2020

Faculty of Engineering

Academic Programmes and Faculty Information

CALENDAR PART 11

UNIVERSITEIT iYUNIVESITHI STELLENBOSCH UNIVERSITY

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Accuracy, liability and changes

- Stellenbosch University has taken reasonable care to ensure that the information provided in the Calendar parts is as accurate and complete as possible.
- Take note, however, that the University's Council and Senate accept no liability for any incorrect information in the Calendar parts.
- The University reserves the right to change the Calendar parts at any time when necessary.

The division of the Calendar

- The Calendar is divided into 13 parts.
- Part 1, 2 and 3 of the Calendar contain general information applicable to all students. Make sure that you understand all provisions in Part 1 (General) of the Calendar that are applicable to you.
- Part 4 to 13 of the Calendar are the Faculty Calendar parts.

Part	Calendar
Part 1	General
Part 2	Bursaries and Loans
Part 3	Student Fees
Part 4	Arts and Social Sciences
Part 5	Science
Part 6	Education
Part 7	AgriSciences
Part 8	Law
Part 9	Theology
Part 10	Economic and Management Sciences
Part 11	Engineering
Part 12	Medicine and Health Sciences
Part 13	Military Science

Availability of the Calendar parts

- The printed versions of the Calendar parts are available at the University's Information Desk in the Admin A Building.
- The electronic versions of the Calendar parts are available at www.sun.ac.za/Calendar.
- There are English and Afrikaans (Part 1 to 12) copies available.

Table of contents

How to use this Calendar part

This section gives you guidelines for finding particular information in the different chapters in this Calendar part. Consult the table of contents for the page numbers of the chapters referred to below.

Where to find information

Prospective undergraduate students

- The General Information chapter contains information about:
  - Communication with the Faculty and the University, which includes an explanation of the concept “student number” as well as relevant contact details where you can refer important enquiries to;
  - Language at the University;
  - The degree programmes that you can enrol for and the qualifications that you can obtain as well as important provisions relating to assessment;
  - Other rules that apply to all students; and
  - Awards and prizes available to engineering students.
- The Undergraduate Programmes chapter contains information about:
  - The minimum admission and selection requirements for the various study programmes;
  - Admission based on the recognition of prior learning;
  - The Faculty’s undergraduate study programmes; and
  - The modules that must be taken per academic year for the different study programmes, with choices where applicable.
- The Undergraduate Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules;
  - An explanation of the different digits used for the numbering of modules in the Undergraduate Programmes chapter; and
  - Definitions of prerequisite pass, prerequisite and corequisite modules.
- An alphabetical list of undergraduate subjects and modules is available in the back of this Calendar part.

Prospective postgraduate students

- The General Information chapter contains information about:
  - Communication with the Faculty and the University, which includes an explanation of the concept “student number” as well as relevant contact details where you can refer important enquiries to;
  - Other rules that apply to all students in the Faculty; and
  - Awards and prizes available to engineering students.

- The Postgraduate Programmes chapter contains information about:
  - The Faculty's postgraduate study programmes;
  - The minimum admission requirements for the various study programmes;
  - Specific closing dates for applications, and other relevant information, for example selection for admission; and
  - The composition of programmes and examination requirements.

Registered undergraduate students

- The General Information chapter contains information about:
  - Communication with the Faculty and the University with relevant contact details where you can refer important enquiries to;
  - Language at the University;
  - Other rules that apply to all students in the Faculty; and
  - Awards and prizes available to engineering students.
- The Undergraduate Programmes chapter contains information about:
  - The Faculty's policy on the granting of dean's concession examinations to final-year students;
  - The Faculty's undergraduate study programmes;
  - The modules that must be taken per academic year for the different study programmes, with choices where applicable; and
  - Renewing your registration as undergraduate student every year.
- The Undergraduate Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules;
  - An explanation of the different digits used for the numbering of modules in the Undergraduate Programmes chapter;
  - The abbreviations and definitions used for the teaching loads of individual modules;
  - An indication at each module of what its teaching load is;
  - Definitions of prerequisite pass, prerequisite and corequisite modules, as well as an indication at each module which of the requisites apply to it, if any;
  - How individual modules are assessed, especially where a module is subject to flexible assessment; and
  - An explanation of how final marks are determined
- An alphabetical list of undergraduate subjects and modules is available in the back of this Calendar part.

Registered postgraduate students

- The General Information chapter contains information about:
  - Rules that apply to all students; and
  - Awards and prizes for engineering students.

- The Postgraduate Programmes chapter contains information about:
  - The Faculty's postgraduate study programmes;
  - Provisions relating to maximum periods of enrolment and the interruption of master's or doctoral studies; and
  - The composition of programmes and examination requirements.

1 General Information

1.1 How to communicate with the Faculty and the University

1.1.1 Using your student number

- The University allocates a student number to you when you apply to study at the University.
- The student number is your unique identification to simplify future communication with the University.
- Use your student number every time you communicate with the Faculty and the University.

1.1.2 The Faculty's contact details

Direct communication with the Faculty to one of the following persons:

Dean	
Prof JL (Wikus) van Niekerk:	engdean@sun.ac.za
Tel:	+27 (0)21 808 4204
For appointments contact Marilie Oberholzer:	marilie@sun.ac.za
Tel:	+27 (0)21 808 9320
Vice-dean (Research)	
Prof P (Petrie) Meyer:	pmeyer@sun.ac.za
Tel:	+27 (0)21 808 4458
For appointments contact Diana Kruger:	dkruger@sun.ac.za
Tel:	+27 (0)21 808 4936
Vice-dean (Teaching)	
Prof AH (Anton) Basson:	ahb@sun.ac.za
Tel:	+27 (0)21 808 4250
For appointments contact Portia Adonis:	portiaadonis@sun.ac.za
Tel:	+27 (0)21 808 4203
Departmental Chairperson Civil Engineering	
Prof J (Jan) Wium:	civilhod@sun.ac.za
Tel:	+27 (0)21 808 4348
For appointments contact Alet de Waal-Louw:	adwl@sun.ac.za
Tel:	+27 (0)21 808 4440
For postgraduate enquiries:	amandadw @sun.ac.za

Departmental Chairperson Electrical and Electronic Engineering	
Prof H (Herman) Engelbrecht:	ee@sun.ac.za
Tel:	+27 (0)21 808 2139
For appointments contact Diana Kruger:	dkruger@sun.ac.za
Tel:	+27 (0)21 808 4936
For postgraduate enquiries:	eepostgrad@sun.ac.za
Departmental Chairperson Industrial Engineering	
Prof CSL (Corne) Schutte:	industrial@sun.ac.za
Tel:	+27 (0)21 808 3617
For appointments contact Karina Smith:	ksmith@sun.ac.za
Tel:	+27 (0)21 808 4234
For postgraduate enquiries:	iepostgrad@sun.ac.za
Departmental Chairperson Mechanical and Mechatronic Engineering	
Prof K (Kristiaan) Schreve:	mmchair@sun.ac.za
Tel:	+27 (0)21 808 4091
For appointments contact Gillian Cortereal:	gillianc@sun.ac.za
Tel:	+27 (0)21 808 4374
For postgraduate enquiries:	meganies@sun.ac.za
Departmental Chairperson Process Engineering (Chemical Engineering)	
Prof AJ (André) Burger:	chemengchair@sun.ac.za
Tel:	+27 (0)21 808 4494
For appointments contact Francis Layman:	flayman@sun.ac.za
Tel:	+27 (0)21 808 4062
For general enquiries:	chemeng@sun.ac.za
For postgraduate enquiries:	postgradchem@sun.ac.za
Faculty Officer (student support)	
Ms A (Avril) Ford:	aford@sun.ac.za
Tel:	+27 (0)21 808 3614
Faculty Administrator (enquiries relating to academic matters at the Registrar's division)	
Ms N (Nicole) Hartzenburg:	nicolepa@sun.ac.za
Tel:	+27 (0)21 808 4835
Fax:	+27 (0)21 808 3822
Faculty Manager	
Mr E (Enzo) D'Aguanno:	vsd@sun.ac.za
Tel:	+27 (0)21 808 4986
Please visit the Faculty's website at **www.eng.sun.ac.za**, where the websites for each of the five departments are indicated.	

1.1.3 The University's contact details

Telephone: (021) 808 9111

Fax: (021) 808 3822

E-mail: info@sun.ac.za

University website: www.sun.ac.za

Written correspondence should be sent to the following postal addresses:

- In relation to academic matters, i.e. study-related matters, bursaries and loans, etc., as well as residency placements:

  The Registrar
  Stellenbosch University
  Private Bag X1
  MATIELAND
  7602

- In relation to finance and service-related matters, including services at residences:

  The Chief Operating Officer
  Stellenbosch University
  Private Bag X1
  MATIELAND
  7602

1.2 Language at the University

Stellenbosch University (SU) is committed to engagement with knowledge in a diverse society and through the Language Policy aims to increase equitable access to SU for all students and staff. Multilingualism is promoted as an important differentiating characteristic of SU. Afrikaans, English and isiXhosa are used in academic, administrative, professional and social contexts. Pedagogically sound teaching and learning are facilitated by means of Afrikaans and English.

More information concerning language at SU is available on the website www.sun.ac.za/language.

1.3 The engineering profession

1.3.1 Definition of engineering

The Engineering Council of South Africa (ECSA) describes engineering as the application of science, engineering science and technology to solve problems that are important economically and that are essential to the progress of society. The solutions must take into account the needs of society, sustainability and the protection of the physical environment. Engineering work requires management and communication, and must be conducted ethically and within the bounds of applicable legislation.

