points from other approved 700 level courses

▶ Please note:

- Students are also required to complete ENGSCI 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/mech

Mechanical Engineering

Pūhanga Pūrere

What will I study?

As a Mechanical Engineering student, you will learn the fundamentals of:

- dynamics
- fluid mechanics and thermodynamics
- industrial engineering
- control systems
- solid mechanics and materials

You will apply your theoretical knowledge to practical problems. You will also practice 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 practice applying your knowledge to the development of new products.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/mechanical-engineering.html

Undergraduate course advisors

Dr Stuart Norris

s.norris@auckland.ac.nz

Exchange: Dr Vladislav Sorokin

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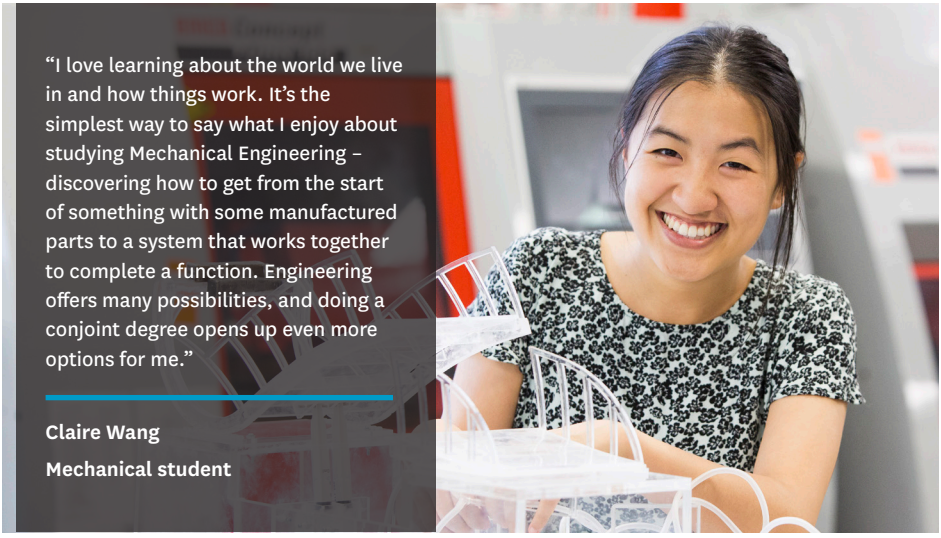

"I love learning about the world we live in and how things work. It's the simplest way to say what I enjoy about studying Mechanical Engineering – discovering how to get from the start of something with some manufactured parts to a system that works together to complete a function. Engineering offers many possibilities, and doing a conjoint degree opens up even more options for me."

Claire Wang

Mechanical student

Courses outlined here for Parts II, III and IV of the Mechanical Engineering specialisation are being taught in 2025

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
ENGSCI 211 Mathematical Modelling 2	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	ENGSCI 311 Mathematical Modelling 3	MECHENG 700A Research Project	MECHENG 700B Research Project
MECHENG 235 Design and Manufacture 1	MECHENG 211 Thermofluids	MECHENG 322 Control Systems	MECHENG 311 Thermal Engineering	MECHENG 731 Mechanical Design Projects	ENGGEN 403 Systems Thinking
MECHENG 242 Mechanics of Materials 1	MECHENG 222 Dynamics	MECHENG 334 Design and Manufacture 3	MECHENG 325 Dynamics of Fluids and Structures	Elective	Elective
Elective	MECHENG 236 Design and Manufacture 2	MECHENG 340 Mechanics of Materials 2	MECHENG 352 Manufacturing Systems	Elective	Elective

Part II Elective Options:

Semester One
MECHENG 201

Part IV Elective Options:

Semester One	Semester Two
AEROSPCE 720	AEROSPCE 740
ENGGEN 705	MECHENG 715
MECHENG 712	MECHENG 718
MECHENG 713*	MECHENG 724*
MECHENG 722	MECHENG 726
MECHENG 743	MECHENG 735
MECHENG 752*	MECHENG 747
	MECHENG 754
	MECHENG 755

Or other approved 700 level course

Please note:

- Students are also required to complete MECHENG 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/mech

Mechatronics Engineering

Pūhanga Pūrere Tāhiko

What will I study?

In Part II, Mechatronics students are provided with a strong foundation in core mechanical engineering subjects. 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 topics including:

- software design
- sensors and actuators
- signal processing
- analogue and digital circuit design
- systems modelling
- analogue and digital control
- structural and fluid dynamics

These 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.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/mechatronics-engineering.html

Undergraduate course advisors

A/Prof Yusuke Hioka

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Exchange: Dr Vladislav Sorokin

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"Getting into a specialisation is competitive, but the great thing is that engineers are all very supportive of each other. People are very interested in working together rather than working against each other. In terms of lecturers, the passion in what people do is definitely present and that's what I really enjoy about the faculty."

Tomas Haver

Mechatronics student

Courses outlined here for Parts II, III and IV of the Mechatronics Engineering specialisation are being taught in 2025

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
ENGSCI 211 Mathematical Modelling 2	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	ENGSCI 311 Mathematical Modelling 3	MECHENG 700A Research Project	MECHENG 700B Research Project
MECHENG 235 Design and Manufacture 1	MECHENG 211 Thermofluids	MECHENG 313 Design of Real-Time Software	MECHENG 306 Design of Sensing and Actuating Systems	MECHENG 705 Mechatronics Systems	ENGGEN 403 Systems Thinking
MECHENG 242 Mechanics of Materials 1	MECHENG 222 Dynamics	MECHENG 322 Control Systems	MECHENG 325 Dynamics of Fluids and Structures	MECHENG 706 Mechatronics Design Projects	Elective
Elective	MECHENG 270 Software Design	MECHENG 370 Electronics and Signal Processing	MECHENG 371 Digital Circuit Design	Elective	Elective

Part II Elective Options:

Semester One
MECHENG 201

Part IV Elective Options:

Semester One	Semester Two
AEROSPCE 720	AEROSPCE 740
ENGGEN 705	COMPSYS 726
MECHENG 709	MECHENG 715
MECHENG 712	MECHENG 718
MECHENG 722	MECHENG 724*
MECHENG 752*	MECHENG 726
	MECHENG 735
	MECHENG 736
	MECHENG 754
	MECHENG 755

Or other approved 700 level course

Please note:

- Students are also required to complete MECHTRON 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/ecs

Software Engineering

Pūhanga Pūmanawa

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 fundamentals of:

- software design and development
- programming languages
- software development processes
- computer organisation and architecture
- operating systems
- data communications
- algorithm design and analysis
- mathematics
- project management
- customer collaboration
- professional ethics

Our degree is co-taught by the Department of Electrical, Computer, and Software Engineering and by the School of 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.

