EVERYTHING YOU NEED TO KNOW ABOUT PREPARING FOR A GREAT CAREER IN THE FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT
Your indispensable guide to who's who and what's what in the EBE Faculty!
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University of Cape Town Mission Statement

UCT aspires to become a premier academic meeting point between South Africa, the rest of Africa and the world. Taking advantage of expanding global networks and our distinct vantage point in Africa, we are committed, through innovative research and scholarship, to grapple with the key issues of our natural and social worlds.

We aim to produce graduates whose qualifications are internationally recognised and locally applicable, underpinned by values of engaged citizenship and social justice.

UCT will promote diversity and transformation within our institution and beyond, including growing the next generation of academics.
Dear Prospective Student

It is an exciting time to be considering joining the Faculty of Engineering & the Built Environment (EBE) at UCT, which enjoys an outstanding international reputation for its high quality graduates and for its groundbreaking research.

South Africa is a fast-developing country and there is a shortage of skills in the engineering and built environment fields. By joining the professions in this area, you will be contributing to building the future for generations to come.

The Faculty has a wide array of exciting degree programmes giving you the freedom to choose the programme appropriate to your skills and interests. We ensure that students who graduate obtain internationally accredited degrees that will enable them to compete on equal terms with their peers all over the world. We also ensure these degree programmes are responsive to the exciting challenges facing our developing nation. The Faculty has links with other African universities and leading academic institutions around the world, and these provide an active student exchange programme as well as bringing world-class researchers to the faculty.

An internationally accredited degree from the EBE Faculty equips graduates with the knowledge and expertise to become leaders and pioneers in their chosen field.

Should you require further information please visit our website at www.ebe.uct.ac.za or contact our Faculty Office at ebe-faculty@uct.ac.za or telephone 021 650-2699.

Professor Francis Petersen
Dean: Faculty of Engineering & the Built Environment
Why study for a career in engineering and the built environment?

The world we live in today relies on the continuous development, improvement and application of technology. Almost everything we need for basic daily life — housing, food, water, clothing, energy, communication and transport — is manufactured in some way. In order to develop, design, manufacture, build and maintain these we need engineers of all kinds, architects, surveyors, property developers and construction personnel.

In fact, almost all human endeavours require the skills and ingenuity of these professionals, from space exploration, to life-saving medical equipment, to the many gadgets and appliances we rely on for a better quality of life.

In a world where human population growth places ever more demands on dwindling natural resources such as water, fuel and building materials, it is up to a new generation of highly trained professionals with the skills, knowledge and sense of urgency to find viable and sustainable solutions to these challenges.

The future growth and economic viability of South Africa and its people (and of everywhere else in the world too) will depend to a large extent on the availability of enough qualified professionals able to address these needs.
How do I know if EBE is the right choice for me?

A person wanting to pursue a career in engineering or the built environment should primarily be a problem solver – able to analyse or break things down into logical steps, and to form concepts and ideas from observation and experience. They should also have good mathematical and scientific skills, and enjoy working in these subjects.

Trying to decide on a career path to follow can cause an immense amount of anxiety and stress for school-leavers. However, taking the time to explore the endless opportunities available and developing a better understanding of yourself can be a challenging but rewarding journey of self-discovery.

Start with some soul searching; understand your likes and dislikes, your strengths and weaknesses. Then, become a researcher, actively gathering as much information as possible on the various degrees and programmes offered by tertiary institutions. Speak to people in industry and seize opportunities to job-shadow professionals.

UCT’s Career Development Programme offers a pre-admissions career counselling service aimed at Grade 11 and 12 learners. They do not conduct aptitude tests or apply psychological assessment tools. Rather, their aim is to enable the learner to take responsibility for managing their own study choices and personal career development process. For more information call 021 650 4398.
All degrees offered by the EBE Faculty are internationally accredited, which means your skills will be applicable and transferable anywhere in the world.

Each department is comprised of teaching staff that are experts in their field and are highly active in research projects.

The highest number of engineering research-rated academics in South Africa are at UCT.

As a result, the Faculty has strong links with industry and government agencies, which commission and fund significant research projects through the various EBE departments.

UCT’s commitment to teaching and research excellence is matched by its commitment to social service, with many social challenges being addressed through its various research interests.

The Faculty has an illustrious legacy with many of its alumni occupying powerful positions in the business world and politics.

Alumni and corporations support the Faculty through bursaries and scholarships, providing many research and study opportunities for students.

The Faculty has a wide array of exciting undergraduate and postgraduate programmes in all departments, giving you the freedom to choose the stream appropriate to your skills and interests.

Links with other African universities and leading academic institutions around the world have encouraged an active student exchange programme between our university and others, as well as bringing world-class researchers and teachers to UCT.

Our graduates are highly sought after; consequently most have already secured employment before they have even graduated.
This section will give you a brief overview of the Faculty structure and outlines which degree programmes are offered in the various departments.

UCT’s Faculty of Engineering & the Built Environment comprises six departments which include the engineering and built environment disciplines. Internationally and locally the trend has been to incorporate all these disciplines in one faculty.

Your first degree is called an undergraduate degree. The undergraduate programmes all lead to internationally recognised professional qualifications which are accredited both nationally and internationally. All undergraduate programmes emphasise design skills, entrepreneurship and project management.