Engineering therefore involves activities, or contributions to activities, that serve economic, social or human needs. It includes:

- Designing and improving materials, components, systems or processes;
- Planning the capacity and location of infrastructure;
- Investigating, advising and reporting on engineering problems;
- Managing or operating plants and processes;
- Managing implementation or construction projects;
- Implementing designs or solutions;
- Research, development and commercialisation of products, and
- Education, training and development of engineering personnel.

1.3.2 The role of the professional engineer

Engineering is also a "profession" and, according to the rules of conduct for professional engineers registered with ECSA, registered persons should do the following in the execution of their engineering work:

- Apply their knowledge and skill in the interests of the public and the environment;
- Execute their work with integrity and in accordance with generally accepted norms of professional conduct;
- Respect the interests of the public and honour the standing of the profession;
- Strive to improve their professional skills and those of their subordinates;
- Encourage excellence within the engineering profession; and
- Not prejudice public health and safety.

Professional engineers are the senior partners in the engineering team, which consists of artisans or craftsmen (trained by means of an apprenticeship), technicians or technologists (trained at a university of technology) and professional engineers (trained at a university).

ECSA is vested with statutory powers in South Africa to lay down standards for education, and to register qualified persons as professional engineers. ECSA requires that engineering training prepares the graduates to solve "complex engineering problems", while technologists are trained to solve "broadly defined engineering problems" and technicians are trained to solve "well-defined engineering problems". The characteristics of complex engineering problems include:

- Their solution requires in-depth fundamental and specialised engineering knowledge.
- They can be ill-posed, under- or over-specified, or require identification and refinement.
- They can be on a high-level and involve unfamiliar or infrequently involved issues.
- Their solutions are not obvious and require originality or analysis based on fundamentals.
- Their solutions involve wide-ranging or conflicting issues including technical and interested or affected parties.

1.3.3 Registration as professional engineer

1.3.3.1 What it means to register as professional engineer

By law, only persons registered as professional engineers with ECSA may use the title “PrEng”. Registering as PrEng gives you a form of recognition that instils a sense of confidence in the mind of the public and clients, since they can be assured that your competence has been assessed by other professionals and that you are bound by a professional code of conduct. Registration as PrEng is a prerequisite for appointment to certain engineering positions and for doing certain engineering work.

1.3.3.2 Requirements for registration

To register as a professional engineer you must normally meet two requirements:

- You must hold a BEng or BScEng degree that has been accredited by ECSA for this purpose; and
- You must have completed a period of in-service training that satisfies ECSA’s requirements in terms of standard and duration (at least three years).

1.3.3.3 Accreditation of programmes by ECSA

ECSA has accredited all the BEng degrees of Stellenbosch University until 2018, when the Council will conduct its next regular accreditation visit.

1.3.3.4 International recognition of programmes

ECSA is a signatory of the Washington Accord and therefore the degrees accredited by ECSA for training professional engineers are recognised internationally by other signatories to the Accord. The training of BEng graduates from Stellenbosch University is therefore recognised for registration as professional engineer (or equivalent) in countries such as the United Kingdom, Ireland, Canada, the USA, Australia and Hong Kong.

1.4 The Faculty

This section gives a short overview of the Faculty as a whole, of the buildings housing the Faculty and of the Faculty’s main organisational units. The departments of the Faculty are not included in this section since they are discussed in Section 1.5.

1.4.1 History

Established in 1944, the Faculty of Engineering was the first Afrikaans engineering faculty in South Africa, and it produced its first graduates in 1945.

Originally there were only three departments of engineering, namely Civil, Mechanical and Electrotechnical Engineering, and the Department of Applied Mathematics. The Departments of Chemical and Metallurgical Engineering and Industrial Engineering were added later, and in 1994 the Departments of Chemical and Metallurgical Engineering were amalgamated into one department, the Department of Chemical Engineering. At present there are five departments in the Faculty, namely Civil Engineering, Electrical and Electronic Engineering, Industrial Engineering, Mechanical and Mechatronic Engineering, and Process Engineering.

1.4.2 Engineering building complex

The current building complex in Banghoek Road, Stellenbosch, was completed in the seventies and since then it has been expanded from time to time; for example, when the Knowledge Centre was added in 2012. The figure below shows an aerial photograph of the current complex.

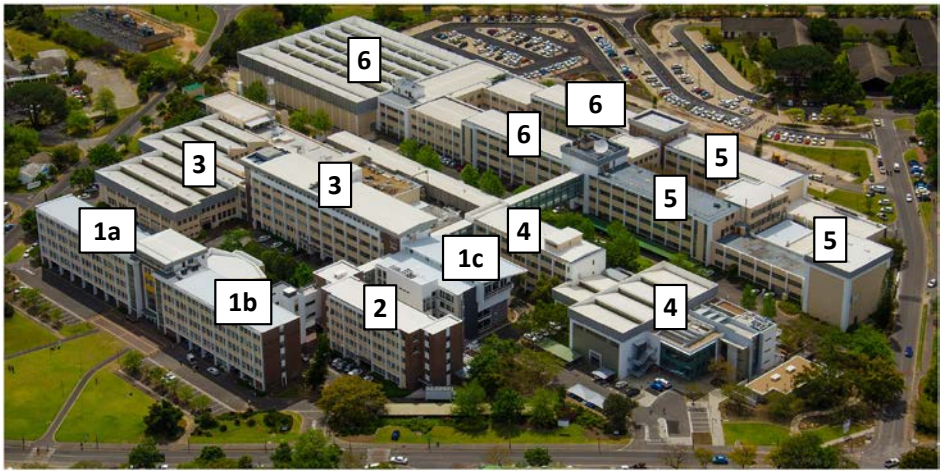

Figure 1.1: The building complex of the Faculty of Engineering (the numbers are used in the descriptions below).

The buildings in Figure 1.1, and the units housed by each, are:

1a,b: General (Main) Engineering Building

- Various lecture halls and tutorial rooms
- Dean's Division of the Faculty of Engineering
- Applied Mathematics and Computer Science Divisions of the Department of Mathematical Sciences, Science Faculty
- Engineering Study Centre (open-plan study area and eight group work rooms)
- Cafeteria

1c: Engineering Knowledge Centre

- Two large lecture halls
- The Engineering and Forestry Library, a branch of the main University library
- Two research units

2: Industrial Engineering Building

- Industrial Engineering's computer-based classrooms
- Department of Industrial Engineering

3: Mechanical and Mechatronic Engineering Building

- Faculty of Engineering Computer User Area (FIRGA) and computer-based classrooms (under construction in 2019)

- Department of Mechanical and Mechatronic Engineering and its laboratories
- Department of Industrial Engineering laboratories
- Schools Centre (under construction in 2019)

4: Process Engineering Building (Chemical Engineering)
- Various lecture halls and tutorial rooms
- Department of Process Engineering and its laboratories

5: Electrical and Electronic Engineering Building
- Various lecture halls and tutorial rooms
- Department Electrical and Electronic Engineering and its laboratories

6: Civil Engineering Building
- Various lecture halls and tutorial rooms
- Department Civil Engineering and its laboratories
- Faculty of Engineering Computer User Area (FIRGA) and computer-based classrooms (until 2019)
- Schools Centre (until 2019)

1.4.3 Faculty of Engineering Computer User Area (FIRGA)

FIRGA is currently on the second and third floors of the Civil Engineering Building, and consists of a general users' area with 131 desktop computers, as well as three electronic classrooms respectively with 150, 83 and 72 desktop computers. These facilities will be replaced by the new and expanded facilities under construction in the Mechanical and Mechatronic Engineering Building. The new facility has a computer users' area with 300 desktop computers and three new electronic classrooms with 113, 116 and 245 desktop computers respectively. All the desktop computers provide access to the Internet and sophisticated software.

FIRGA supports the academic activities of all engineering students. It offers facilities for field-specific tasks like numerical and digital modelling and computer-aided engineering, as well as for more general activities such as access to SUNLearn (the University's platform that provides Internet access to academic information), e-mail, and creating and storing documents like assignments and theses.

1.4.4 Schools Centre

The Schools Centre is situated on the second floor of the Civil Engineering Building and offers outreach programmes to stimulate interest in science, mathematics and technology, and also to promote skills development. TRAC currently uses the Schools Centre. TRAC is a national programme, focussing on physical science and applied mathematics, that motivates learners from secondary schools to study in SET directions at a tertiary level ("SET" is the acronym for "science, engineering and technology"). The programme uses computer technology to reinforce scientific concepts. Learners and their teachers daily visit TRAC's several fixed computer laboratories, while TRAC facilitators also visit schools using mobile facilities. The TRAC headquarters are in the Civil Engineering Building. Further details can be found at www.trac.sun.ac.za.

1.5 Departments and engineering disciplines

This section describes the different engineering disciplines under the department in which they are offered.

1.5.1 Department of Civil Engineering

The degree programmes in civil engineering are hosted by this department.

What civil engineering entails

Civil engineers are responsible for large, permanent works such as irrigation systems, bridges, dams, harbours, canals, airports, roads and streets, pipelines, sewerage systems, railways, structures of various kinds and structure foundations, storm water systems, tunnels, towers, water supply systems, and various kinds of heavy construction work. Through their work they re-create, improve and conserve the environment, and provide the facilities required for efficient community life.