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/software-engineering.html

Undergraduate course advisor

Dr Valerio Terragni

v.terragni@auckland.ac.nz

Choosing Part II Electives:

Students should carefully consider their electives in Part II, as this could enable the completion of the requirements for three specialisations (Electrical and Electronic, Computer Systems, and Software Engineering), thus providing the potential to change specialisations at the end of Part II.

The courses shown below are for students commencing Part II in 2021 or later. Students enrolled in the BE(Hons) prior to 2020 will complete their degree under the 2019 Calendar Regulations. See Appendix for more details.

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
COMPSYS 201 Fundamentals of Computer Engineering	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	SOFTENG 306 Software Engineering Design 2	SOFTENG 700A Research Project	SOFTENG 700B Research Project
ENGSCI 211 Mathematical Modelling 2	SOFTENG 206 Software Engineering Design 1	SOFTENG 351 Fundamentals of Database Systems	SOFTENG 325 Software Architecture	SOFTENG 770 Capstone Project	ENGGEN 403 Systems Thinking
SOFTENG 281 Object-Oriented Programming	SOFTENG 283 Software Quality Assurance	Elective A	Elective A	Elective	Elective
Elective	Elective	Elective A or B	Elective A or B	Elective	Elective

Part II Elective Options:

Semester One	Semester Two
ELECTENG 291	ELECTENG 204
SOFTENG 282	ELECTENG 292
	SOFTENG 284

Part III Elective A Options:

Semester One	Semester Two
SOFTENG 350	SOFTENG 310
SOFTENG 370	SOFTENG 364

Part III Elective B Options:

Semester One	Semester Two
COMPSCI 373	COMPSCI 335
COMPSYS 305	COMPSCI 367
ENGSCI 313	COMPSYS 303
	COMPSYS 304
	COMPSYS 306
Semester Two	ELECTENG 305
COMPSCI 316	ELECTENG 331
COMPSCI 320	ELECTENG 332

Or other approved course above stage II

Part IV Elective Options:

Semester One	Semester Two
COMPSCI 704	COMPSCI 705
COMPSCI 732	COMPSYS 705
COMPSYS 721	COMPSYS 726
COMPSYS 723	MECHENG 726
COMPSYS 731	SOFTENG 752
COMPSYS 732	SOFTENG 753*
ELECTENG 733	SOFTENG 761
ENGSCI 760	SOFTENG 762*
SOFTENG 701	
SOFTENG 751	
SOFTENG 754	

Or other approved 700 level course

Please note:

- Students are also required to complete SOFTENG 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

auckland.ac.nz/cee

Structural Engineering

Pūhanga Rangaranga

What will I study?

Professional engineers will tackle the complex structural and geotechnical nuances in Civil Engineering which are increasingly in demand.

You'll be learning from exceptional academics about various aspects of seismic setting, such as:

- mechanical properties and design considerations of common construction material
- design philosophy and verification methods for everyday loading and rare extreme events such as wind storm and earthquakes
- influence of ground condition on structural design
- design and analysis of low-rise and multistorey buildings
- structural response due to dynamic loading

Keen to find out more?

Find out more online at

https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/structural-engineering.html

Undergraduate course advisors

Direct Entry: Dr Quincy Ma

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Part II: Dr Febelyn Reguyal

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Parts II/III and III: Dr Lucas Hogan

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Parts III/IV and IV: Dr Gary Raftery

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Our newest specialisation responds to the increasing demand for professionals who can tackle the complex structural and geotechnical nuances of civil engineering. Structural Engineering is specially relevant to New Zealand's unique seismic setting. Our curriculum aligns with international best practice, reflects expectations of key processional bodies and focuses on the theoretical foundations needed by structural engineers. This ensures that your BE(Hons) in Structural Engineering from the University of Auckland will be comparable to a tertiary programme in this specialisation offered by leading institutions worldwide.

Courses outlined here for Parts II, III and IV of the Structural Engineering specialisation are being taught in 2025

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
CIVIL 202 Fluid Mechanics and Pipe Flow	CIVIL 200 Intro to Geotechnical Engineering	CIVIL 300 Geotechnical Engineering	ENGSCI 311 Mathematical Modelling 3	CIVIL 705A Research Project	CIVIL 705B Research Project
CIVIL 203 Transport Design and Geomatics	ENGGEN 204 Professional Skills, Communication and Collaboration	ENGGEN 303 Innovation and Business Cases	STRCTENG 302 Steel Structures Design	STRCTENG 710 Low Rise Structures Design	CIVIL 756 Capstone Project
ENGSCI 211 Mathematical Modelling 2	ENVENG 200 Fundamentals of Environmental Engineering	STRCTENG 300 Design Loads and Dynamic Response of Structures	STRCTENG 303 Concrete Structures Design	STRCTENG 711 Multistorey Structures Design	ENGGEN 403 Systems Thinking
STRCTENG 200 Introductory Structural Mechanics	STRCTENG 201 Civil Engineering Materials and Design	STRCTENG 301 Timber Structures Design	Elective	Elective	CIVIL 790 Civil Engineering Administration

Part III Elective Options:

Semester Two
- CIVIL 301
- CIVIL 302
- CIVIL 303
- CIVIL 305

Or other approved stage III courses

Part IV Elective Options:

Semester One
- CIVIL 700
- CIVIL 722
- CIVIL 726
- CIVIL 729
- CIVIL 731
- CIVIL 733
- CIVIL 735
- CIVIL 736
- CIVIL 750
- CIVIL 782
- CIVIL 791
- ENVENG 701
- ENVENG 740
- ENVENG 747*

Or other approved 700 level course

Please note:

- Students are also required to complete STRCTENG 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- *not offered in 2025
- All courses in the above table are 15 points in value, all electives are subject to change
- For further information on elective courses or for detailed information on all courses, https://www.calendar.auckland.ac.nz/en/courses/faculty-of-engineering, or see the back of this handbook

Course descriptions

Aerospace Engineering

Part IV

AEROSPCE 720 (15 Points)

Space Dynamics and Missions

Classical orbital mechanics and dynamics of spacecraft. Application of this knowledge in mission design for achieving pre-specified objectives and adequate spacecraft pointing. Examples of past missions.