Once you have completed your first degree and you wish to study further, you may apply to do postgraduate studies.
THE BUILT ENVIRONMENT DISCIPLINES

ARCHITECTURE, PLANNING AND GEOMATICS

Undergraduate degree programmes

• Architectural Studies (BAS)
• Geomatics Streams (BSc Geomatics)
• Geoinformatics
• Surveying
• Planning (BSc Geomatics 4 years and MCRP 5 years)

Postgraduate areas of specialisation

• Architecture
• City and Regional Planning
• City Planning and Urban Design
• Conservation Studies
• Geomatics
• Landscape Architecture
• Transport Studies (jointly offered with the Department of Civil Engineering)
• Geographical Information Systems (GIS)
CIVIL ENGINEERING

Undergraduate degree programme:
- Civil Engineering (BSc (Eng))

Postgraduate areas of specialisation:
- Spatial Information Systems and GIS
- Structural Engineering and Materials
- Geotechnical Engineering
- Transport Studies
- Urban Engineering and Urban Management
- Water Quality Engineering
- Urban Water Management

CONSTRUCTION ECONOMICS AND MANAGEMENT

Undergraduate degree programmes:
- Construction Studies (BSc)
- Property Studies (BSc)

Postgraduate areas of specialisation:
- Construction Management
- Housing Development and Management
- Quantity Surveying
- Property Studies
- Project Management
ENGINEERING DISCIPLINES

CHEMICAL ENGINEERING

Undergraduate degree programmes:
• Chemical Engineering (BSc (Eng))

Postgraduate areas of specialisation:
• Bioprocess Engineering
• Catalytic Process Engineering
• Environmental and Process Systems Engineering
• Hydrometallurgical Engineering
• Mineral Processing

ELECTRICAL ENGINEERING

Undergraduate degree programmes:
• Electrical Engineering (BSc (Eng))
• Electrical and Computer Engineering (BSc (Eng))
• Mechatronics (BSc (Eng))

Postgraduate areas of specialisation:
• Control Engineering
• Image Processing and Vision Systems
• Instrumentation
• Power Electronics
• Power Engineering
• Remote Sensing and Radar
MECHANICAL ENGINEERING

Undergraduate degree programmes:
- Electro-Mechanical Engineering (BSc (Eng))
- Mechanical Engineering (BSc (Eng))

Postgraduate areas of specialisation:
- Computational Mechanics
- Energy and Development Studies
- Electro-Mechanical Engineering
- Engineering Management
- Materials Engineering
- Mechanical Engineering
- Sustainable Energy Engineering
What does Architecture entail?
In order to graduate with a professional qualification in Architecture, a student would need to complete the three-year Bachelor of Architectural Studies undergraduate degree (BAS) which is, after one year of practical experience, followed by a one-year Bachelor of Architectural Studies (Hons) degree and a one-year Masters of Architecture (Professional) degree. Prospective students have to apply for selection to both the BAS and BAS (Hons) degrees.

Professional Status
On completion of the Masters of Architecture (Professional), students are considered to have a professional qualification. After two years of experience in practice and on passing an exam set by the South African Council for Architectural Professions (SACAP) one can register as a Professional Architect.

Bachelor of Architectural Studies
A general design-based first degree, the Bachelor of Architectural Studies (BAS) is a three-year undergraduate degree programme that focuses on the design of the built environment and architectural design. This programme equips students with the ability to solve design problems imaginatively, to think rationally and to exercise appropriate judgement within the discipline of architecture. In particular it aims to develop the capacity to design appropriately within the built and natural environment.

The BAS degree provides the necessary grounding for entry into the professional postgraduate degrees leading to careers in architecture, landscape architecture, city and regional planning, urban design, transport engineering and housing. Students should note the BAS degree is a necessary prerequisite for entry into the BAS (Hons) degree.
First year courses cover:

- APG1003W Technology 1
- APG1020W Design and Theory Studio 1
- APG1004F & 1005S History and Theory of Architecture I & 2
- APG1021W Representation 1

Students completing the Bachelor of Architectural Studies degree may continue their studies for the Bachelor of Architectural Studies (Hons) and thereafter, the Master of Architecture (Professional) degree. These one year degree programmes, taken consecutively, are designed to equip graduates with the necessary skills for the innovative and critical practice of architecture. It equips students with the ability to deal with complex architectural design problems and with professional practice matters. The completion of the Master of Architecture (Professional) allows graduates to register with various professional architectural bodies.

**Landscape Conversion Course**

This consists of courses from first and second year of the BAS programme. Students with an undergraduate degree other than BAS, and who wish to enter the Master of Landscape Architecture (MLP) Programme, can apply for a one year conversion course. The course is designed to equip students who have limited or no design background with the basic skills with which to enter into the MLP programme.

**CAREER OPPORTUNITIES**

The BAS degree provides training for career openings as an architect’s assistant, interior designer, urban designer or as an employee in housing agencies or local authorities in architectural, works and housing administration sections. It does not allow you to practice as an architect, however you may do minor design work as an independent architectural designer.

MArch (Prof) graduates may join private consulting companies, establish their own company, engage with NGOs concerned with housing or the environment, or enter the public sector. There are also careers in research and teaching at universities, technical universities and private colleges.
Geomatics is a varied discipline in which geographical information systems (GIS), remote sensing and surveying are the three broad areas of specialisation.

To excel in this field you will need a mathematical, scientific and technical aptitude combined with an interest in geography and the environment. It is also an ideal career for people who enjoy the idea of working outdoors. You will work with sophisticated electronic equipment and computers and be involved in the areas of land development, environmental management and/or engineering projects.

**Bachelor of Science in Geomatics**

This is a four-year undergraduate degree that provides students with a foundation in surveying and spatial information science. They use this foundation in one of their chosen areas of specialisation which are reflected in the three streams of the degree programme:

1. Geoinformatics, where a student majors in computer science and either environmental and geographical science or geology.
2. Surveying, with specialisation in engineering surveying, geodesy, and cadastral surveying.
3. Planning, whereby a graduate obtains a BSc(Geomatics) degree after four years and a Masters degree in City and Regional Planning (MCRP) after a further year of study in a combined programme.

First year courses cover:

- APG1016S Geomatics 1
- CSC1015F Computer Science
- OR
- APG 1015S Programming for Geomatics
- MAM1017F & 1018S Engineering Mathematics
- GEO1009F Introduction to Earth & Environmental Science
- STA1000S Statistics
Geomatics also offers postgraduate degrees at Masters and Doctoral level in various specialist areas (GIS, 3D GIS & virtual reality modelling, heritage studies, geodesy, engineering surveying, machine vision, photogrammetry, remote sensing, cadastral and land tenure systems, heritage documentation).