Knowledge and skills you can gain from this programme

During the first two years of study, a sound foundation is laid in mathematics, chemistry and the engineering sciences. The third and fourth years of the programme progress into specialist areas such as water engineering, structural engineering, transportation engineering and geotechnical engineering. Subjects such as Environmental Engineering and Engineering Management give you a wide frame of reference. In engineering informatics for civil engineers, you develop the ability to use the computer as a powerful aid in solving civil engineering problems.

Career opportunities for civil engineers

Civil engineers are responsible for the development, planning, design, construction, maintenance and/or operation of large-scale projects. There are various career opportunities in the public and private sectors, from local authorities to government departments, and from consulting firms to construction firms. Several South African civil engineering firms are active internationally, and some are part of large global companies.

Departmental laboratories

The Department has irrigation, geotechnical, transport, water, concrete, heat transfer, solar energy, strength of materials and structures laboratories, as well as departmental computer facilities.

1.5.2 Department of Electrical and Electronic Engineering

The degree programmes in electrical engineering and electronic engineering are hosted by this department.

What electrical engineering and electronic engineering entail

Electrical engineers are responsible for the generation, transmission and conversion of electrical energy (including renewable energy sources) in industrial settings, such as electricity supply, factories, chemical plants, mines, municipalities, railways, and harbours.

Electronic engineers specialise in:

- the control of electrical and mechanical robotic systems, particularly embedded controllers;
- the collection, processing and dissemination of information by computer and communication networks, such as cell phone networks, Wi-Fi and mobile data networks; and
- the design of computers and large software systems.

Knowledge and skills you can gain from this programme

The first part of the programme lays a foundation of mathematics, natural sciences and engineering sciences that is relevant for all electrical and electronic engineers, particularly the techniques required to model systems analytically and design systems systematically. From the second semester of the third year, you can choose to specialise in one of the following elective areas: robotics, electrical energy, telecommunication or informatics.

Career opportunities for electrical and electronic engineers

Electrical and electronic engineers are responsible for the development, manufacturing and/or operation of various products or systems. There are numerous employment opportunities in the public and private sector, from local authorities to information technology companies, and from large multinational companies to small specialist companies. This technical area offers many opportunities for entrepreneurs to create new high-technology small businesses.

Departmental laboratories

The Department has laboratories for antennas, control systems, radio and microwave technique, micro-electronics, electronics, electrical circuits, electrical machines, high voltage technique, computer systems, satellite systems and numerical signal processing.

1.5.3 Department of Industrial Engineering

The degree programmes in industrial engineering and engineering management are hosted by this department. Please note that engineering management is only offered at postgraduate level.

What industrial engineering and engineering management entail

Industrial engineering's main branches are manufacturing technology and operational systems design. Industrial engineering involves facets of industry that are important in the modern industrial and service environments, such as quality assurance, robotics, engineering economics, operations research, industrial ergonomics and information technology.

Engineering management is a specialist area in industrial engineering in which engineering principles are applied to business practices to manage technology or technical processes in enterprises. The contribution of technology in realising the company's strategy is also emphasised.

Knowledge and skills you can gain from these programmes

The **industrial engineering** programme is an interdisciplinary programme in which training in several applied sciences, for instance mechanical, mechatronic, electrical and electronic engineering, together with economic management, natural sciences, information technology and operational research, are combined as a unit for the design and operation of various operational

systems. This programme also particularly trains you to use computers in decision-making for enterprise management.

Engineering management requires multi-disciplinary coordination of inputs and contributions from several engineering disciplines, as well as other specialist areas such as project management, risk management, quality management, performance management and feasibility studies.

Career opportunities for industrial engineers and engineering managers

An industrial engineer's daily tasks involve a great variety of creative activities, especially in modern manufacturing and service industries. An individual industrial engineer's work covers a selected part of a wide spectrum that starts at the design stage, concentrates on the manufacturing or delivering stages (where attention is particularly focussed on planning, efficiency and productivity), and concludes with marketing. Industrial engineers and engineering managers often work in large companies, or offer consulting services to large companies, but many are also responsible for the operation of small enterprises.

Departmental laboratories

The Department has the following laboratories: rapid product development laboratory, reverse engineering laboratory, three laboratories with advanced computer facilities, quality control laboratory and metrology laboratory.

1.5.4 Department of Mechanical and Mechatronic Engineering

The degree programmes in mechanical engineering and mechatronic engineering are hosted by this department.

What mechanical engineering and mechatronic engineering entail

Mechanical engineering is characterised by motion and energy transfer, for example in vehicles, aeroplanes, vessels, missiles, cooling systems, power stations and engines. It also covers machines used in all branches of the economy, for example in process plants and the manufacturing industries.

Mechatronic engineering is a combination of precision mechanical engineering, electronics and computer systems. A typical mechatronic system closely integrates mechanical components, electronic sensors, mechanical and electrical actuators and computer controllers. Examples of mechatronic systems are electronic engine control systems, robot systems and automated assembly lines.

Knowledge and skills you can gain from these programmes

The specialist knowledge these programmes offer you is built on a basis of mathematics, physics and chemistry.

For **mechanical engineering** the specialist knowledge areas include heat transfer, fluid mechanics, structural mechanics, dynamics and mechanical design. In your final year, you can choose one of three elective modules; these are finite element structural analysis, computational fluid dynamics and maintenance science. You are also exposed to some of the key elements of mechatronic engineering.

The **mechatronic engineering** programme consists of modules from the BEng (Mechanical) and BEng (Electrical and Electronic) programmes. The emphasis in the programme is on mechatronics, control systems, machine design, electronics and computer systems.

Career opportunities for mechanical and mechatronic engineers

The multi-faceted training of **mechanical engineers** leads to various professional careers that usually include the development, manufacturing and/or operation of products and systems. Mechanical engineers work in the whole range of companies, from large multinationals to smaller consulting partnerships.

Although mechatronic engineering is one of the smaller engineering disciplines in South Africa, there is a sustained demand for mechatronic engineers. Some **mechatronic engineers** work for large multinational corporations, but the diverse education of mechatronic engineers is sought after in smaller engineering concerns and serves as an excellent base for entrepreneurs. Mechatronic engineers are usually closely involved in the development or operation of systems that contain mechanical, electronic and/or electrical subsystems.

Departmental laboratories

The Department has various wind tunnels, internal combustion engine testing cells, a towing tank for ship model tests, a test area for structures, and automation and biomedical engineering laboratories, as well as computer facilities for massive parallel computing in computational fluid dynamics and finite element structural analysis.

1.5.5 Department of Process Engineering

The degree programmes in chemical engineering, with elective modules in mineral processing, are hosted by the Department of Process Engineering.

What chemical engineering entails

Chemical engineering involves the large-scale operation of processes by which various consumer products are produced, such as chemicals, pharmaceutical products, fertilisers, fuels, metals and other materials. Chemical engineers are also involved where effluents and waste materials are processed and recycled. The processes used range from simple physical separations, such as distillation, evaporation, drying or filtration, to complex chemical synthesis.

Knowledge and skills you can gain from this programme

The programme in chemical engineering equips you with a thorough knowledge of the fundamental sciences of mathematics, physics and chemistry, as well as thermodynamics, reaction kinetics, mass transfer, reactor design, separation processes, control systems and plant design. The programme also contains elective modules in mineral processing.

Career opportunities for chemical engineers

In practice, chemical engineers develop, design, construct and/or operate the processes described above on an economical basis. They work in a wide range of concerns, from large multinational companies to small consultation partnerships.

Chemical engineers, who specialise in mineral processing, play an important role in the mining industry and in metallurgic plants for the production of metals and minerals from ore.

Departmental laboratories

The Department has pilot-plant facilities, general laboratories for bioprocess engineering, extractive metallurgy, separation technology and water treatment, as well as a computer centre for process simulation and data processing.

1.6 Rules of the Faculty

This section outlines faculty-specific rules that apply both to undergraduate and to postgraduate students. Rules that apply only to undergraduate or only to postgraduate students can be found in the chapters in this part of the Calendar that deal specifically with undergraduate and postgraduate programmes. You can find university-wide rules in Part 1 of the University Calendar.

Please also refer to the following two Faculty documents. These two documents are available to students on the SUNLearn pages of all modules offered by the Faculty of Engineering and, to staff, on the document archive (SharePoint):

- Assessment Rules
- General Stipulations for Under- and Postgraduate Modules

In addition to the two documents named above, the ones in the list below are referred to in this Calendar part and are available to staff on SharePoint. If you are a current or prospective postgraduate student, you can use the e-mail address at "Postgraduate enquiries" under your current or prospective home department in Section 1.1.2 to request access to these documents. Current and prospective undergraduate students should please contact the Faculty Officer (see Section 1.1.2 above for contact details).

- RPL/CAT Procedures for the Faculty of Engineering
- Minimum Standards Regarding PhD Registration
- Minimum Standards Regarding DEng Registration
- Minimum Standards for MEng Examination Procedures
- Minimum Standards for PhD Examination Procedures
- Minimum Standards for DEng Examination Procedures
- Minimum Standards Regarding Upgrading from MEng to PhD

1.6.1 Provisions relating to assessment

- Each item that you submit for assessment (and which may contribute to determining a final mark), must be your own work. No part of it may have been done by another person. The exception is where the relevant lecturer gave written consent that you may use the work of your team members for the item in question.
- If you wish to dispute an assessment's mark, you must first approach your lecturer in this regard and, if necessary, thereafter the departmental chairperson. In all cases, you must do this **within seven calendar days** after the mark has been disclosed. No representations will be considered after this deadline.

