

The Five Branches of Engineering

The details listed below each branch title indicates the member of academic staff to whom enquiries about admission to the quota should be addressed.

The selection criteria listed for each branch are provided as a guide only and will be refined when more information is available about student preferences, places in each quota, and results achieved.

Chemical Engineering

Professor Paul Webley

204/36

In level 2, students are introduced to core chemical engineering units which lay the foundation for proficiency in chemical engineering. These units include mass and energy balances, heat and mass transfer, thermodynamics, fluid mechanics as well as more detailed grounding in chemistry and mathematics. Commencing at level 3, in addition to continuing with advanced chemical engineering core units, students must select one minor stream for additional focus. These streams reflect the future direction of chemical engineering. The option streams comprise three units of study: one at level 3 and two at level 4. The options are:

Biotechnology	Chemical engineers are in demand by biotechnology and pharmaceutical companies world wide as they attempt to apply biological processes on a large scale. Applications include the use of recombinant DNA, the development of micro-organisms, and new bio processing techniques.
Nanotechnology	Nanotechnology is literally engineering at the molecular level. Over the last two decades, our ability to manipulate matter at the molecular level has improved dramatically. This revolution will let us fabricate an entire new generation of products that are cleaner, stronger, lighter, and more precise.
Sustainable Processing	Apply the principles of sustainability and life cycle assessment to the development of environmentally clean technologies for product manufacturing and power generation to the benefit of the environment. Learn how we can develop processes for manufacturing existing and new products from renewable raw material sources. Chemical engineers make an important contribution to protecting the environment.

In level 4 of the BE program, students maintaining a sufficiently high academic performance may be offered the opportunity of a period of integrated industrial experience arranged by the Department. This is an excellent opportunity to improve employment prospects. The fourth year also synthesizes the knowledge gained in earlier years and culminates in each student completing a major project which is the design of entire processes, including economic analysis, safety and sustainability. In addition, you will also do a one-semester research project and complete the study of your chosen stream.

The Department has an active undergraduate society (SMUCE) which offers students weekly lunch time seminars from company representatives offering vacation and graduate opportunities as well as many other topics throughout the year. **When you enrol into Chemical Engineering, every student is a member of the Department of Chemical Engineering!**

Selection criteria: Academic criteria - a weighted average of $\geq 50\%$ will be required (although this may be adjusted in the selection process), and a numerical quota will apply.

Civil Engineering

Assoc Prof Jay Sanjayan

129/60

At second year, students are introduced to basic analysis techniques in each of the four disciplines in civil engineering through significant project-based units. These include geomechanics, transport, water supply and structural engineering. In third year the core units further extend the studies in engineering design and analysis but with increasingly complex tasks. All four disciplines are again represented, with the addition of two management units. The fourth year electives concentrate on the practice of civil engineering as a preparation for professional employment. Design and project work requires the synthesis of applied science and engineering judgement.

Selection criteria: No academic criteria have been set; a numerical quota will apply. For marginal cases, preference will be given to those who successfully completed ENG1020.

Electrical and Computer Systems Engineering

Associate Professor Lindsay Kleeman G16/36

The Electrical and Computer Systems Engineering course has been totally redesigned over the last few years to reflect the rapid pace of innovation in the electronics and computer industries. This new course supports the needs of students entering both local and global industries, with particular emphasis on emerging areas such as efficient energy utilization, wireless and photonic broadband telecommunications, biomedical engineering, autonomous robotics, sensing and image recognition, as well as sophisticated control techniques for plant, transportation and power systems. Particular emphases are given to reconfigurable computing, and the interaction between electronics and the real world by sensors and actuators of all types and sizes. We offer extensive elective choices in both third year and fourth year, together with a thorough grounding in the fundamentals of the discipline. Project work provides hands-on experience in teams and as individuals with a strong focus on computer-aided design techniques. We aim to equip you with the knowledge and skills to enable you to create new companies or become key players in larger corporations.

Selection criteria: Academic criteria - Passed 24 credit points of level one, including ENG1060 and ENG1091

Materials Engineering

Professor George Simon

142/19

The discipline of Materials Engineering is a very widespread and important one in engineering. Everything is made of materials and there are increasing demands for better performing, smarter materials with reduced environmental impact. At the core of Materials Engineering is the relationship between structure, processing and properties of materials. Increasingly this involves nanomaterials, biomaterials and materials relating to energy generation and storage.

Students are introduced at second year to fundamental aspects of the structure of materials and their relationship to engineering properties, and how their properties are influenced by processing. This sits alongside further training in mathematics and other essential skills including aspects of the various major classes of materials, functional materials, nanomaterials and materials selection and design.

In levels three and four, the units involve aspects of both materials science and materials engineering in which a wide treatment is given to the processing, properties and characterisation of metals, plastics, rubber, ceramics, biomaterials, nanomaterials, composites and surface engineering (corrosion and adhesion). In the last year, special attention is given to materials design and selection, optimisation of properties, processing and its influence on properties, shaping and fabrication, and the performance of materials in service.

Practical work forms an essential part of most units and a substantial research project in a field of materials (metals, plastics, rubbers, nanotechnology, corrosion, biomaterials and tissue engineering, green materials engineering, modelling of materials or ceramics) of their own choosing is carried out by students in their final year. During levels three and four, an opportunity to specialise in certain areas of materials is afforded by the choice of elective subjects and the choice of project.

Selection criteria: No academic criteria have been set; a numerical quota will apply.

Mechanical Engineering

Professor Mark Thompson 108/33

Mechanical engineers play a pivotal role in solving some of the most challenging problems currently facing the globe. This is achieved by employing multi-disciplinary skills to design and develop unique solutions to complex problems.

Our degree equips students with the skills to pursue careers in fields as diverse as mining, renewable energy generation, oil and gas exploration, construction, nano- and micro-scale technology, and automotive design, among many others.

The mechanical engineering degree provides our graduates with a thorough grounding in the key disciplines of solid and fluid mechanics, thermodynamics and heat transfer, control systems, electronic instrumentation and computer-aided engineering. Specialisation in mechanical engineering commences in second year, where students learn fundamental concepts in these discipline areas. Students employ this knowledge to create practical devices as part of their engineering design units, and have the opportunity to participate in the annual Warman competition. In second year, students may join the student-led Formula SAE team, which annually designs, builds and races a car in competition with universities from around the world.

In third year, engineering science and practical studies are extended further and students are increasingly encouraged to learn independently; students undertake an experimental project, where the theory of research and experimental design are taught. In their final year, students commence an independent research project, working individually with an academic, in an area of their interest. These projects may be industry based, or selected from a broad range of very applied through to fundamental research projects. Students undertake four electives of their choice in this year, developing their skills in a specialist area.

Selection criteria: Academic criteria and a numerical quota apply.