AEROSPCE 740 (15 Points)

Aerospace Structures and Mechanisms

Overview of the main issues to be addressed during the structural design process of aircraft and spacecraft, including space mechanisms. Includes requirements definition, analysis processes, materials selection, manufacturing, and typical aircraft and spacecraft configurations.

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, including a group project on the design methodology of instrumentation systems. Topics include: Fundamentals of measurement systems (electric circuits, basic electronics, frequency domain signal analysis and transient analysis, measurement systems), engineering design (teamwork, communication, safety in design and professional responsibility, software tools, material and manufacturing process selection).

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

BIOMENG 299 (0 Points)

Workshop Practice

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 and group design project integrating professional engineering considerations.

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 technical and professional engineering courses to the design of medical devices and software to meet client needs. The project also requires consideration of ethical issues, social impact, safety in design, and international regulations.

Prerequisite: BIOMENG 341, and a further 45 points from non-elective courses listed in Part III of the BE(HONS) Schedule for Biomediacl Engineering

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)

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: CHEM 110 or 120 or ENGGEN 140

Restriction: CHEMMAT 211

CHEMMAT 202 (15 Points)

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)

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)

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

Restriction: CHEMMAT 221

CHEMMAT 205 (15 Points)

Process Design 1

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

Prerequisite: ENGGEN 121 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

CHEMMAT 299 (0 Points)

Workshop Practice

Part III

CHEMMAT 301 (15 Points)

Transfer Processes 2

Principles of continuous and staged processes. Mass transfer in various media, systems and phases. Interrelating equipment design to mass transfer processes. Studies of selected separation processes such as absorption, solvent extraction, and distillation, and membrane processes

Prerequisite: CHEMMAT 203 or 213, and CHEMMAT 242 or 206

Restriction: CHEMMAT 312

CHEMMAT 302 (15 Points)

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)

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)

The Future of Energy

Discussion of topical and significant developments in the field of energy transformation, usage and storage in the context of climate change, both globally and in New Zealand. Topics include: energy efficiency, energy storage and applications, sustainability, non-renewable and renewable power generation.

Prerequisite: CHEMMAT 201 or 211

Restriction: CHEMMAT 317

CHEMMAT 305 (15 Points)

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)

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 720 (15 Points)

Materials Design and Processing

Materials processing of metals, ceramics and polymers. Phase transformation. Microstructural development during materials processing. Case studies of materials selection in product design.

CHEMMAT 723 (15 Points)

Advanced Materials - Level 9

An advanced course with emphasis on new developments in materials science and engineering and their impact on technology and society, for example surface engineering, nanomaterials and composites, alloy development, high performance ceramics, powder processing, biomaterials. Students develop critical assessment, report writing and oral communication skills through independent projects and seminars.

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 725 (15 Points)

Advanced Functional Materials

Electronic properties of materials. Functional properties. Materials applications for energy storage, environmental protection and resource recovery. Nanomaterials and nanotechnology.
Restriction: CHEMMAT 755

CHEMMAT 750A (15 Points)

CHEMMAT 750B (15 Points)

Capstone 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

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)

Biological Materials and Biomaterials

Fundamentals of biological materials from small-scale building blocks (genes, proteins) to large-scale biological entities (organs, joints). Biomaterial design, material selection and functionalisation and the interaction between biomaterials and the biological tissue. Critique and review recent research on selected topics. 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 MATH 108 or equivalent

Restriction: CHEMMAT 361, 464, FOODSCI 704

CHEMMAT 758 (15 Points)

Resource Recovery Technologies

Selection and application of resource recovery processes. Examination of a variety of resource recovery technologies. Critical evaluations of the latest research and development in innovative resource recovery techniques. Social and economic aspects as catalysts or obstacles to resource recovery. Includes an independent research project.

CHEMMAT 759 (15 Points)

Industry 4.0 for Chemical Engineering

In-depth coverage of digitalisation and Industry 4.0 in the context of modern biological, chemical, food and materials processing industries. Topics include model building, digital models and digital twins using process simulators, scripting, open source software and data-driven analysis using machine learning concepts, and the application of these to modelling a virtual plant.

Prerequisite: ENGSCI 311

CHEMMAT 760 (15 Points)

Advanced Microbial Technology in Bioprocess Engineering

Microbiological, biochemical, and molecular approaches crucial for analysing, developing, and optimising engineering bioprocesses. Fundamentals of microbial growth and the effect of environmental factors, molecular tools for quantifying bacterial cells and activities, bioinformatics, and in vitro enzymatic reactions. Applications of microbiology in engineering processes for chemical production, food engineering, bioenergy, and waste treatment.

CHEMMAT 763 (15 Points)

Waste Reduction and Recycling Technologies

Principles, concepts, and technologies in waste minimisation and recycling. Topics include

implementation of waste management and recycling technologies, economic analysis of waste recycling and minimisation and the three pillars of sustainability.

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

CIVIL 299 (0 Points)

Workshop Practice

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. Environmental and sustainability considerations.

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. Environmental and sustainability considerations.

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, and environmental and sustainability considerations, are included.

Prerequisite: CIVIL 203

Restriction: CIVIL 360, 361

CIVIL 304 (15 Points)

Climate Adaptation Design

Fundamental understanding of the impact of climate change on the built environment and strategies, and design for adaptation. Topic areas include assessing climate change impacts, vulnerability studies, and climate change adaptation strategies, adaptation design and asset management for major infrastructure and infrastructure networks. Awareness and consideration of holistic adaptation strategies including indigenous knowledge perspectives and nature-based solutions.

Prerequisite: CIVIL 200, 203 and ENVENG 200

Corequisite: CIVIL 303

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 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 structural assemblages in structural steel, reinforced concrete, reinforced masonry and timber, including connections in steelwork, composite steel/concrete beams and reinforced masonry structures. Emphasis on good load paths, application of seismic design, techniques for the checking of existing structures and lessons learnt from failures. Introduction to the NZ Standard for light timber frame construction and concepts for light steel frame construction.

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

Slope failure mechanisms, geological controls and classification. Shear strength of rock and soil materials. Laboratory testing of earth materials for slope stability. Limit equilibrium techniques, including analytical, numerical and graphical methods. Effects of water and earthquake on slope stability. Slope monitoring, stabilisation and remediation. Landslide risk management.
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 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 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 Design

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

Prerequisite: CIVIL 733

CIVIL 733 (15 Points)
Coastal Engineering Dynamics

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 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

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, cultural, social, ethical, and environmental impact components to complete a scheme assessment report incorporating safety in design concepts.

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, cultural, social and ethical 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, 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 with considerations of cultural, social and ethical responsibilities.