**CAREER OPPORTUNITIES**

Geomatics graduates have excellent employment prospects as there is a shortage of professionals in surveying, geographic information science and remote sensing in South Africa. Career opportunities exist for various categories of surveyors, planners, GIS specialists, GIS and GPS software developers, environmental scientists, geologists (who have a specific interest in GIS and spatial analysis), photogrammetry and remote sensing specialists.

With their specialised knowledge of spatial information and spatial information management issues, Geomatics practitioners have a pivotal role to play in the economic development of South Africa. Their skills are currently, and will continue to be, in high demand in infrastructure development, urban and environmental management, and in the current land reform process.

Geomatics at UCT has a very strong research and teaching record and the programme is internationally respected as a leader in geomatics education and research. Many UCT Geomatics graduates have also entered exciting overseas careers in all disciplines encompassed by Geomatics.
The Department of Civil Engineering offers an undergraduate programme at UCT that is fully accredited by the Engineering Council of South Africa.

Our undergraduate programmes in Civil Engineering offer the best that is available in South Africa and we are in line with the latest international developments in engineering curricula.

**What does Civil Engineering entail?**

Civil Engineering is a profession that plays a major role in research, planning, design, construction, development and management of the infrastructure necessary for community life. This infrastructure includes: large buildings (such as office blocks and shopping centres); bridges; water drainage, storage, treatment and pipeline systems; and roads and public transport.

Civil engineering appeals to people who thrive on the challenges inherent in problem-solving. This requires an aptitude for and skills in mathematics and science, and a desire to be involved in the planning, design, construction, development and management of infrastructure necessary for civilisation. Civil engineering makes a positive difference to the world in which we live.

**Bachelor of Science (Eng) in Civil Engineering**

As well as learning about the various civil engineering areas during lectures, you will also have practical sessions in the labs. These involve the investigation of the properties of various construction materials, soil behaviour and foundation design, behaviour of structural members under different loads, water quality and waste treatment. During vacations students are expected to do practical training involving both site work and design office experience. The course also includes a survey camp covering basic survey operations and the preparation of a site plan.

“I guess what I most look forward to within my career are the vast challenges of clean water, sustainable energy and transportation needs that have to be addressed.”

Rodwell Cloete (graduate)
First year courses cover:

CEM1008F  Chemistry for Engineers
CIV1004W  Engineering 1 - Civil Engineering
MAM1017F & 1018S  Engineering Mathematics
MAM1042S  Engineering Statics
MEC1002W  Engineering Drawing
PHY1012F & 1013S  Engineering Physics

CAREER OPPORTUNITIES

Civil engineers may work on site e.g. construction of the Lesotho Highlands Water Project or the Cape Town Stadium, or in a consulting office — undertaking the planning, designing and analysis of civil engineering projects before they can be built on site.

After gaining experience in a variety of projects, many civil engineers end up in senior management roles in the engineering or business field.

Some civil engineers prefer to work for national, provincial or local government/municipalities — finding and implementing practical solutions to problems faced in society in the areas of housing, provision of clean water, waste water treatment, roads and public transportation.
Recognised as one of the leading academic departments of its kind in the country, UCT’s Department of Construction Economics and Management offers degrees, accredited both locally and internationally by professional institutions.

What does Construction Economics and Management entail?

The study of construction studies, quantity surveying, construction management and property studies at UCT typically entails a combination of fields associated with the built environment, namely management, law, economics, science and technology.

Construction projects require the expertise of specialists such as architects and engineers but their successful physical execution depends on the expertise of those with the appropriate management skills. These include a command of cost planning and cost management techniques and a thorough understanding of the administrative and legal aspects of building developments.

UNDERGRADUATE DEGREE PROGRAMMES

Bachelor of Science in Construction Studies

This is a three year degree which equips students with a wide range of skills and knowledge required of a managerial role in the construction industry. Students are challenged with aspects that deal with design, construction and engineering technology as well as subjects such as economics, statistics, human resource management, commercial and contract law, costing, surveying and professional communication. Practical exercises are a component in all three years’ curricula.
First year courses cover:
CIV1006S  Building Science 1
CON1004W  Construction Technology 1
CON1010S  Construction Information Systems
BUS1036F  Evidence-based Management
ECO1010F  Microeconomics
ECO1011S  Macroeconomics
MEC1002W  Engineering Drawing
STA1001F  Statistics 101
CON1007X  Practical Training

Bachelor of Science in Property Studies
This is also a three year degree. The programme exposes students to a broad knowledge base including finance, economics, property law, and appropriate communication and computer skills. In addition, students develop particular skills in property valuation and development. These include evaluating and structuring finance for property investments, assessing feasibility and risk in property developments, valuing property assets, managing property portfolios, designing and implementing facilities management programmes, and managing the procurement of buildings.

First year courses cover:
CON1011F & 1012S  Property Studies 1A and B
CON1015S  Property Information Systems
CON1017S  Property Investment Mathematics 1
CON1018W  Building Technology 1
BUS1036F  Evidence-based Management
ECO1010F  Microeconomics
ECO1011S  Macroeconomics
STA1001F & 1000S  Statistics
POSTGRADUATE AREAS OF SPECIALISATION

BSc (Honours) in Construction Management
This one-year postgraduate degree follows the undergraduate programme in Construction Studies and results in a professional qualification as a Construction Manager. Graduates will be qualified to identify, analyse and solve problems in the field of construction assembly and manage the construction process. The degree provides graduates with the necessary foundation to specialise further in project management, property management and housing at Masters level.

BSc (Honours) in Property Studies
This programme is intended for students who have completed a BSc in Property Studies and who wish to advance their knowledge and skills, and gain further insight by specialising in particular aspects of property valuation and management. The qualification provides the necessary foundation for specialisation at Masters level in various fields such as: property development and management; project management; housing development; and facilities management.