1.6.2 Absence from assessments

If you were unable to write a test or submit an assessment because you were sick or have any other certifiable reason, the measures stated in the section "Absence from Classes and/or Tests" in Part 1 of the University Calendar apply.

1.6.3 Academic work during vacations

The following applies to postgraduate and final-year undergraduate students:

- Over and above the time that is allocated for it in the timetable, you may be expected to work on your project, research assignment, thesis or dissertation in the laboratories of your home department during the University vacation.

1.6.4 IT-infrastructure

The Faculty's information technology infrastructure is mainly based in the Faculty of Engineering Computer User Area (FIRGA). See Section 1.4.3 above for more on FIRGA.

1.6.4.1 Responsibility to read e-mails regularly

The Faculty and the University expect you read all e-mail sent to your University e-mail account regularly (typically daily during the academic year). Important information is sent to these e-mail addresses. It is also important to read these e-mails from time to time during recess periods, particularly the week before lectures recommence.

1.6.4.2 Annual levy

To be permitted to use the Faculty's IT infrastructure you must pay a levy each year. All engineering students pay this levy, except for a few postgraduate students who do not study on campus and who are specifically exempted from this obligation.

1.6.4.3 Connecting your own hardware to the University IT network

You may only connect hardware that has been approved by the University's Information Technology Division to the University's IT network.

1.6.4.4 User area etiquette

Among other things, do the following to show consideration for other users of the communal computer user areas:

- Keep all workstations in the general computer user areas clean and tidy, as you would like to find it.
- Complete the fault report forms, which are kept in the front of the room, so that faulty equipment can be attended to as soon as possible.
- Do not allow long programs to run unattended while you leave a message that the computer must be left alone.
- Make positive suggestions to the manager of FIRGA that will improve the functionality of the system.

1.6.4.5 E-mail and network etiquette

Among other things, do the following to show consideration for other e-mail and network users:

- Provide a descriptive title for each e-mail that you send.
- Keep active the setting which automatically sends a read receipt to the sender – confirmation that you have received the message is very useful to the sender because it indicates that your reaction or answer can be expected.
- Read your e-mail regularly and answer all e-mails that are addressed to you personally and that are not intended for general distribution.
- Use proper language and avoid aggression in messages.
- Do not attach large files to e-mails; it misuses disc space. Rather use web facilities (such as Google Drive or Dropbox) to transfer large files.
- Do not use the University's e-mail system for non-academic purposes such as giving notice of bazaars, concerts, etc.

1.6.4.6 Misuse of the IT infrastructure

You are strictly forbidden to misuse the IT infrastructure. You misuse the IT infrastructure when you:

- interfere with other students' access to or use of the IT infrastructure. This includes occupying a computer in a computer users' area without using it for university-related purposes.
- access computers or servers in an unauthorised way.
- use software programs in an unauthorised way or use illegal software.
- copy computer programs that you are not authorised to copy or violate copyright.
- access in an unauthorised way and/or copy or change system files, including configuration, user and password files.
- harass others by displaying indecent material or sending unwelcome messages.
- intercept network traffic and wrongfully read e-mail.
- commit any form of fraud via the network, which includes using another person's password.
- play computer games on the network.
- perform any action resulting in the system being overloaded with information, for example sending chain letter messages and spam.

1.7 Awards and prizes

In this section you will find a description of the most important awards and prizes that are unique to the Faculty of Engineering. Please refer to Part 2 of the University Calendar for details regarding other prizes and bursaries that you may be eligible for as an engineering student.

1.7.1 Faculty-wide

In Appendix A you will find the names of past recipients of faculty-wide awards.

1.7.1.1 The Dean's Award for Outstanding Achievement

The Faculty awards the Dean's Award for Outstanding Achievement to a student whose undergraduate, as well as postgraduate, performance has been outstanding, similar to recipients of the Chancellor's Medal. The period of study that will be taken into account is usually limited to eight consecutive years of study. To qualify for this award, you must have an excellent academic record and you must also have excelled as a researcher. You must typically have had at least one journal article that you are the main author of accepted for publication by a reputable international journal, and you must have contributed to the published proceedings of one or more international conferences.

The award comprises a silver medal and a cash prize. The departments nominate candidates and the Faculty Committee decides who receives the award. The award will not necessarily be awarded every year.

1.7.1.2 The ECSA Medal of Merit

The Faculty awards the ECSA Medal of Merit to the most deserving BEng graduate in the Faculty.

1.7.1.3 The Jac van der Merwe Prize for Innovation

The Faculty awards the Jac van der Merwe Prize for Innovation to a BEng final-year student whose project or thesis affords the greatest evidence of ingenuity or originality of thought. MultiChoice sponsors this prize of R30 000.

1.7.1.4 Lecturer of the Year

With this award, in the form of a medal, the Faculty recognises contributions over a broad range of activities, including:

- good teaching,
- a formative influence on the Faculty's students,
- a contribution to the development of the Faculty's programmes and/or laboratories, and
- the development of the Faculty in other respects.

The departments nominate candidates each year and the Faculty Committee makes the award on the grounds of the motivations submitted by the departments.

1.7.1.5 Upcoming Researcher of the Year

This award, in the form of a medal, goes to a lecturer or researcher who has made exceptional progress in the field of research over the past few years. The Research Advisory Committee recommends this candidate to the Faculty Committee and the Faculty Committee endorses the award.

1.7.1.6 Annual Teaching Excellence Award

This award, in the form of a medal, goes to a lecturer or a team of lecturers who have greatly contributed to enhancing students' learning over the past few years, through a scholarly approach to teaching. The Faculty's nominations for similar University and national awards are normally selected from the nominees for the Faculty award. A panel appointed by the Dean, after consultation with the Faculty's Management Committee, evaluates candidates' teaching portfolios and then chooses the recipients of the Faculty's award, as well as the Faculty's nominees for the University and national awards.

1.7.1.7 Honorary Member of the Faculty

This award, in the form of a certificate, may be awarded each year to up to three people from outside the Faculty, who have rendered outstanding service to the Faculty over a long period of time and who have promoted the Faculty's interests.

The departments nominate candidates and the Faculty Committee makes the award on the grounds of the motivations provided by the departments.

The awards are announced at the meeting of the Faculty Advisory Board and the certificates are handed over at an Advisory Board meeting or other suitable occasion.

1.7.2 Civil Engineering

- The AURECON Prize for the best final-year project.
- The AURECON Prize for the most deserving student in Environmental Engineering.
- The AURECON Prize for the most deserving student in Transport Science.
- The Bergstan South Africa Prize for the best first-year student in Civil Engineering.
- The Bergstan South Africa Prize for the best second-year student in Civil Engineering.
- The Bergstan South Africa Prize for the best third-year student in Civil Engineering.
- The Concrete Society of Southern Africa Prize for the best thesis, or the most deserving student in Concrete Technology.
- The Element Consulting Engineers (Pty) Ltd Prize for the most deserving student in Advanced Design (Structural Engineering).
- The GIBB Engineering and Science Prize for the most deserving student in Advanced Design (Transportation, Geotechniques or Engineering Management).
- The GLS Prize for the best thesis/dissertation on Water Engineering.
- The Haw & Inglis Civil Engineering (Pty) Ltd Prize for the best master's student in Civil Engineering.
- The HL Reitz Medal and the AECOM Prize for the best postgraduate student in Civil Engineering.
- The Institute for Water and Environmental Engineering Prize for the most deserving final-year student in Advanced Design (Hydraulics).
- The ITS Prize for the best final-year project in Road Safety.
- The Manfred Kloos Prize for the most deserving postgraduate student in Port and Coastal Engineering.

- The Marius Louw Medal and the AURECON Prize for the best final-year student in Civil Engineering.
- The MathU Prize for the best second-year student in the module Informatics in Civil Engineering.
- The MathU Prize for the best third-year student in the module Informatics for Civil Engineers.
- The Math U prize for the best postgraduate student in the module Informatics for Civil Engineers.
- The Melis & Du Plessis Prize for the most deserving undergraduate or postgraduate student in Geotechnics.
- The Murray & Roberts Construction (Pty) Ltd Prize for the best postgraduate student in the module Informatics for Civil Engineers.
- The Murray & Roberts Construction (Pty) Ltd Prize for the best second-year student in the module Informatics in Civil Engineering.
- The Murray & Roberts Construction (Pty) Ltd Prize for the best third-year student in the module Informatics for Civil Engineers.
- The Pretoria Portland Cement Prize for the most deserving work in the field of Concrete Engineering.
- The SA Institute of Steel Construction Prize for the most deserving student in Steel Construction.
- The SANRAL Prize for the best final-year project in Pavement Engineering.
- The UWP Consulting (Pty) Ltd Prize for the best final-year student in Transportation Engineering.
- The Western Cape Branch of SAICE Prize for the student who has contributed most to the advancement of Civil Engineering.
- The WSP Group (Pty) Ltd Prize for the most deserving final-year student in Hydraulic Engineering.

1.7.3 Electrical and Electronic Engineering

Merit Certificates are awarded to students who:

- pass a specific undergraduate year with an average above 75%.
- obtain a postgraduate degree or diploma with distinction.