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 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. Professional issues introduced in ENGGEN 204 (health and safety, sustainability, cultural diversity/awareness, communication, leadership, teamwork, financial awareness) and design for repair are reinforced and developed.

Prerequisite: COMPSYS 201 and ELECTENG 202, or COMPSYS 201 and ELECTENG 291, or PHYSICS 140 and 244

Restriction: ELECTENG 209

COMPSYS 299 (0 Points)

Workshop Practice

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. Professional issues introduced in ENGGEN 204 and 303 (health and safety, ethics, sustainability, cultural diversity/awareness, communication, leadership, teamwork, financial awareness) are reinforced and developed.

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

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 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, 331, 332
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 Safety Critical Software

Formal methods for the validation/verification of safety critical software, including machine learning algorithms. Topics covered will include mathematical modelling 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 ENGSCI 233 or MECHENG 270 or 313 or SOFTENG 211 or 281 or 282

COMPSYS 721 (15 Points)

Machine Intelligence and Deep Learning

Explores essential concepts and technologies in state-of-the-art deep neural network architectures,

including convolutional neural networks, decision trees, random forests, similarity learning, recurrent neural networks, and long short-term memory networks. Includes hands-on experience combining hardware components with software implementations.

Prerequisite: COMPSYS 306, and COMPSYS 302 or SOFTENG 306 or 351

Restriction: COMPSYS 726

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

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

Fundamentals of robotic and intelligent systems, including reactive and deliberative functionality, navigation techniques, planning and programming of robot actions, machine learning, artificial neural networks and may include topics in sensors and actuators, kinematic analysis, 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, 306, ENGSCI 331, MECHENG 313, SOFTENG 306

Restriction: COMPSYS 406, 721

COMPSYS 732 (15 Points)

Mobile Autonomous Robotics

Techniques and principles for designing and developing mobile robots that interact autonomously with their environment. Topics include sensors and actuators, kinematic analysis, computer vision, state estimation and planning. Includes significant hands-on experience through the design and development of a mobile robot.

Prerequisite: 15 points from COMPSYS 302, 306, ENGSCI 331, MECHENG 313, SOFTENG 306

COMPSYS 770 (15 Points)

Capstone Project

Final year team exercise with students in multidisciplinary 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

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 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. Professional issues introduced in ENGGEN 204 (health and safety, sustainability, cultural diversity/awareness, communication, leadership, teamwork, financial awareness) and design for repair are reinforced and developed.

Prerequisite: COMPSYS 201 and ELECTENG 202, or COMPSYS 201 and ELECTENG 291, or PHYSICS 140 and 244

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 nonlinear microelectronic circuits and their practical applications.

Prerequisite: ELECTENG 202 or 291, or PHYSICS 121 and 244

Restriction: ELECTENG 210

ELECTENG 299 (0 Points)

Workshop Practice

Part III

ELECTENG 305 (15 Points)

Applied Electronics

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

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 electrical and electronic engineering systems. Design skills are enhanced through engineering projects which typically involve modelling, simulation and analogue/digital electronic hardware design. Professional issues introduced in ENGGEN 204, 303 and 403 (ethics, sustainability, cultural awareness, communication, leadership, teamwork, financial awareness, safety in design) and design for repair are reinforced and developed.

Prerequisite: COMPSYS 201, and COMPSYS 209 or 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. Professional issues introduced in ENGGEN 303 (health and safety, sustainability, cultural diversity/awareness, communication, leadership, teamwork, financial awareness) and design for repair are reinforced and developed.

Prerequisite: ELECTENG 310

ELECTENG 331 (15 Points)

Signals and Systems

Introduction to continuous-time and discretetime 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 202 or 291, or PHYSICS 140 and 244

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 202 or 291

Restriction: ELECTENG 303

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 310, 311, and 30 points from ELECTENG 303, 305, 309, 331, 332

Restriction: ELECTENG 401

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

ELECTENG 701 (15 Points)

Mobile Wireless Engineering

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

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

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 331 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 or 332

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 or 331

Restriction: ELECTENG 412

ELECTENG 733 (15 Points)

Digital 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

ELECTENG 770 (15 Points)

Capstone Project

Final year team exercise with students in multidisciplinary 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

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)

Fundamentals of Engineering in Society

An introduction to chemistry and biology as applied to solving fundamental engineering problems from first principles using conservation laws and with appropriate consideration for uncertainty. Problems will also be addressed from a social perspective, considering the environment, the Treaty of Waitangi, social license to operate, and the role of professional engineering skills in the community and society.

Part II

ENGGEN 204 (15 Points)

Professional Skills, Communication and Collaboration

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

ENGSCI 299 (0 Points)

Workshop Practice

Part III

ENGGEN 303 (15 Points)

Innovation and Business Cases

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)

Systems Thinking

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: BUSINESS 101 and 102, or BUSINESS 111 and either 112 or 113, or DESIGN 220 or 221 or 222, or ECON 151 and GLOBAL 101, or ENGGEN 303 or LAW 241 or MUS 186 or 365 or PROPERTY 231 or SCIGEN 201 or 201G

ENGGEN 499 (0 Points)

Practical Work

Students are required to complete 800 hours of engineering practical work and complete formal written reportsreflecting on their work experience. This enables students to gain workplace experience, practical knowledge, andhands-on engineering experience by working in an organisation.

ENGGEN 701 (15 Points)

Professional Project

A comprehensive investigation, analysis and reporting of a complex engineering design, development or professional engineering problem

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 205 (15 Points)

Engineering-Centric Machine Learning

Introduction to machine learning algorithms with a focus on their applicability to engineering problems. Implementation of machine learning pipelines using high-level software libraries. Project-based application of the data science process to engineering problems. Data and signals-based model development and calibration. Interpretable machine learning. Evaluation of machine learning models for engineering-centric applications. Physics-informed machine learning.

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 and Analytics 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 Engineering General or Engineering Science

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, group project work, and group communication skills. The use of computational models to support design-focused decision making while considering ethical, societal, cultural, and environmental factors.

Prerequisite: ENGGEN 115 and ENGSCI 233

Corequisite: ENGSCI 211 or 213

Part III

ENGSCI 309 (15 Points)

Image and Digital Signal Processing

Fundamentals of image processing and digital signal processing. One dimensional signals and digital filters. Digital filtering with FIR and IIR filters and the Digital Fourier Transform (DFT). Two-dimensional signals, systems and analysis methods. 2D images, spatial sampling, grey-scale quantification, point operations, spatial operations, high pass filtering, sharpening images, noisy images, nonlinear image processing.