BSc (Honours) in Quantity Surveying
This one-year postgraduate degree follows the undergraduate programme in Construction Studies and results in a professional qualification as a Quantity Surveyor. Quantity Surveyors work closely with other professionals on construction projects, and are responsible for the financial and contractual management of projects.

CAREER OPPORTUNITIES
Graduates of the department play a vital role in the process of planning, designing, constructing and managing all types of residential, commercial and industrial developments.

Graduates have an excellent understanding of the principles of management, economics, construction technology, and environmental engineering. They are good communicators, have well-developed planning and problem-solving skills, are able to work positively in a team situation. Their unique skills assure them of excellent career prospects. Depending on their area of specialisation, they are in great demand by employers such as: large building and construction contractors; property valuers, developers and managers; financial institutions; and professional quantity surveying practices. In addition, they are well prepared to enter self-employment as consultants in a wide range of vocations in the construction and property
industries. Graduates are in high demand by local and overseas employers. The Construction Management and Quantity Surveying degrees are fully accredited by the South African Council for the Quantity Surveying Profession and the Royal Institution of Chartered Surveyors. In addition, the Construction Management degree is accredited by the Chartered Institute of Building.

The BSc Property Studies and the Honours degree in Property Studies are for those wishing to pursue professional qualifications in Property Valuation, Property Development, and Property Management. Graduates of both degrees will be ideally suited to vocations in property valuation, property broking, property development, and property management. Both degrees are accredited by the South African Council for the Valuation Profession and the Royal Institution of Chartered Surveyors.
Chemical Engineering

The Department of Chemical Engineering’s tradition of excellence is reflected in the fact that almost a third of South Africa’s chemical engineers graduate from UCT. As the custodian of the largest national research programme, the Department is arguably recognised as the leading academic department of its kind in Africa.

What does Chemical Engineering entail?
Almost everything you use in daily life — plastics, metals, textiles, paper, food and beverages, toiletries, cosmetics and pharmaceuticals — has been made with the help of a chemical engineer. Chemical engineers are instrumental in the process of converting raw (and sometimes recycled) materials into finished products. This process is complex and involves research and development, design, construction, daily plant operation and management.

Not only do chemical engineers design and operate cost-effective processes, they also ensure that these are accomplished in the most environmentally-friendly way.

Bachelor of Science (Eng) in Chemical Engineering
This is a four-year degree that prepares graduates for careers in the chemical, metallurgical, and process industries. There is a limited amount of specialisation in the areas of mineral processing, bioprocess engineering, catalytic processing, crystallization, process synthesis and environmental process engineering. The degree focuses on the development of technical expertise, problem-solving, teamwork and communication skills. UCT’s chemical engineering degree tends to be generalist in nature, as well as being practical.

First year courses cover:

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>CEM1000W</td>
<td>Chemistry</td>
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<tr>
<td>CEM1004W</td>
<td>Engineering 1 - Chemical Engineering</td>
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<tr>
<td>MAM1017F &amp; 1018S</td>
<td>Engineering Mathematics</td>
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<tr>
<td>MEC1002W</td>
<td>Engineering Drawing</td>
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<tr>
<td>PHY1012F &amp; 1013S</td>
<td>Engineering Physics</td>
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Chemical Engineering Conversion Programme for Science Graduates

A two- or three-year Conversion Programme can be undertaken by BSc graduates. Students accepted into the Conversion Programme are given credit and exemption for the Science subjects they have completed in their BSc degree. While most BSc graduates will be considered for the three-year Conversion Programme (where the workload is similar to the last three years of the regular Chemical Eng degree), some BSc graduates with an outstanding academic record may be accepted into a shorter Conversion Programme.

Access Programme for Technikon Diplomates

Students with outstanding academic records in the National Diploma in Chemical Engineering will be considered for admission to the BSc (Chemical Engineering) programme. If accepted, students will be given credit for some of the practical and elective courses which will enable a slightly reduced load in each of the four years. Students accepted for this programme also have the option of admission to second year by writing the first year course examinations.

CAREER OPPORTUNITIES

UCT chemical engineering graduates are highly sought after in the workplace, and occupy key positions in top companies. The degree is accredited both locally, by the Engineering Council of South Africa, and internationally.

Chemical engineers work in many different and exciting workplaces — not only in the expected settings of the petrochemical and mining industries, but also in a wide variety of other process-based industries such as food, beverage, paint and pharmaceutical industries. As UCT-trained chemical engineers have excellent general problem-solving skills, they also end up in fields such as banking, marketing and computing.
The Department of Electrical Engineering offers three four-year undergraduate programmes:

- Electrical Engineering (the mainstream programme)
- Electrical and Computer Engineering, and
- Mechatronics

Although all three programmes have slightly different first-year curricula — reflecting the overall direction of each — in some cases it is possible to change programmes at the beginning of the second year.

**What does Electrical Engineering entail?**

Electrical Engineering is that branch of the engineering profession responsible for the planning and design of systems using electricity either as a form of energy (so-called heavy-current or electrical engineering) or as a means of representing, storing and transmitting information (light-current or electronic engineering).

**UNDERGRADUATE DEGREE PROGRAMMES**

**Bachelor of Science (Eng) in Electrical Engineering**

The mainstream Electrical Engineering programme covers both light-current and heavy-current engineering. The first three years are quite general, and cover the fundamentals of the electrical engineering disciplines. In the fourth year, students may choose any three major courses from the eight that are currently offered. This means that each student can opt for the mix that he or she wants (including any desired mix of light-current and heavy-current courses). This gives the new graduate considerable flexibility in the employment market.