1.7.4 Industrial Engineering

- The Deloitte Consulting Prize for the highest average in the first year.
- The LTS Prize for the highest average in the second year.
- The IBi Prize for the highest average in the third year.
- The PPS Prize for the highest average in the fourth year.
- The LTS Prize for the final-year student with the highest average over four years.
- The Lecturers' Prize: 'Makes Industrial Engineering Visible on Campus'.

- The Decision-making and Analysis Prize for the best student over four years in mathematical and operational research subjects.
- The QMUZIK Prize for the best student over four years in information systems and programming.
- The QMUZIK Prize: Student Nomination: 'Who will be the Most Successful Engineer in Future?'
- The Competitive Dynamics International Holdings (Pty) Ltd (CDI) Prize for the best Industrial Project for a sustainable competitive advantage.
- The Fraunhofer IWU/GCC Cooperative Laboratory Prize for the best Industrial Project in the Fraunhofer Joint Lab.
- The PRASA Chair Prize for the best fourth-year student in railway technology.
- The Aluminium Federation of South Africa (AFSA) Prize for the best Industrial Project that uses aluminium.
- The HSE&IH Prize for the best final-year project in health systems engineering and innovation.
- The Optimisation Prize for the best system optimisation Industrial Project.
- The Decision Support Prize for the best decision support project.
- The SUnORE Bursary for the best Industrial Project by a SUnORE student who plans to enrol for a master's degree during the following year.
- The Centre for Rapid Prototyping and Development Prize for the best project related to additive manufacturing.
- The Departmental Prize for the Industrial Project runner-up.
- The PRAGMA Prize for the best final-year project.
- The PRAGMA Prize and Trophy for the best postgraduate project in physical asset management.
- The BYTES Universal Systems Prize for the best postgraduate student in information technology and system design.
- The HSE&IH Prize for the best master's project in health systems engineering and innovation.
- The Lecturers' Prize for the most versatile postgraduate student.
- The Departmental Prize for the best overall postgraduate student.
- The South African Institute for Industrial Engineering (SAIIE) dux student.

1.7.5 Mechanical and Mechatronic Engineering

- The AAT Composites Prize for the best final-year project in Composite Materials.
- The Aluminium Federation of South Africa's Prize for the best final-year project with aluminium.
- The Arthur Child Award for an exceptional postgraduate student in Aeronautics.
- The Autodesk/Educad Prize for the best use of CAD (Inventor) in a final-year project in Mechanical or Mechatronic Engineering.

- The Centre for Renewable & Sustainable Energy Prize for the best final-year project in Renewable Energy.
- The Centre for Renewable & Sustainable Energy Prize for the best postgraduate project in Renewable Energy.
- The Chairperson's Prize awarded to a Mechanical or Mechatronic Engineering student for an outstanding achievement as decided by the lecturers of the Department.
- The DeltaV Aerospace Prize for the best final-year student in Mechanical Engineering.
- The DeltaV Aerospace Prize for the best postgraduate student in Mechanical Engineering.
- The Element Six (Pty) Ltd and DST/NRF Centre of Excellence in Strong Materials prizes for excellence in Materials Science and Engineering for the best third- and final-year student in Mechanical Engineering with the highest average.
- The GeoSUN Prize for the best final-year project in Solar Energy.
- The Heever Technologies Prize for the best final-year project in Biomedical Engineering.
- The ITM Prize for the best second-year student in Mechatronic Engineering.
- The ITM Prize for the best third-year student in Mechatronic Engineering.
- The John Thompson Prize for exceptional performance in Mechanical Engineering.
- The John Thompson Prize for the best final-year project in Thermal Energy Systems.
- The Kelvion Prize for the best second-year student in Mechanical Engineering.
- The Kelvion Prize for the best third-year student in Mechanical Engineering.
- The Kelvion Prize for the best third-year student in Mechanical Engineering in Design.
- The Kröger Book Prize for the best final-year project in the field of Thermodynamics or Heat Transfer.
- The MMW Prize for the most outstanding final-year student in the laboratory environment.
- The MMW Prize for the most outstanding postgraduate student in the laboratory environment.
- The PRASA Prize for the best final-year project in the field of railways.
- The prize for the group with the best project in Machine Design B 344.
- The prize for the group with the best project in Mechatronics 424.
- The SAIMechE Prize for the best final-year project presentations in Mechanical and Mechatronic Engineering.
- The SAIMechE Shield for the best final-year project in Mechanical and Mechatronic Engineering.
- The Simera Prize for the best progress in a final-year project by the middle of the year.
- The Simera Prize for the most independent and innovative student for practical work in the Structures laboratory.
- The Space Advisory Company prize for the best final-year or postgraduate project in satellite engineering.

- The TFDesign Prize for the best final-year student in Mechatronic Engineering.
- The TFDesign Prize for the best postgraduate student in Mechatronic Engineering.
- The Vibration & Acoustics prize for the best final-year project in this field.

1.7.6 Process Engineering

- The AJ Burger Prize for the best MEng student.
- The Centre for Process Engineering Prize for the best final-year design.
- The Centre for Process Engineering Prize for the best final-year project poster.
- The Chairman's Award for a noteworthy contribution by a final-year student.
- The Department of Process Engineering Prize for the final-year student with the highest average over four years.
- The departmental nominee for the Jac van der Merwe Prize for the most innovative final-year project.
- The Element Six/DST/NRF Medal in Support of Material Science for the best third-year student.
- The Element Six/DST/NRF Medal in Support of Material Science for the best final-year student in this area.
- The Elton Thyse Award for the best student in Extractive Metallurgy.
- The GE Digital Mine Prize for the best PhD student.
- The Minerals Education Trust Fund Prize for the best final-year project.
- The SAIChE Silver Medal for the best final-year student in the Department of Process Engineering.
- The SAIMM Prize for the best third-year student in Mineral Processing.
- The SAIMM Prestige Prize for the student with the best final-year project in Mineral Processing.
- The Stone Three Mining Solutions Prize for the best final-year student in Process Control.
- The Stone Three Services Prize for the best final-year student in Process Design.

2 Undergraduate Programmes

2.1 Qualifications and fields of study

Qualification awarded by the Faculty

The Faculty awards the following undergraduate qualification:

- BEng: Bachelor of Engineering

The BEng degree is the basic qualification in engineering that leads to registration as a professional engineer.

Fields of study

The BEng degree may be awarded in the following fields of study:

- Chemical Engineering
- Civil Engineering
- Electrical and Electronic Engineering
- Industrial Engineering
- Mechanical Engineering
- Mechatronic Engineering

Programmes in each field of study

The Faculty offers two degree programmes in each field of study, namely:

- a four-year degree programme, BEng (4yr)
- a five-year extended degree programme, BEng (EDP)

If you have an inadequate school background, the BEng (EDP) can help you to master a BEng programme. Each BEng (EDP) programme begins with a transition year, which is not part of the four-year BEng. After the transition year, you will follow the normal curriculum of the BEng (4yr) in your chosen field. A BEng (EDP) therefore gives you an alternative access route to the BEng programmes in the Faculty of Engineering.

2.2 ECSA accreditation

All off the Faculty's four-year and extended BEng programmes are accredited by the Engineering Council of South Africa (ECSA) for registration as professional engineer. This means that all the programmes include at least the required number of credits per ECSA knowledge area and develops and assesses all the ECSA exit level outcomes. If you complete a BEng programme, you will meet the ECSA requirements for engineers, irrespective of the electives you chose.

2.3 Undergraduate enrolment management

The University Council sets targets regarding the fields of study and diversity profile of the student body of Stellenbosch University, as well as the total number of students at the University. The University then manages all the enrolments from prospective undergraduate students to reach these targets and to ensure that the total number of enrolments is within the available capacity. This means that there may be students who meet the admission requirements for a given programme but are not admitted.

The following points of departure apply when undergraduate enrolments are managed:

- Establishing an equitable, transparent and reasonable process for admission to undergraduate and postgraduate programmes.
- Contributing to the creation of an inclusive student community, where diversity is regarded as an asset.
- Attracting and admitting academically excellent students.
- Admitting prospective students who have the potential to graduate successfully and to be well-equipped thought leaders for the future.
- Offering equal opportunities to prospective students who are equally situated, and facilitating redress where individuals or categories of people were or still are disadvantaged due to past unfair discrimination.

2.4 How to be admitted to a BEng programme

2.4.1 Applicants with no prior tertiary learning

This section applies to you if you have never studied at a traditional university or university of technology before, or if you have studied in a completely unrelated field, like theology, for which you cannot get recognition of prior learning. For more on admission based on the recognition of prior tertiary learning, see Section 2.4.2 below.

2.4.1.1 Admission requirements for BEng (4yr) and BEng (EDP)

The table shows the admission requirements for all the BEng (4yr) and BEng (EDP) programmes for students starting in BEng studies in 2021 or later (please refer to the 2019 Calendar for the requirements for 2020). The percentages shown in the table are the percentages achieved in the applicable school final examination.

BEng (4yr)	**BEng (EDP)**
National Senior Certificate with admission to bachelor's studies, or an exemption certificate issued by the Matriculation Board	
An average, using the six best matric subjects (excluding Life Orientation and Mathematical Literacy), of at least:	
70%	60%
Mathematics with at least:	
70% (or in the Senior Certificate Examination before or	60%*

BEng (4yr)	BEng (EDP)
in 2007, Mathematics HG: at least a B)	
Physical Sciences with at least:	
60% (or in the Senior Certificate Examination before or in 2007, Physical Science HG with at least a C)	50%*
English Home Language: 50%, with no Afrikaans requirement; *or* English First Additional Language: 60%, with no Afrikaans requirement; *or* English First Additional Language: 50%, together with Afrikaans Home Language: 50%; *or* English First Additional Language: 50%, together with Afrikaans 2nd Additional Lang.: 60%	

** Only students who have recently passed Matric are considered for the EDP.*

Prospective students who meet the above admission requirements must also be selected before they can be admitted. See Section 2.4.1.2 below for the selection process for the BEng (4yr) and Section 2.4.1.3 below for the selection process for the BEng (EDP).