Prerequisite: ENGSCI 211 or 213

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, calculus of variations and statistical methods. Topics include: eigenvalues, eigenvectors, systems of equations, stability, separation of variables, wave and heat equations, Euler-Lagrange equation, Hamilton's Principle, probability, random variables, common distributions, Poisson process, exploratory data analysis, confidence intervals, hypotheses tests, linear models including one-way and two-way ANOVA, ANCOVA and multiple regression, introduction to logistic regression.

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)

Computational Design for Physical Systems

Integrate sustainability and environmental considerations into computational engineering. 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. Enhance skills in sustainable decision-making and addressing environmental challenges.

Restriction: ENGSCI 744

ENGSCI 355 (15 Points)

Simulation Modelling for Process Design

Use of simulation models to design complex processes including consideration of cultural, environmental, societal and ethical factors as appropriate. Learning will focus on practical problem solving, translational methods and the development of real-world modelling skills.

Prerequisite: ENGSCI 255 or STATS 255

Restriction: OPSRES 385

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, 211, MATHS 108, 208, 250, 253, and 15 points from COMPSCI 101, ENGGEN 131, MATHS 162, STATS 220

Restriction: ENGSCI 765

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

Prerequisite: 60 points from non-elective courses listed in Part III of the BE(HONS) Schedule for either Engineering Science or Biomedical Engineering

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 721 (15 Points)

Data-centric Engineering for Physical Systems

Mathematical modelling of complex physical systems, including model development, parameterisation and evaluation, illustrated using examples from current research and industry. Inverse problems and uncertainty quantification for physical models in engineering and science, including principles of uncertainty propagation for linear and nonlinear physical models given real-world data, and connections to physics-informed machine learning.

Prerequisite: 15 points from COMPSCI 101, ENGGEN 131, MATHS 162, 199; and either 15 points from ENGSCI 311, 313, 314, or MATHS 260 and either STATS 210 or 225

ENGSCI 740 (15 Points)

Computational Engineering for Physical Systems

Principles and practice for modelling complex physical systems. Applications 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, fracture, composite materials and geomechanics. Underlying theories, computational techniques and industry applications explored using commercial software.

Prerequisite: BIOMENG 321 or ENGSCI 343

ENGSCI 755 (15 Points)

Decision Making in Engineering

Introduction to techniques for decision making in engineering systems including decision heuristics, simple prioritisation, outranking approaches, analytic hierarchy process, application to group decision making.

Prerequisite: ENGSCI 211 or MATHS 250

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: 15 points from COMPSCI 101, ENGGEN 131, MATHS 162, 199, and 15 points from COMPSCI 120, ENGSCI 111, STATS 125

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 or 765

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 or 765

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 or 765

ENGSCI 773 (15 Points)

Capstone Project

Group based projects involving the application and integration of knowledge in computational engineering, data analytics and operations research for design, prototyping and performance testing of a new product. Topics include social and Te Tiriti considerations, engineering design practice, optimisation methods in robust design, material selection and structural analysis, risk management, communication skills, prototype manufacturing and design validation.

Prerequisite: 60 points from non-elective courses listed in Part III of the BE(HONS) Schedule for Engineering Science, including at least 15 points from ENGSCI 344, 355

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. 105 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 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 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. Environmental responsibilities and sustainability considerations.

Prerequisite: ENGGEN 200

Restriction: ENVENG 341

ENVENG 331 (15 Points)

Three Waters: Quality and Treatment

Drinking-water treatment, stormwater and agricultural runoffs, biological wastewater treatment, small-scale water treatment systems, nutrient removal, micropollutants, emerging contaminants, water quality standards.

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

Applying the engineering design process to mechanical parts and assemblies, with consideration of risk management and manufacturing impacts. Design for common production processes and fabrication methods. Design of machine elements including hydraulic and pneumatic systems and components. Documenting and communicating detailed design process and outputs.

Prerequisite: ENGGEN 115

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, SOFTENG 281

MECHENG 299 (0 Points)

Workshop Practice

MECHTRON 299 (0 Points)

Workshop Practice

Part III

MECHENG 306 (15 Points)

Design of Sensing and Actuating Systems

A range of projects on mechatronic elements and systems, involving sensors, actuators and microcontrollers, as well as their interfacing. The design of mechatronic sub-systems, including interfacing, signal conditioning and processing, sensors, actuators, control technologies, software, systems modelling, simulation, analysis and design.

Prerequisite: MECHENG 235 and 270

Restriction: MECHENG 312

MECHENG 311 (15 Points)

Thermal Engineering

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

Prerequisite: MECHENG 211

MECHENG 313 (15 Points)

Design of Real-Time Software

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 New Zealand sound insulation standards. 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)

Design and Manufacture 3

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: Prerequisite: MECHENG 235, 236, 242

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.

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: ELECTENG 101

MECHENG 371 (15 Points)

Digital Circuit Design

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

Prerequisite: ELECTENG 101

Part IV

MECHENG 700A (15 Points)

MECHENG 700B (15 Points)

Research Project

Supervised research on a topic in engineering culminating in an independent written project report that includes a literature review, a description of the research and its findings, and a statement of research contribution. Further supporting technical material will be provided as a compendium.

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 322, 370

MECHENG 706 (15 Points)

Mechatronics Design Projects

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 306 or 313, and 370

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.

Restriction: MECHENG 710, 753, 754

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 718 (15 Points)

Computational Fluid Dynamics

Application of computational methods to fluid dynamics and heat transfer. Finite volume and finite difference methods. Convergence and stability. Mesh generation and post-processing. Application of commercial computer programs to industrial problems.

Restriction: MECHENG 711

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: CIVIL 314 or ELECTENG 303 or 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

The wave equation and solutions. Noise sources. Sound reflection and propagation. The ear and hearing system. Psychology of hearing. Measurement of sound fields and acoustic properties of rooms. Legal and standards requirements. Sound fields in enclosures. Sound transmission. Materials as absorbers and reflectors. Electro-acoustics. Digital signal processing for audio and acoustics.

Prerequisite: ELECTENG 331 or MECHENG 325

MECHENG 731 (15 Points)

Mechanical Design Projects

Team design projects requiring the ideation, development, prototyping and communication of designsolutions. The projects will involve application of project management tools and techniques alongsideselection and appropriate application of suitable engineering methods, while accounting for a range ofdesign issues such as suitability, quality, safety and regard for the environment, with consideration tostakeholder values in the New Zealand context.

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 325

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.