“**I chose to study Electrical Engineering as I have always had an interest in science and technology. I am interested in Electrical Computer Engineering because it is on the cutting edge of technology and the fastest growing field.**”

Lebogang Tsimane
Bachelor of Science (Eng) in Electrical and Computer Engineering

Electrical and Computer Engineering is an interdisciplinary branch of engineering that combines a fundamental study in electrical engineering with substantial parts of the three year computer science programme. This equips graduates with an excellent basis on which to build valuable engineering roles in modern industry.

The advent of small, powerful processor chips has meant that not only has there been a proliferation of desk top computers (PCs), but almost every home appliance, motor vehicle, aircraft and industrial machine has a small computer embedded into it. This has led to the term “Embedded Systems” to describe this field of engineering, in which there are plenty of opportunities for good engineers.
Bachelor of Science (Eng) in Mechatronics

Mechatronics is an interdisciplinary branch of engineering that combines fundamental studies in mechanical engineering, electronics, and control systems engineering. Mechatronics offers an excellent foundation for graduates who wish to straddle the disciplines of electrical and mechanical engineering. In industries such as motor manufacturing, there has been a huge increase in the amount of electronic control that is built into products (a modern motorcar, for example, has over forty microprocessors in its circuits), and we aim to produce an engineer who can design and integrate these complex systems.

First year courses cover:
- CAS1001S Culture, Identity and Globalisation in Africa
- MAM1017F & 1018S Engineering Mathematics
- MAM1042S Engineering Statics
- EEE1003W Computing for Electrical Engineers
- EEE1004W Engineering 1 – Electrical Engineering
- MEC1003F Engineering Drawing
- PHY1012F & 1013S Engineering Physics
- EEE1000X Practical Training

Electrical Engineering Conversion Programme for Science Graduates

A two- or three-year Conversion Programme can be undertaken by BSc graduates. Students accepted into the Conversion Programme are given credit and exemption for the Science subjects that they have completed in their BSc degree.

CAREER OPPORTUNITIES

The electronic and electrical industry is one of the fastest growing industries at present. Electrical and electronic engineers work in many organisations and firms. These include private consultation firms and development laboratories, large and small private companies involved with the design, development, production and marketing of electronic systems, subsystems, components of products as well as government and semi-government organisations.

Graduates of the Mechatronics programme can be found building underwater robots; designing artificial intelligence software to identify faulty machinery; designing new packaging systems for bottled beverages; and developing diagnostic systems for the next generation of cars.
The Mechanical Engineering Department has a dynamic staff led by professionals who are experienced academics and practitioners and some of the staff are recognised as world leaders in their research fields.

As a person studying Mechanical or Electro-Mechanical Engineering, you should be interested in how things work. The aim of the undergraduate programme is to educate and train professional engineers to enable them to think independently and to approach problems in a logical and confident manner.

What does Mechanical engineering entail?
The Mechanical Engineering degree provides students with a solid understanding and appreciation of the materials and forces of nature. The undergraduate programme is structured around the study of mathematics, physics, chemistry, materials, basic electrical engineering, the design process and management studies.

What does Electro-Mechanical Engineering entail?
In today’s world of computer control, industry welcomes our graduates, who understand the basics of both the mechanical and electrical engineering disciplines and can design, build, control, and maintain a wide range of engineering products and processes. Examples of some products are: motor-cars and aeroplanes where computers control the engines and ensure the engines are working efficiently; production machine tools such as lathes and milling machines that have been automated by means of computer control; artificial hearts, and many other products used in the world of medicine; robots that are used more and more in industry and medicine; even the humble washing machine is now computer controlled.

Electro-Mechanical Engineering entails the study of mathematics, physics, chemistry, materials, basic electrical engineering, basic mechanical engineering, and the integration of these in carefully structured design courses.

UNDERGRADUATE DEGREE PROGRAMMES
The two undergraduate BSc(Eng) degree programmes, Mechanical and Electro-Mechanical Engineering, have a common first and second year curriculum and students make their choice of which of the programmes to pursue prior to the beginning of their third year of study.
Bachelor of Science (Eng) in Mechanical Engineering

This programme concentrates on instruction in the areas of solid mechanics, dynamics and thermofluids, accompanied by experimental verification. Communication skills are addressed through expert instruction and application in reports of experimentation and design. Design is made central to the curriculum where team skills and, finally, individual skills are developed. Curriculum flexibility in the final year of study allows students the selection of courses that can provide an introduction to a career in Mechanical Engineering.

First year courses cover:
- CEM1008F  Chemistry for Engineers
- MAM1017F & 1018S  Engineering Mathematics
- MAM1042S  Engineering Statics
- MEC1002W  Engineering Drawing
- MEC1004W  Engineering 1 - Mechanical Engineering
- PHY1012F & 1013S  Engineering Physics
- MEC1000X  Practical Training

Bachelor of Science (Eng) in Electro-Mechanical Engineering

The programme aims to provide an educational approach where emphasis is placed on integrated studies and on the production of graduates who are generalists, rather than specialists. It aims to meet the increasing demand for engineers with cross-discipline skills, particularly in the fields of robotics, flexible manufacturing and electromechanical power systems. The programme comprises mainly courses selected from the Electrical Engineering and Mechanical Engineering curricula. These courses include: microprocessors, digital electronics, mechatronics design, electro-mechanical design, computer integrated manufacture and robotics, project management, maintenance management and reliability in systems, industrial engineering, industrial law and new venture planning.

Note: Courses in the first two years of the Electro-Mechanical programme are identical to those in Mechanical Engineering.
As a person studying Mechanical or Electro Mechanical engineering you should be interested in how things work and how you can make them work better. The aim of the undergraduate programme is to educate and train professional engineers to enable them to think independently and to approach problems in a logical and confident manner.

In order to gain practical experience we require students to spend a period of at least six weeks at the end of every year working in industry.