2.4.1.2 Selection process for BEng (4yr)

2.4.1.2.1 Measures used for selection

- The **selection score** is the most important measure used by the Faculty for selecting students for BEng programmes. This score is calculated as follows:

  Selection score = Mathematics mark + Physical Sciences mark + 6 x Matric average

  - The percentages you obtained in Mathematics and Physical Sciences, plus the average percentage of your six best matric subjects (excluding Life Orientation and Mathematical Literacy), are used for calculating the selection score.
  - This means that the selection score takes a broad group of matric subjects into account, and that, in effect, Mathematics and Physical Sciences usually each contribute twice.
  - The maximum score is 800.
- **Other measures** used for selection are the following:
  - your results in the National Benchmark Tests (NBTs) (for more on the NBTs, consult Section 2.4.1.4.1 below)
  - your school results
  - other relevant information
  - personal interviews – in exceptional circumstances.

2.4.1.2.2 How the selection score is used

- The Dean sets an admission threshold and a minimum selection score for each BEng programme. This is done in consultation with the Faculty Management Committee after all complete applications received before the closing date have been processed.

  The **admission threshold** is a selection score based on:

  - the number of applicants who meet the admission requirements,
  - the number of places available in the particular degree programme and

- the points of departure for undergraduate enrolment management as mentioned above in Section 2.3.

The **minimum selection score** is the lowest score that indicates that a student will be reasonably likely to complete the particular programme. This score is based on the Faculty's experience with previous students.

- You will be selected if you:
  - meet the admission requirements and
  - your selection score is equal to, or larger than, the admission threshold score for the particular degree programme that you want to follow.

  Please note:

  - Being selected for one BEng programme does not mean that you have been selected for another BEng programme.
  - You may apply for more than one BEng programme, ranking your preferences from highest to lowest. The highest preference that you are also selected for will be allocated to you.
- If your selection score is below the admission threshold, but above the minimum score for your preferred BEng programme(s), the following happens:
  - you are placed on a waiting list, which means that you may still be admitted to a particular programme if places become available later; or
  - you can apply to be admitted to another BEng programme if you meet the selection requirements for that particular programme. You must contact the Faculty Officer or the Faculty Secretary if you consider changing the programmes you applied for (see Section 1.1.2 for contact information).

2.4.1.3 Selection process for BEng (EDP)

You cannot apply directly to be admitted to a BEng (EDP). All prospective BEng students apply to be admitted to a BEng (4yr); then, if you are not selected for a BEng (4yr), but meet the admission requirements for a BEng (EDP), you may be selected for the BEng (EDP). The following applies at selection for the EDP:

- Only a limited number of students are selected.
- Students from educationally disadvantaged environments receive preference.

2.4.1.4 Application procedure for BEng (4yr) and BEng (EDP)

2.4.1.4.1 How to apply for a BEng programme

- Submit a complete application by **30 June** of the year before the one in which you want to register for a BEng programme. Apply at www.maties.com.
- Write two National Benchmark Tests (NBTs):
  - the Mathematics (MAT) test and
  - the Academic Literacy and Quantitative Literacy (AQL) test.

  You can write the NBTs before or after submitting your application, but you must have done so by **15 August** of the year before the one in which you want to register for a

BEng, since the results of these test may influence your selection. For further particulars, go to www.nbt.ac.za.

2.4.1.4.2 Final and provisional admission

- If you have already passed Grade 12 and you are admitted to a specific BEng programme, your admission is final.
- If you are still in Grade 12 when you apply, you may be admitted to a specific BEng programme based on your Grade 11 results. However, this admission is provisional. For your admission to be finalised, the following is necessary:
  - You must submit written proof that you have obtained a National Senior Certificate, or equivalent, that meets the admission requirements of the particular degree programme.
  - Your admission scores, based on your Grade 12 final examination marks, must be the same or better than your admission scores based on your Grade 11 marks, or must meet the particular programme's admission threshold (described above in Section 2.4.1.2.2).

2.4.1.4.3 Late or unsuccessful application

- If you are granted permission to submit a complete application after the closing date (30 June), you will be considered for admission if there are places available in the particular programme.
- If you applied, before the closing date, using your Grade 11 marks, but were not admitted, you may submit your Grade 12 results to be considered again by contacting the Faculty Officer (see Section 1.1.2 for contact information). You can be admitted if there are places available in the particular programme.

2.4.1.4.4 Failure to register

- If you do not register in the year for which you were admitted, your admission will lapse. If you then apply again for a later year, you will have to be selected again.

2.4.2 Applicants with prior tertiary learning

This section explains how you may be admitted to a BEng programme at the Faculty of Engineering if you have already studied in another tertiary programme or at another tertiary institution. This is termed "Credit Accumulation and Transfer (CAT)".

2.4.2.1 Residency requirement for obtaining a BEng degree from Stellenbosch University

Irrespective if your prior tertiary studies, you must pass at least the final two academic years of an approved BEng programme at Stellenbosch University to obtain a BEng degree from this university. The University also requires that you complete at least 50% of the credits of a programme at this university to be awarded the degree by the University.

2.4.2.2 How to obtain recognition for modules from other programmes or institutions

If you have already completed applicable modules before enrolling for the BEng programmes of the Faculty of Engineering, you may apply for the modules that you have completed to be recognised in the place of modules in the relevant BEng programme.

Please note: Only credits completed in the preceding five years are normally considered to be transferable.

Your application must:

- be submitted to the Faculty Secretary before **3 January** of your intended first year of study in a BEng programme at Stellenbosch University;
- include your complete academic record; and
- include the content and outcomes of the modules that you are asking recognition for.

Your application will be considered by a committee for recognition of prior learning (RPL/CAT committee) of the particular BEng programme's home department. The Faculty Secretary will give you written feedback. Refer to the document "RPL/CAT Procedures for the Faculty of Engineering" for details relating to RPL/CAT committees. (Consult Section 1.6 above to find out how to access this document.)

Recognition will be granted per module (in other words, recognition is not granted for parts of modules) and subject to the following:

- the curriculum, outcomes and credits of the completed module must largely meet or exceed the requirements of the corresponding module within the engineering programme you want to follow,
- exemption or credit transfer may be granted for a maximum of 50% of the credits of a programme, and
- a maximum of 50% of the credits of a completed qualification may be transferred to another qualification.

2.4.2.3 Applicants from other programmes at Stellenbosch University

This section applies to you if you began your studies in another programme at Stellenbosch University and want to switch to a BEng programme.

2.4.2.3.1 Admission requirements for BEng (4yr)

- You must meet the normal language requirements that also apply to applicants without any prior tertiary learning (see Section 2.4.1.1 above).
- You must either have passed:
  - Mathematics 114 and 144, *or*
  - Engineering Mathematics 115 and 145

- You must either:
  - meet the normal requirements for the BEng (4yr) regarding Physical Sciences (see Section 2.4.1.1 above), *or*
  - have passed physics and chemistry at first-year BSc level.
- You must either:
  - have passed, in one year, all modules within an appropriate first-year BSc programme (where Mathematics 114 and 144, or Engineering Mathematics 115 and 145, were included); *or*
  - have been selected by the home department of the particular BEng programme.

Students who have already been awarded a BSc degree

- Even if you already have a BSc degree, you will generally only be admitted to the first year of a BEng (4yr) programme (and not to a later year), but you can apply for some of the modules you have passed in the BSc programme to be recognised towards the BEng degree.
- If you have completed a BSc degree programme but took longer than the normal minimum time to complete it, or performed poorly in general, you will normally not be admitted to a BEng (4yr) programme.

2.4.2.3.2 Admission requirements for BEng (EDP) second year

The requirements you must meet if you want to apply for admission to the second year of a BEng (EDP) are:

- You must have completed the first year of another appropriate extended degree programme within one year of study.
- In that first year, you must have achieved at least the level of performance that is required in the BEng (EDP) to proceed from the first to the second year.

2.4.2.3.3 Application procedure

Do the following to apply to be admitted to a BEng-programme on the basis of your prior learning at Stellenbosch University:

- Submit a written application to the Faculty Secretary in the year before you intend to start your studies in engineering.
- Do this after all the final marks have been made available, but before **13 December**.

Your application will be considered by the RPL/CAT committee of the particular programme's home department. If you are admitted to a BEng (4yr), the committee will also decide which of the modules that you have already completed can be recognised in the place of modules in the BEng programme (also see Section 2.4.2.2 for more on how to obtain recognition for modules). The Faculty Secretary will give you written feedback.

2.4.2.4 Applicants from BEng, BScEng and BSc programmes at other universities in South Africa

This section applies to you if you began your studies in some science or engineering programmes at another university, but want to continue your studies in a BEng programme at Stellenbosch University. If you began studying in a BEng or BScEng programme elsewhere, we strongly advise you to do only your first year at the other university and to apply for admission to the second year of a BEng (4yr) at Stellenbosch University.