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

Analysis and design of manufacturing processes, with a focus on techniques to manipulate metals and polymers. Application of solid mechanics, fluid mechanics and heat transfer to current additive, subtractive, forming and injection/casting manufacturing technologies. Topics include: bulk and sheet forming, extrusion, injection moulding, 2D and 3D printing processes.

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

MECHENG 754 (15 Points)

Industry 4.0 Smart Manufacturing

New information technologies and their applications in manufacturing enterprises, including introduction to Industry 4.0, product modelling technologies, smart manufacturing systems, industrial IoT sensing and data analysis technologies, digital twins and applications of RFID in a modern manufacturing setting.

Restrictions: MECHENG 709, 710, 753

MECHENG 755 (15 Points)

Design for Additive Manufacturing

Design for additive manufacturing (AM), Metal AM, Polymer AM, AM technologies, Material extrusion, Powder bed fusion, vat photopolymerisation, Material Jetting, Binder Jetting, AM thought process, Economics of AM, Support generation, Residual stress reduction, Post-processing, computational design, Light-weighting, Topology optimisation, Lattice structures, Mass-customisation, Tooling, Conformal cooling, Heat exchangers, Part consolidation, Specialized AM software: nTopology Magics, Inspire, CAD for AM.

Prerequisite: MECHENG 235

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. Professional issues introduced in ENGGEN 204 (ethics, communication, and teamwork) are reinforced and developed while simulating a client-facing software development process.

Prerequisite: SOFTENG 251 or 281

SOFTENG 281 (15 Points)

Object-Oriented Programming

Computer programming using objects as the mechanism for modularity, abstraction, and code reuse. Review of control structures for conditionals and iteration. Instance variables, methods, and encapsulation. Interfaces, inheritance, polymorphism, and abstract classes. Exception handling. Introduction to basic data structures and basic algorithms including sorting and searching.

Prerequisite: COMPSCI 101 or ENGGEN 131

Restriction: COMPSCI 230, COMPSYS 202, MECHENG 270, SOFTENG 251

SOFTENG 282 (15 Points)

Software Engineering Theory

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: COMPSCI 101 or ENGGEN 131

Restriction: COMPSCI 225, SOFTENG 211

SOFTENG 283 (15 Points)

Software Quality Assurance

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 of testing and complexity of programs. Techniques for engineering of software systems including requirements, specification, validation, verification. Modelling paradigms including information, behaviour, domain, function and constraint models. Specification languages.

Prerequisite: COMPSYS 202 or SOFTENG 251 or 281

Restriction: SOFTENG 254

SOFTENG 284 (15 Points)

Data Structures and Algorithms

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

Prerequisite: COMPSYS 202 or SOFTENG 251 or 281

Restriction: COMPSCI 220, 717, SOFTENG 250

SOFTENG 299 (0 Points)

Workshop Practice

Part III

SOFTENG 306 (15 Points)

Software Engineering Design 2

Working in project teams to develop software to meet changing requirements for a large application. Project Planning. Requirements gathering. Estimating, costing and tracking. Acceptance and unit testing. Evolutionary design and development. Collaborative development tools. Professional issues introduced in ENGGEN 204 and 303 (communication, leadership, teamwork, safety in design) are reinforced and developed.

Prerequisite: SOFTENG 206, and 254 or 283

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

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 254 or 283

Restriction: COMPSCI 331

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 or 283

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: SOFTENG 251 or 281

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 251 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: SOFTENG 350

Restriction: COMPSCI 705

SOFTENG 715 (15 Points)

Special Topic

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: COMPSYS 302 or 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: COMPSYS 302 or SOFTENG 306

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: COMPSYS 302 or SOFTENG 306

SOFTENG 753 (15 Points)

Machine Learning Techniques and Applications

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

Prerequisite: COMPSYS 302 or 306 or SOFTENG 306

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 306

SOFTENG 761 (15 Points)

Advanced Agile and Lean Software Development

(previously Agile and Lean SoftwareDevelopment)

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: COMPSYS 302 or SOFTENG 306

SOFTENG 762 (15 Points)

Robotics Process Automation

Covers the fundamentals of Robotic Process Automation (RPA) systems. Students explore what RPA is and where it is useful, how RPA fits into current information technology setups, extracting and manipulating data from both external and internal sources, generating reports and statistics, and orchestrating multi-robot installations.

Prerequisite: COMPSYS 302 or SOFTENG 306

SOFTENG 770 (15 Points)

Capstone Project

Final year team exercise with students in multidisciplinary 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 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 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

STRCTENG 299 (0 Points)

Workshop Practice

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 including environmental and sustainability considerations in. 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 including material environmental and sustainability considerations. 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. Discussion of environmental and sustainability considerations when using concrete as a building material.

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 including the concept of safety in design. Discussion of sustainability and environmental implications of selecting different building materials. Introduction to seismic building behaviour at a conceptual level.

Prerequisite: CIVIL 210 or STRCTENG 200

Restriction: CIVIL 312, 313

Part IV

STRCTENG 710 (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 including discussion of sustainability and environmental impacts of design decisions. Strut and tie design for reinforced concrete. Introduction to fire engineering. Techniques in ensuring safety in design, checking of existing structures and lessons learnt from failures, and design for repair.

Prerequisite: STRCTENG 302, and CIVIL 313 or STRCTENG 303

Restriction: CIVIL 713

STRCTENG 711 (15 Points)

Multistorey Structures Design

Techniques for the design of multistorey structures to resist seismic loading. Derivation of design actions and design of structural components subject to cyclic inelastic action. Includes identifying alternative structural systems for resisting seismic loads, incorporating sustainable design into seismic structural systems, detailing of members and joints to enhance earthquake resistance, design for repair, seismic isolation, and ensuring safety in design.

Prerequisite: STRCTENG 302, and CIVIL 313 or STRCTENG 303

Restriction: CIVIL 714


Loadfrac II

APPENDIX - 2019 Calendar Regulations

Students enrolled in the BE(Hons) prior to 2020 will complete their degree under the 2019 Calendar Regulations. Visit **https://cdn.auckland.ac.nz/assets/calendar/docs/2019-CalendarBook1.pdf** for more details.

Courses below are listed in the semester they are being offer in for 2025.