**CAREER OPPORTUNITIES**

Graduates find employment opportunities in a wide spectrum of exciting careers requiring the talents of mechanical engineers. These include design, development and manufacture of technologies, products and processes, including in the automotive, aircraft and space industries; marine engineering and naval architecture; air conditioning and refrigeration; food and packaging industry; bio-mechanical research and development; energy and power utilisation; robotics and computer-aided manufacturing and design; general manufacturing and production; and the environmental industry, to name a few. Many of our graduates have followed successful career paths and have become leaders in industry.
The Academic Support Programme for Engineering in Cape Town (ASPECT) is designed for students who obtained the National Senior Certificate endorsed for degree studies or a Senior Certificate with matriculation exemption from schools that have not prepared them adequately for tertiary study. The Programme provides a supportive environment that is sensitive to students’ academic, social and emotional needs. The curriculum is planned so that the degree should take five years to complete.

In the first year, students register for three full credit-bearing courses all counting towards the degree. These are Mathematics, Physics or Chemistry, and Engineering. These are the same courses as are taken by students registered for the four-year degree. The Mathematics course is taught by staff in ASPECT; the Physics lectures are conducted by ASPECT staff, while the laboratory sessions are offered by the Physics department. Chemistry is taught in the Chemistry department with an extra afternoon workshop run by an ASPECT staff member. Students also take an Introduction to Communication course, run by ASPECT staff.

Students who continue with engineering at UCT will complete, in their second year, the remaining first year courses, one major second year course, namely the Mathematics course for engineers, and up to two courses from the second year engineering curriculum. In the third year, students complete the remaining second year courses together with appropriate courses from the third year curriculum, while ASPECT continues to provide non-academic support and counselling. ASPECT staff will monitor and advise students while they complete the remaining degree requirements.
**FIRST YEAR COURSE OUTLINES**

**APG1003W TECHNOLOGY 1**
To introduce principles of construction; to begin the study of the materials, components and technologies involved in the construction process of South African architecture at small scale, particularly load-bearing and timber frame construction. Awareness of sustainable use of building materials, introduction to technical terminology and detail drawing conventions.

**APG1004F & 1005S HISTORY AND THEORY OF ARCHITECTURE**
The primary aim is to give a broad historical overview of architecture and urban history up to the end of the 19th century. The emphasis is on exploring historical models to gain a working understanding of the phenomena which support and influence the design and building of places. The course also introduces concepts and methods that are used in historical analysis and criticism. Part 2 of this course revisits the inquiry of HATA1 in the context of the South African city, engaging students in an enquire into local and international buildings. The critical skills and methods introduced in HATA1 are expanded upon.

**APG1016F GEOMATICS 1**
This course aims to provide a foundation in geomatics as a measurement science by introducing key concepts such as: Introduction to geomatics, measurement science, spatial reference systems, and basic calculations, survey measurement and techniques, representation of spatial data, areas and volumes, programming and software in geomatics, introduction to Geographical Information Systems, Remote Sensing and Photogrammetry.

**APG1020W DESIGN AND THEORY STUDIO 1**
As a basic course for architecture, urban design, and landscape architecture, its focus is on initiating the development of transferable design ability through the medium of architecture. Its primary objective is to introduce students to essential concepts, three dimensional spatialisation and habitation as well as developing skills and techniques. Particular emphasis is paid to the development of productive working methods in design. The format of the course consists of short experimental exercises, longer projects and tests.
**APG1021W  REPRESENTATION 1**
The course aims to develop visual literacy, and is divided equally between freehand and geometric drawing. While the aim is to introduce techniques and disciplines, once understood these are intended to enhance creativity rather than conformity.

**BUS1036F  EVIDENCE-BASED MANAGEMENT**
This course is intended to furnish students with the main intellectual skills required in the study and practice of business at all levels. The focus is on the development of critical reasoning skills, including the ability to analyse and construct logical arguments, to research problems, to articulate competing viewpoints and to form independent judgements about contentious issues of policy and practice. The approach of the course is centred on case studies and controversies in areas of especial relevance to an understanding of commercial activity and the social and political environment in which it occurs.

**CAS1001S  AFRICA: CULTURE, IDENTITY AND GLOBALISATION**
The course is divided into three modules. The first, entitled Histories and Sites of Struggle provides a foundation for the course as a whole by giving some timeless and historical context which frame some notions of post-apartheid society; the second focuses on Identity in a Colonial and Postcolonial, Apartheid and Post-Apartheid Context; and the last block investigates Conceptions of Development.

**CEM1000W  CHEMISTRY**
Microscopic and macroscopic concepts, atomic structure, chemical bonding and molecular structure, chemistry of the elements and inorganic chemistry, chemical equilibrium, acids and bases, solubility products, chemical analysis, phases of matter, thermodynamics and thermochemistry, colligative properties, oxidation and reduction, electrochemistry, chemical kinetics and radiochemistry. Introduction to structure and reactivity in organic chemistry and the language of organic chemistry; describing and predicting organic reactivity; introduction to the structure, properties and reactivity of biologically important molecules.

**CEM1008F  CHEMISTRY FOR ENGINEERS**
Basic chemical concepts, stoichiometry, some systematic inorganic chemistry, particularly metal oxides. Atomic structure and chemical bonding, with the emphasis on the structure of solids. Chemical equilibrium and aqueous solution chemistry, acids and bases. Thermochemistry. Basic electrochemistry and corrosion of metals, polymers.
**CHE1004W  ENGINEERING 1 – CHEMICAL ENGINEERING**

This course consists of three modules:

**Using computers:** Basic skills, spreadsheets and word processing.

**Introduction to Chemical Engineering:** Orientation to university study and the chemical engineering profession. Introduction to the chemical process industry. Basic chemical engineering calculations including unit conversion and simple mass and energy balances.

**Modelling and Computing:** Modelling of the real world, numerical solution of models, exploration of system characteristics using computer techniques, programming.