2.4.2.4.1 Admission requirements for a BEng (4yr)

To be admitted to a BEng (4yr) on the basis of your prior BEng, BScEng or BSc studies at another university, you must meet the following requirements:

- You must meet the normal language requirements that also apply to applicants without any prior tertiary learning (see Section 2.4.1.1 above).
- You must either:
  - meet the normal requirements for the BEng (4yr) regarding Mathematics (see Section 2.4.1.1 above), *or*
  - have passed the equivalents of Engineering Mathematics 115 and 145.
- You must either:
  - meet the normal requirements regarding Physical Sciences (see Section 2.4.1.1 above), *or*
  - have passed physics and chemistry at first-year BSc or BEng level.
- You must meet the requirements to continue with your studies in engineering at the university where you have studied before, or where you are studying at the time of your application.
- You must have been selected by the home department of the particular BEng programme.

2.4.2.4.2 Application procedure

Do the following to apply to be admitted to a BEng (4yr) on the basis of your prior studies in science or engineering at another university:

- Submit a written application to the Faculty Secretary before **30 June** of the year before you plan to start your BEng studies at Stellenbosch University;
- Your application must include:
  - your complete academic record
  - the content and outcomes of the modules that you are asking recognition for

Your application will be considered by the RPL/CAT committee of the particular programme's home department. If you are admitted to a BEng (4yr), the committee will also decide which of those modules that you have already completed can be recognised in the place of modules in the BEng programme (also see Section 2.4.2.2 above for more on how to obtain recognition for modules). The Faculty Secretary will give you written feedback.

2.4.2.5 Applicants with a National Diploma, National Higher Diploma or BTech degree from another university in South Africa

This section applies to you if you already have an applicable National Diploma (ND), National Higher Diploma (NHD) or BTech degree and have performed well academically. You can apply to be admitted to the first year of the BEng programmes and for recognition of modules (see Section 2.4.2.2 above for more on how to obtain recognition for modules). Alternatively, you can apply to be admitted to the second or third year of a BEng (4yr) programme if you have passed an assessment in certain required modules, as explained below.

2.4.2.5.1 Admission requirements for the second and third year of the BEng (4yr)

The requirements for admission to the second or third year of a BEng (4yr) on the basis of your prior ND, NHD or BTech studies are as follows:

- You must meet the normal language requirements that also apply to applicants without any prior tertiary learning (see Section 2.4.1.1 above).
- You must pass the normal assessments in the modules indicated below in Sections 2.4.2.5.2 and 2.4.2.5.3. This entails that:
  - you must sit for the relevant assessments with the current BEng students during the official university examination period.
  - you must complete all the assessments in a maximum of two consecutive examination periods: one first-semester and one second-semester examination period. The semester will be determined by the required modules, in other words whether they are offered in the first or second semester.
  - you get only one assessment opportunity to pass a given module.
- You must be selected.

2.4.2.5.2 Modules required for admission to the second year of the BEng (4yr)

To be admitted to the second year of a BEng (4yr), you must have passed the assessments of the following modules:

- Engineering Mathematics 145;
- Applied Mathematics B 154; and
- at most, two further modules as specified by the relevant department. The department will consider your study record and choose the modules to ensure that you have the necessary background for further successful study.

2.4.2.5.3 Modules required for admission to the third year of the BEng (4yr)

To be admitted to the third year of a BEng (4yr), you must have passed the assessments of the following modules, according to the programme you have applied for:

- Chemical Engineering (offered by Department of Process Engineering)
  - Engineering Mathematics 214
  - Engineering Mathematics 242
  - Applied Mathematics B 224
  - Numerical Methods 262

- Civil Engineering
  - Engineering Mathematics 214
  - Applied Mathematics B 224
  - Applied Mathematics B 242
  - Applied Mathematics B 252
- Industrial Engineering
  - Engineering Mathematics 214
  - Engineering Mathematics 242
  - Production Management 212
  - Engineering Economics 212
- Electrical and Electronic Engineering
  - Engineering Mathematics 214
  - Applied Mathematics B 224
  - Applied Mathematics B 242
- Mechanical Engineering
  - Engineering Mathematics 214
  - Engineering Mathematics 242
  - Applied Mathematics B 224
  - Numerical Methods 262
- Mechatronic Engineering
  - Engineering Mathematics 214
  - Engineering Mathematics 242
  - Applied Mathematics B 224
  - Numerical Methods 262
- All fields of study
  - At most two further modules as specified by the relevant department. The department will consider your study record and choose the modules to ensure that you have the necessary background for further successful study.

2.4.2.5.4 Application and assessment procedure

Application procedure

Do the following to apply:

- Apply to the Faculty Secretary by **1 April** of the year before you want to start with the second or third year of the BEng (4yr).
- Your application must include:
  - your complete academic record,
  - the content and outcomes of the modules that you are asking recognition for.

The departmental RPL/CAT committees will consider your application and decide which assessments you must complete.

Please note that your first assessment opportunity may already be at the end of the first semester of the year in which you applied.

Assessment procedure

- The Faculty Secretary will let you know which assessments you must complete.
- The relevant departments will provide the following for each module so that you can prepare for these assessments:
  - the syllabus,
  - module content,
  - class notes (if applicable), and
  - the name of the prescribed text book.
- The Faculty Secretary will let you know only whether you have passed or failed a module. These results will not be included in your study record.

2.4.2.6 Applicants from universities outside of South Africa

If you have studied at a university outside of South Africa and want recognition for qualifications or modules from that university, you must:

- apply in writing to the Faculty Secretary before **30 June** of the year before your intended study at Stellenbosch University.
- include with your application:
  - your complete academic record,
  - the content and outcomes of the modules that you are asking recognition for.

The International Office and/or the Human Sciences Research Council's assessment of foreign qualifications will be used as the guideline for assessing your prior learning.

If you have a qualification or studied at an institution where the standards are regarded as being on the same level as South African universities, your application will be handled in a similar manner to applications by students from BEng, BScEng and BSc programmes at other universities in South Africa (see Section 2.4.2.4 above). Otherwise, your individual modules will not be recognised, but you may be given the same opportunity as students with a National Diploma, National Higher Diploma or BTech degree to complete specific mainstream assessments (see Section 2.4.2.5 above). The Faculty Secretary will give you written feedback.

2.4.2.7 Recognition of prior learning not covered in the sections above

If you want to apply for admission based on the recognition of modules completed elsewhere, but your situation is not covered in Sections 2.4.2.3 to 2.4.2.6 above, you must:

- apply before **1 April** of the year before your intended studies at Stellenbosch University.
- include with your application full details of prior learning; that is:
  - the name of the programme,
  - a description (contents, scope and outcomes),
  - the assessment criteria,
  - the type of assessments,
  - the accreditation of the institution, and
  - when the learning was obtained.

  Please note: If you leave out any of this information, your application cannot be processed.

Experience in itself is not recognised; it must be learning that has been assessed in a recognised manner.

The RPL/CAT committee of the relevant department will consider your application by comparing your education with relevant module contents, outcomes and credits. The committee can:

- refuse your application with relevant reasons,
- recognise certain module(s),
- recommend that you complete mainstream assessments for certain modules (the same as applicants with an ND, NHD or BTech; see Section 2.4.2.5 above), and/or
- request a personal interview (which will be considered as an oral assessment). At least two academic staff members must be present during this interview.

The Faculty Secretary will give you written feedback.

2.5 Changing your BEng degree programme

Changing programmes after completing your first year

All BEng programmes have largely the same first year, and therefore you can change from one BEng programme to another at the end of your first year. The following applies:

- You automatically qualify to change your degree programme if you passed all the first-year modules of the BEng (4yr) programme in your first year of study, unless you followed the Data Engineering focus area in the BEng (Electrical and Electronic Engineering) programme.
- The second year of the BEng (EDP) programme and the first year of the four-year programme are the same; therefore, you also automatically qualify to change programmes if you have passed all the modules in the second year of a BEng (EDP).
- If you did not pass all your first-year modules, you must normally have obtained at least 0,75 HEMIS credits at the end of your first year to change programmes (this means that you must have passed 75% of the module credits). Having 0,75 HEMIS credits does not mean, however, that you will necessarily receive permission to change. (Section 2.6.2 below explains how HEMIS credits are calculated.)
- You must be selected for the new programme before you can make the change.
- You do not have to follow any additional modules for the new programme once you have been selected.

Changing programmes from your second year onwards

From your second year onwards, the later you change programmes the more modules you will have to catch up on when you make the change.

Application procedure

Apply in writing to the Faculty Secretary before **13 December** of the year before you want to change programmes.

Please consult the Almanac in Part 1 of the Calendar for the last date on which programmes may be changed.

Further guidance and responsibility

The Centre for Student Counselling and Development (CSCD) and the departmental chairpersons in the Faculty of Engineering are available to give you guidance in choosing a field of study.

It is your responsibility to determine whether your bursary conditions allow you to change from one undergraduate programme to another.

2.6 Renewing your registration as an undergraduate student each year

As an undergraduate student you must each year acquire at least a prescribed number of HEMIS credits and meet other conditions to be permitted to register again in the following year. In this section you can find out what is required of you after specific years of study, what to do if you do not meet the requirements and what happens if your studies are interrupted.

2.6.1 Requirement to renew registration annually

You must normally register in a BEng programme for each consecutive year, from when you start in a BEng programme until you have completed it. If your registration is interrupted for one or more years, you will have to apply anew for admission and be selected before you may continue your BEng studies.