Civil Engineering

Part II — 120 points

Semester One	Semester Two
CIVIL 201	CIVIL 211
CIVIL 210	CIVIL 221
CIVIL 220	CIVIL 250
CIVIL 230	ENGGEN 204
ENGSCI 211	ENVENG 244

Part III — 120 points

Semester One	Semester Two
CIVIL 322	CIVIL 361
CIVIL 331	ENGSCI 311
CIVIL 360	ENVENG 333
ENGGEN 303	Elective
Elective	Elective

Part III Elective A Options:

Semester One	Semester Two
CIVIL 312	CIVIL 313
ENVENG 341*	ENVENG 342

Part III Elective B Options:

Semester One	Semester Two
CIVIL 314	CIVIL 324
	CIVIL 332

Part IV — 120 points

Semester One	Semester Two
CIVIL 705A	CIVIL 705B
CIVIL 790	ENGGEN 403
Elective	CIVIL 756
Elective	Elective

Part IV Elective A Options:

Semester One	Semester Two
CIVIL 713	CIVIL 714
CIVIL 715	CIVIL 725
CIVIL 718*	CIVIL 726
CIVIL 719	CIVIL 734*
CIVIL 721*	CIVIL 743
CIVIL 722	CIVIL 759
CIVIL 731	CIVIL 782
CIVIL 733	ENVENG 701
CIVIL 750	ENVENG 702
CIVIL 758	ENVENG 707
CIVIL 791	
ENVENG 740	
ENVENG 746	
ENVENG 747	

Part IV Elective B Options:

Semester One	Semester Two
CIVIL 710	ENGGEN 701*

This schedule is designed as a reference for students who have entered the BEHONS programme prior to 2020. Please use this appendix in conjunction with course planning information online which can be found at **https://uoa.custhelp.com/app/answers/detail/a_id/16083**

Please note:

- Students are also required to complete ENGGEN 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV.
- * Not offered in 2025
- For further information on elective courses or for detailed information on all courses, visit https://uoaengineering.github.io/courseviewer/, or see the back of this handbook.

Computer Systems Engineering

Part II	120 points	Part III	120 points	Part IV	120 points
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
COMPSYS 201	COMPSYS 202	COMPSYS 302	COMPSYS 301	COMPSYS 700A	COMPSYS 700B
ELECTENG 202	ELECTENG 204	COMPSYS 305	ELECTENG 303	Elective	ENGGEN 403
ELECTENG 210	ELECTENG 209	ENGGEN 303	Elective	Elective	Elective
ENGSCI 211	ENGGEN 204	ENGSCI 313	Elective	Elective	Elective

Part III Elective Options:

Semester Two
COMPSYS 303
COMPSYS 304
SOFTENG 325

Or other approved course

Part IV Elective A Options:

Semester One	Semester Two
COMPSYS 701	COMPSYS 704
COMPSYS 723	COMPSYS 705
COMPSYS 726	COMPSYS 722
ELECTENG 722	COMPSYS 725*
ELECTENG 732*	ELECTENG 704
ELECTENG 733	ELECTENG 706*
ELECTENG 734	ELECTENG 726
SOFTENG 701	SOFTENG 761
SOFTENG 751	

Part IV Elective B Options:

Semester Two
ENGGEN 701*

This schedule is designed as a reference for students who have entered the BEHONS programme prior to 2020. Please use this appendix in conjunction with course planning information which can be found at **https://uoa.custhelp.com/app/answers/detail/a_id/16182/kw/engineering%20software/p/212**

Please note:

- Students are also required to complete ENGGEN 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV.
- * Not offered in 2025
- All courses in table above are 15 points in value.
- For further information on elective courses or for detailed information on all courses, visit https://uoaengineering.github.io/courseviewer/, or see the back of this handbook.

Electrical and Electronic Engineering

Part II (120 points)		Part III (120 points)		Part IV (120 points)	
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
COMPSYS 201	COMPSYS 202	ELECTENG 310	ELECTENG 303	ELECTENG 700A	ELECTENG 700B
ELECTENG 202	ELECTENG 204	ENGGEN 303	ELECTENG 305	Elective	ENGGEN 403
ELECTENG 210	ELECTENG 209	ENGSCI 313	ELECTENG 311	Elective	Elective
ENGSCI 211	ENGGEN 204	Elective	Elective	Elective	Elective

Part III Elective Options:

Semester Two	Semester Two
COMPSYS 302	COMPSYS 303
COMPSYS 305	COMPSYS 304
ELECTENG 307	ELECTENG 309
	SOFTENG 325

Or other approved course

Part IV Elective A Options:

Semester One	Semester Two
COMPSYS 723	COMPSYS 704
COMPSYS 726	COMPSYS 725
ELECTENG 721	ELECTENG 703
ELECTENG 722	ELECTENG 704
ELECTENG 731	ELECTENG 706*
ELECTENG 732*	ELECTENG 726
ELECTENG 733	ELECTENG 735*
ELECTENG 734	ELECTENG 736
	ELECTENG 738

Or other approved course

Part IV Elective B Options:

Semester Two
ENGGEN 701*

This schedule is designed as a reference for students who have entered the BEHONS programme prior to 2020. Please use this appendix in conjunction with course planning information which can be found at **https://uoa.custhelp.com/app/answers/detail/a_id/16182/kw/engineering%20software/p/212**

Please note:

- Students are also required to complete ENGGEN 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in table above are 15 points in value
- For further information on elective courses or for detailed information on all courses, visit https://uoaengineering.github.io/courseviewer/, or see the back of this handbook

Software Engineering

Part II		Part III		Part IV	
120 points		120 points		120 points	
Semester One	**Semester Two**	**Semester One**	**Semester Two**	**Semester One**	**Semester Two**
COMPSYS 201	ENGGEN 204	ENGGEN 303	SOFTENG 306	SOFTENG 700A	SOFTENG 700B
ENGSCI 211	SOFTENG 206	SOFTENG 350	SOFTENG 325	Elective	ENGGEN 403
SOFTENG 250	SOFTENG 211	SOFTENG 351	Elective	Elective	Elective
SOFTENG 251	SOFTENG 254	SOFTENG 370	Elective	Elective	Elective

Part III Elective Options:

Semester One	Semester Two
COMPSCI 373	COMPSCI 367
COMPSYS 305	COMPSYS 303
	COMPSYS 304
	SOFTENG 364

Or other approved course

Part IV Elective Options:

Semester One	Semester Two
COMPSYS 723	COMPSYS 705
COMPSYS 726	SOFTENG 702
ENGSCI 760	SOFTENG 752
SOFTENG 701	SOFTENG 761
SOFTENG 750	SOFTENG 762
SOFTENG 751	
SOFTENG 754	

Or an approved 700 level course

This schedule is designed as a reference for students who have entered the BEHONS programme prior to 2020. Please use this appendix in conjunction with course planning information which can be found at **https://uoa.custhelp.com/app/answers/detail/a_id/16182/kw/engineering%20software/p/212**

Please note:

- Students are also required to complete ENGGEN 299 Workshop Practice in Part II and ENGGEN 499 Practical Work before and during Part IV
- * Not offered in 2025
- All courses in table above are 15 points in value
- For further information on elective courses or for detailed information on all courses, visit https://uoaengineering.github.io/courseviewer/, or see the back of this handbook.