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**CIV1004W  ENGINEERING 1 – CIVIL ENGINEERING**

The course provides opportunities for the development of the essential skills required in engineering within a civil engineering context. Aspects of civil engineering is introduced by means of practical sessions involving problem solving, personal academic and professional and simulation techniques, numerical and computational methods, laboratory experiments and project work, group work, fieldwork, the use of measurement techniques, and elementary aspects of planning. The course includes a module which will address the development of academics skills needed for studying in a university environment, and a module to ensure productive use of IT.

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**CIV1006S  BUILDING SCIENCE 1**

The course introduces students to the nature and properties of construction materials and how these affect their uses. It illustrates problems that might arise through injudicious choice of materials and the reasons behind the selection of materials for particular applications. It deals with soils, cement and concrete, stone, timber, metals (iron and steel, aluminium, copper, brass, bronze, zinc), corrosion, ceramics, glass, polymers, paints and bitumen, composites, and thermal, acoustic and fire properties of building components.

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**CON1004W  CONSTRUCTION TECHNOLOGY 1**

Construction Technology appropriate for assembly of a double-storey house, including: manufacture and performance of materials and components used; construction of such a dwelling; selection of materials and components used; construction details; typical plans, sections and elevations; and requirements of good practice and laws and bye-laws.
CON1007X  PRACTICAL TRAINING
Four weeks of approved employment experience. This requires that you be employed in any of the built environment disciplines (construction; engineering; housing; property development and management; quantity surveying; relevant local authority, provincial and national government departments).

CON1010S  CONSTRUCTION INFORMATION SYSTEMS
Introduction to computers; introduction to networks; data storage, manipulation/analysis and reporting using spreadsheets (MS Excel) and relational databases (MS Access); problem-solving with spreadsheets and databases.

CON1011F  PROPERTY STUDIES 1A
Property Development: A study of the principles of property development including the relevant status and ordinances; Urban development; Control of land in South Africa; Town Planning; Overview of property development; The establishment of townships; Types of dwelling units and housing types; Principles of medium and high density residential developments; Sectional title and group housing; Development of retirement centres; Introduction to commercial property development; Development of: Office buildings, parking garages, shopping centres, industrial parks; Rehabilitation and conversion of buildings.

CON1012S  PROPERTY STUDIES 1B
Welfare and economic efficiency: economic efficiency through the price system. Real property: characteristics and functions of the real property market; pricing of land and resources. Development: the development process; timing and rate of development; finance for development; redevelopment; public sector development; economics of planning controls; the construction industry. Urban land use: land use and land values; pattern of urban land use; growth of urban areas; quality of urban environment; housing; regional policy. The government and land resources: impact of government economic policy on land resources; theory of urban public finance; taxation and land resources; recent developments.

CON1015S  PROPERTY INFORMATION SYSTEMS
Introduction to computers; introduction to networks; data storage, manipulation/analysis and reporting using spreadsheets (MS Excel) and relational databases (MS Access); problem-solving with spreadsheets and databases.
CON1017S    PROPERTY INVESTMENT MATHEMATICS 1
Simple interest, equivalence, compound interest, present value, annuities, general annuities, sinking funds, amortization.

CON1018W    BUILDING TECHNOLOGY 1
An appreciation of the construction industry; its size and role in the economy. An overview of the construction industry’s structure; its participants and their roles and responsibilities. An understanding of the construction assembly process associated with simple buildings, together with an appreciation of the relationship between design, technology and assembly. Basic architectural drawing directed to the understanding and transmission of graphic information. Introduction to site surveying including measurement, levelling, etc.

CSC1015F    COMPUTER SCIENCE 1A
Introduction to computing and applications. Problem solving and algorithm development and object-oriented programming in Java. Fundamental programming constructs and abstractions.

CSC1016S    COMPUTER SCIENCE 1B
Advanced programming constructs and techniques in the object-oriented paradigm. Linear abstract data structures, including Lists, Stacks and Queues. Binary trees and their applications. Applets, event-driven programming, graphics and graphical user interfaces. Number representation, Boolean algebra and logic gates. Ethics and professional issues in computing.

ECO1010F    MICROECONOMICS
The course focuses on demand and supply analysis; consumer behaviour; production functions and production costs; market forms and income distribution.

ECO1011S    MACROECONOMICS
The course covers the following areas: circular flow model; national income accounting; aggregate demand and supply; money; interest rates and exchange rates; inflation, monetary, fiscal and balance of payments policy.

EEE1000X    PRACTICAL TRAINING
Students must complete at least six weeks of practical training in an approved workshop before registration for the following year. Alternatively students may complete an approved structured intensive practical training course of at least three weeks duration.
EEE1003W  COMPUTING FOR ELECTRICAL ENGINEERS

The course begins by discussing computer programming from its basic binary instructions to high level programming. Different computer applications (databases, spreadsheets, compilers) are discussed, and also different programming: structured, procedural and object-orientated. Python is introduced with examples of graphical programming and simple algorithms. Sorting and searching algorithms are introduced. Practical laboratories are used to enable students to write programmes that deal with real devices.

EEE1004W  ENGINEERING 1 – ELECTRICAL ENGINEERING

Module A: Introduction to studying engineering at UCT.
Course structure, credits vs study hours, study habits, resources.

Module B: Laboratory.

Module C: Electrical phenomena from an engineering viewpoint.

Module D: Practical elementary electronics.
A range of signal-processing modules with practical applications. This provides the basic descriptive and theoretical input required for the performance of Modules B and E.

Module E: Approach to Engineering Design.
Lectures on some basic aspects of design; the generate-and-test cycle, worst-case design; elementary statistical aspects of design, design tasks involving the application of the foregoing principles to the design of simple electrical and electronic circuits and systems. There will be some exposure to the use of Matlab programming language to design problems.

END 1004W  ENGINEERING 1

Aspect students take the Engineering 1 courses related to their specific disciplines. For information refer to CEM1004W, CIV1004W, EEE1004W and MEC1004W.
**END0007F  FOUNDATION OF ENGINEERING MATHEMATICS**
Differential and integral calculus of functions of one variable with applications to optimisation, rates of change, areas, volumes, Taylor series, an introduction to differential equations, complex numbers, vector geometry and matrix algebra.