Find out more

Need help and advice?

Visit or get in contact with us at the Student Hubs:

General Library
City Campus, 5 Alfred Street
Open: Monday to Thursday 8am-10pm, Friday 8am-8pm, Saturday and Sunday 9am-8pm (except public holidays)
Phone:
(09) 923 5023 (Auckland)
0800 61 62 63 (Outside Auckland)
+64 9 373 7513 (International)
www.auckland.ac.nz/engineering

Find answers to your questions at
www.askauckland.ac.nz

Find more information about undergraduate study in Engineering at:
https://www.auckland.ac.nz/en/study/study-options/find-a-study-option/bachelor-of-engineering-honours-behons.html

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www.instagram.com/uoaengineering

Resources for students

www.auckland.ac.nz/engineering

Canvas
https://canvas.auckland.ac.nz

Current students
https://www.auckland.ac.nz/en/engineering/current-students/undergraduate.html

How to enrol in courses
www.auckland.ac.nz/enrolment

IT Help
www.engineering.auckland.ac.nz/engineering-IT

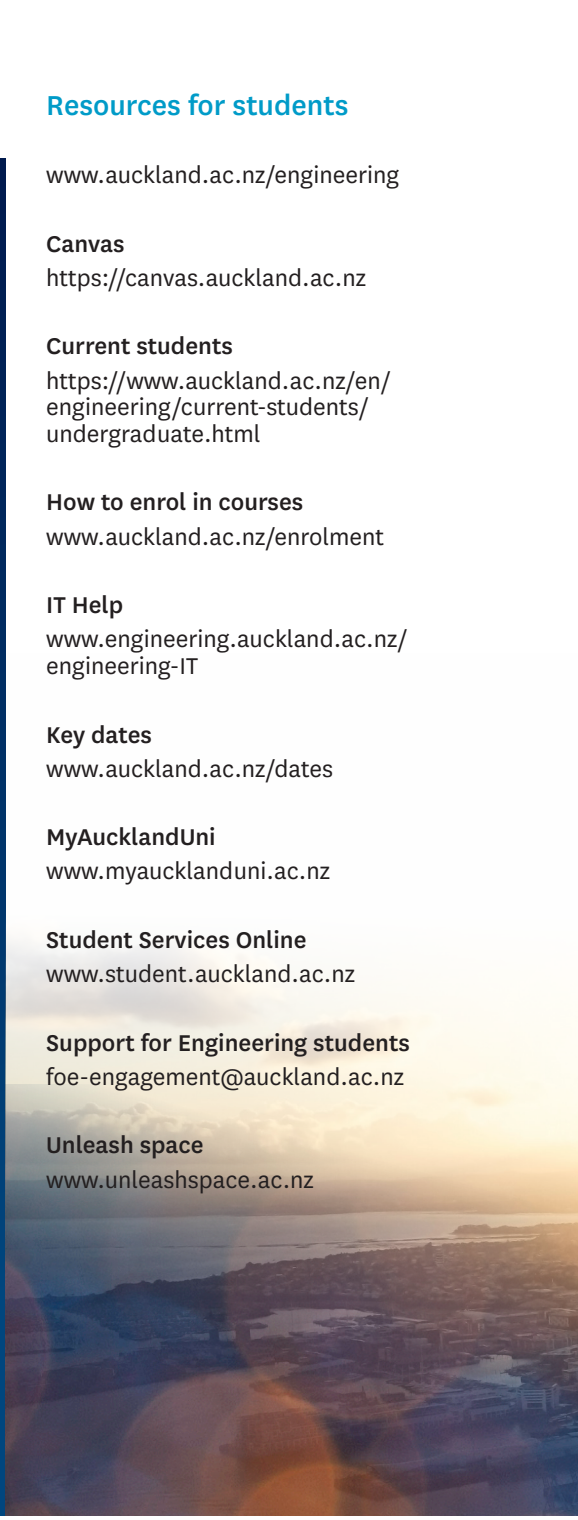
Key dates
www.auckland.ac.nz/dates

MyAucklandUni
www.myaucklanduni.ac.nz

Student Services Online
www.student.auckland.ac.nz

Support for Engineering students
foe-engagement@auckland.ac.nz

Unleash space
www.unleashspace.ac.nz



Useful web addresses

Auckland University Student's Association
www.ausa.org.nz

Career Development and Employment Services
www.cdes.auckland.ac.nz

Clubs, societies and associations
https://www.auckland.ac.nz/en/on-campus/life-on-campus/clubs-societies.html

Entry requirements
www.auckland.ac.nz/entry-requirements

Exams
www.auckland.ac.nz/exams

Finances, scholarships and fees
www.auckland.ac.nz/fees
www.auckland.ac.nz/scholarships

How to apply for admission
www.auckland.ac.nz/apply

International Office
Phone: +64 9 373 7513
Email: int-questions@auckland.ac.nz

International students
www.international.auckland.ac.nz

IT essentials
www.auckland.ac.nz/it-essentials

Libraries and Learning Services
www.library.auckland.ac.nz

Maori and Pacific students
https://www.auckland.ac.nz/en/engineering/study-with-us/maori-and-pacific-at-the-faculty.html

Overseas exchanges
www.auckland.ac.nz/360

Security
Phone: 373 7599 ext 85000
(or ext 85000 directly from a University telephone)

Student life
www.auckland.ac.nz/en/on-campus.html

Studylink
www.studylink.govt.nz

Support services
www.auckland.ac.nz/studentsupport

The University of Auckland
www.auckland.ac.nz

The University of Auckland Calendar
www.calendar.auckland.ac.nz

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Email us: auckland.ac.nz/ask-us
Or phone: 0800 61 62 63
International: +64 9 373 7513

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General Library, Building 109,
5 Alfred Street, Auckland

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Philson Library, Building 503
Level 1, 85 Park Rd, Grafton
(Entry via the Atrium)

SOUTH AUCKLAND CAMPUS
Te Papa Ako o Tai Tonga
6 Osterley Way, Manukau

WHANGĀREI CAMPUS
Te Papa Ako o Tai Tokerau: L Block,
13 Alexander Street,
Whangārei

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