**END1017F/S  MATHEMATICS 1017**
Functions and models; limits and derivatives; rules of differentiation; applications of differentiation —maxima, minima, related rates, optimization and curve sketching; integration and applications of integration.

**END1018S  MATHEMATICS 1018**
Integration and applications of integration; an introduction to differential equations; complex numbers; matrices; vectors and the geometry of space.

**END1008Z  INTRODUCTION TO COMMUNICATION**
The course develops content-specific academic literacy skills for engineering students. It concentrates on academic reading, academic writing, listening skills, research skills and oral communication skills. Students are thus prepared for communication in engineering courses, as well as for the demands of the engineering profession. A project rounds off the activities of the year.

**GEO1006S  INTRODUCTION TO MINERALS, ROCKS AND STRUCTURES**
Crystals and minerals; igneous and metamorphic rocks; structured geology; mineral deposits and economic geology; planetology. Students are required to attend a one day excursion in the Cape Peninsula and a four day excursion through the South Western Cape during the September vacation.

**GEO1009F  INTRODUCTION TO EARTH AND ENVIRONMENTAL SCIENCE**
Structures and dynamics of the Earth; stratigraphy and geological history; climatology; surface processes and evolution of landscapes; biography; humans and the environment.

**MAM1017F  ENGINEERING MATHEMATICS A**
involving functions of a single variable. L’Hospital’s rules, indeterminate forms and the 
squeeze theorem. Antidifferentiation. Permutations and combinations, finite series and 
the binomial theorem. The definite integral and the fundamental theorem of calculus. The 
substitution rule.

Differential and integral calculus of functions of one variable, differential equations, partial 
derivatives, vector geometry, matrix algebra, complex numbers, Taylor series.

**MAM1018S ENGINEERING MATHEMATICS B**

Further calculus of a single variable. Radian measure, the trigonometric and inverse 
trigonometric functions. Integration by parts. Partial fractions. Areas, volumes and arc length. 
An introduction to modeling and differential equations. Vector algebra and geometry. Points, 
Inverses. An introduction to complex numbers. The complex plane. Moduli and arguments, 

**MAM1042S ENGINEERING STATICS**

The course covers topics from: review of vectors, position, displacement and force vectors, 
line of action and transmissibility, addition of force at a point, normal reaction and friction, 
equilibrium for a particle, limiting equilibrium, free body diagrams. Parallel and non-parallel 
coplanar forces, moment of a force, couples, principle of moments, addition of a force and a 
couple, equilibrium for a rigid body, toppling and sliding, two-force and three-force systems, 
vehicles in contact, jointed rods. Distributed forces, centre of mass of many particles, review 
of integration, centre of mass of extended bodies, composite bodies, pressure distributions, 
moments of inertia for areas and masses, parallel axis theorem.

**MEC1000X PRACTICAL TRAINING**

Students must complete at least six weeks of practical training in an approved workshop 
before registration for the following year. Alternatively students may complete an approved 
structured intensive practical training course of at least three weeks duration.

**MEC1002W ENGINEERING DRAWING**

Use of drawing instruments, plane geometry; principles of: orthographic projection; pictorial 
projection; auxiliary projection; sections; intersection of solids; development; engineering
drawing conventions; dimensioning; the measurement of areas; graphical integration; contours with cuttings and embankments; descriptive geometry of points, lines and planes in space; an introduction to the basics of CAD.

MEC1003F  ENGINEERING DRAWING
Use of drawing instruments, plane geometry; principles of: orthographic projection; pictorial projection; auxiliary projection; sections; the measurement of areas; graphical integration; descriptive geometry of points, lines and planes in space; an introduction to the basics of CAD.

MEC1004W  ENGINEERING 1 - MECHANICAL ENGINEERING
This course has been designed to expose students to the real engineering world by way of hands-on project work. It will focus on the understanding of physical principles on which engineering is based, as well as the development of the essential skills required. This course will include a module which specifically addresses the development of academic success skills, the role of the engineer in society, the engineering curriculum, learning in a tertiary environment, and building a career in engineering.

PHY1012F/S  ENGINEERING PHYSICS A
Vectors, kinematics, dynamics, work, energy power, conservative and non-conservative forces, friction, impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, static equilibrium, elasticity, elastic moduli, simple harmonic motion, electric charge, electric field, Gauss‘law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, the magnetic field, Biot-Savart Law, Ampere‘s Law, electromagnetic induction, inductance.

PHY1013F/S  ENGINEERING PHYSICS B
Vectors, kinematics, dynamics, work, energy power, conservative and non-conservative forces, friction, impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, static equilibrium, elasticity, elastic moduli, simple harmonic motion, electric charge, electric field, Gauss‘law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, the magnetic field, Biot-Savart Law, Ampere’s Law, electromagnetic induction, inductance.
**STA1000F/S  STATISTICS 1000**

**STA1001F/S  STATISTICS 1001**
CONTACT DETAILS

Engineering & the Built Environment Faculty Office
Tel: 021 650 2699
Fax: 021 650 3782
Email: ebe-faculty@uct.ac.za

Admissions Office
Tel: 021 650 2128
Fax: 021 650 5189
Email: admissions@uct.ac.za

Student Housing
Tel: 021 650 1045 /1040
Fax: 021 650 4014 /3010
Email: res@uct.ac.za

Fees Office
Tel: 021 650 1704
Fax: 021 650 4768
Email: Fnd-Fees@uct.ac.za

Student Financial Aid Office
Tel: 021 650 2125
Fax: 021 650 5043
Email: sfa-finaid@uct.ac.za

NB For dialling from outside of South Africa, please use your international code for South Africa followed by 27 21 followed by the 7-digit local number

Postal Address:
Faculty of Engineering & the Built Environment,
University of Cape Town, Private Bag X3, Rondebosch, 7701 South Africa

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