If your studies were interrupted for a period of three years or longer, the credits you accumulated previously will not automatically be transferred, but you may apply to have the modules you passed during your prior studies recognised (consult Section 2.4.2.2 in this regard).

2.6.2 Calculating HEMIS credits

One HEMIS credit is equivalent to the total required number of module credits that are prescribed in a specific year of a BEng (4yr).

For example:

The third year of Electrical and Electronic Engineering (EEE) has a total of 150 credits for the year:
150 module credits for third-year EEE = 1 HEMIS credit
The third year of Industrial Engineering (IE) has a total of 147 credits for the year:
147 module credits for third-year IE = 1 HEMIS credit
The module Control Systems 314, which is included in both the EEE and IE programmes, comprises:
15 module credits
If you pass Control Systems 314 as an EEE student, you will therefore have gained:
15 ÷ 150 = 0,1 HEMIS credits
If you pass the same module as an IE student, you will have gained:
15 ÷ 147 = 0,102 HEMIS credits

Attendance modules, for which no assessments are written, are not considered in the calculation of HEMIS credits.

2.6.3 Requirements for renewal after one year of study in a BEng (4yr)

You will normally only be permitted to continue your BEng studies after your first year of study if in that year:

- you acquired at least 0,6 HEMIS credits in prescribed modules of the first year of the BEng programme you are following; and
- at least 0,2 of the above 0,6 HEMIS credit were from the following modules:
  - Applied Mathematics B 124
  - Applied Mathematics B 154
  - Engineering Mathematics 115
  - Engineering Mathematics 145

2.6.4 Requirements for renewal after two or more years of study in a BEng (4yr)

HEMIS credits

As a BEng (4yr) student, you must have acquired the following HEMIS credits, after the number of years of study mentioned below, to be permitted to continue your studies:

- After 2 years at least 1,3 HEMIS credits
- After 3 years at least 2,0 HEMIS credits
- After 4 years at least 2,7 HEMIS credits
- After 5 years at least 3,4 HEMIS credits
- After 6 years at least 4,1 HEMIS credits

Further conditions

In addition to the HEMIS credits you must meet the following conditions to be able to renew your registration:

- After 2 years of full-time study, you must normally have passed all the prescribed modules for the first year of the BEng (4yr).
- After 4 years of full-time study, you must normally have passed all the prescribed modules of the first and second years of the BEng (4yr).
- After 6 years of full-time study, you must have completed the programme successfully and will normally not be permitted to continue if you haven't completed it.
- Irrespective of any other stipulations, you will normally only be permitted to study further if you have acquired at least 0,5 HEMIS credits in the year preceding the one in which you want to continue studying.

  For example: If you passed all your modules in your first and second year, but in your third year you only managed to acquire 0,2 HEMIS credits, you will have 2,2 HEMIS credits. This means that you satisfy the requirement to have 2,0 HEMIS credits after three years of study, but you do not satisfy this requirement of having 0,5 HEMIS credits in the preceding year.

2.6.5 Requirements for renewal after one year of study in a BEng (EDP)

You must have passed all the modules of the first year to be admitted to the second year of the BEng (EDP) programme.

The Faculty determines the performance level it requires for the first year and communicates it to students at the beginning of the academic year. You must pass all the modules of the first year on this level.

2.6.6 Requirements for renewal after two or more years of study in a BEng (EDP)

HEMIS credits

As a BEng (EDP) student, you must have acquired the following HEMIS credits, after the number of years of study mentioned below, to be permitted to continue your studies:

Please note: The first year of a BEng (EDP) = 1 HEMIS credit

- After 2 years at least 1,6 HEMIS credits
- After 3 years at least 2,3 HEMIS credits
- After 4 years at least 3,0 HEMIS credits
- After 5 years at least 3,7 HEMIS credits
- After 6 years at least 4,4 HEMIS credits
- After 7 years at least 5,1 HEMIS credits

Further conditions

In addition to the HEMIS credits, you must meet the following conditions to be able to renew your registration:

- After 3 years of full-time study, you must normally have passed all the prescribed modules for the first two years of study of the BEng (EDP).
- After 5 years of full-time study, you must normally have passed all the prescribed modules of the first three years of study of the BEng (EDP).
- After 7 years of full-time study, you must have completed the programme successfully and will normally not be permitted to continue if you haven't completed it.
- Irrespective of any other stipulations, you will normally only be permitted to study further if you have acquired at least 0,5 HEMIS credits in the year preceding the one in which you want to continue studying.

  For example: If you passed all your modules in your first and second year, but in your third year you only managed to acquire 0,3 HEMIS credits, you will have 2,3 HEMIS credits. This means that you satisfy the requirement to have 2,3 HEMIS credits after three years of study, but you do not satisfy this requirement of having 0,5 HEMIS credits in the preceding year.

2.6.7 Applying for readmission if you did not meet the requirements for renewal

If you do not meet the conditions to continue your studies at this University in your chosen BEng programme, you may apply for readmission to the particular programme. You must:

- apply in writing to the Registrar before the date given in Part 1 (General: Policies and Rules) of the University Calendar, in the section "Readmission After Unsuccessful Studies".
- include in your application a full statement of reasons why you should be readmitted, with supporting documentation where applicable.

The Readmission Committee of the University will consider your application and make a recommendation to the Executive Committee of Senate.

It may happen that your studies are interrupted before you can successfully apply for readmission. In that case, refer to Section 2.6.1 above regarding credit transfer.

2.6.8 Requirements for renewal after you have been readmitted

If your application for readmission is successful, you may continue your BEng studies at the University in each subsequent year under the following condition:

- You must complete at least 0,7 HEMIS credits in the immediately preceding year. This requirement replaces the normal requirements regarding the number of HEMIS credits required per year as given in Sections 2.6.4 and 2.6.6.

2.7 Rules for following modules from more than one year of study

You may register in a single semester for modules from more than one year of a particular programme. The following rules apply to BEng (4yr) as well as BEng (EDP) students who want to do that:

- To receive a final mark for a module, you must be registered for that module.
- You must meet the requirements regarding normal, co- and pass prerequisites.
- There must be no timetable clashes for classes, tests, assessments or examinations. The University publishes these timetables centrally and it is entirely your responsibility to make sure that there are no clashes.

  Please note the exceptions discussed below.

- You may register for at most 100% of the normal academic load per semester.

  For example: The total number of credits for a semester of the BEng (4yr) is typically 76 or fewer. Therefore, if you are registering for modules from the second and third year in a semester, your total combined load must be fewer than or equal to 76 credits.

Please note the exceptions discussed below.

- In a single semester, you may not simultaneously register for modules from more than two consecutive years of a degree programme.

  For example: You may not register for a third-year module and a first-year module in the same semester, but you may register for a first-year module in the first semester and for a third-year module in the second semester, or vice versa.

- In any given semester, you may only register for modules from more than one year if you:
  - have already passed all the modules for the corresponding semester of the more junior years, or
  - if you are also registering for the modules from all the corresponding semesters of the more junior years, which you have not yet passed.

    For example: You may follow a first-semester module from the third year if you:
    - have already passed all the first-semester modules of the first two years, or
    - if you have passed all the first-semester modules from the first year, as well as some of the modules from the second year, and you are also registering for the remaining first-semester modules from the second year.

The following exceptions apply to the rules above:

- You may not register for modules with clashing assessment timetables (that is, test, assessment or examination timetables), but you may register for two modules with clashing contact sessions (lectures, tutorials or practicals) if the clashes have been resolved. A clash has been resolved when lecturers from one or both of the clashing modules have granted you written exemption from clashing sessions.
- If you meet the requirements to register for the complete normal semester of a particular year of study, but in that semester you still have to pass one module from an earlier year, the chairperson of the programme's home department may permit you to register for the complete semester and the additional module. The following apply here:
  - You will be permitted on merit to register for the additional module and must therefore have performed satisfactorily in other respects.
  - The chairperson of the relevant department will make a decision in consultation with the Dean of the Faculty.

Also note the stipulations about repeating a module in the section "Provisions Relating to Examination and Promotion" in Part 1 of the University Calendar.

2.8 Dean's concession examinations

You can find the Faculty's rules regarding dean's concession examinations in the Faculty's "Assessment Rules" (consult Section 1.6 above to find out how to access this document).

To apply for a dean's concession examination:

- E-mail your application to the Faculty Secretary as soon as all your final marks are known.
- The Faculty Secretary will inform you, by e-mail to your university e-mail address, whether your application was successful.

Dean's concession examinations are conducted on a date and at a time determined by the Dean.

2.9 Improving your final mark

- **Modules for which only satisfactory attendance is required:** You can improve you final marks *until the end of January*, but you must first get approval from the departmental chairperson of the module's home department.
- **Modules that make use of project evaluation in the final year:** If you are in your final year and did not pass the relevant module, the departmental chairperson may give you an opportunity to improve your final mark at *any time after the normal round of examinations in November*. The following applies:
  - The relevant department will prescribe work for improving your final marks, which you must complete satisfactorily.
  - The examiners may submit the improved final mark *any time after the normal round of examinations.*
  - Marks are submitted for interim approval by the Executive Committee of the Senate.
  - This concession must be limited to no more than two modules per student.
- **All other cases:** Any opportunity to improve your final mark may only be granted *before the date when the final marks of a particular June or December examination are due*.

2.10 Electronic pocket calculators

As from your first year, you must own an approved electronic pocket calculator as specified in the Faculty's "General Stipulations for Under- and Postgraduate Modules" (consult Section 1.6 above to find out how to access this document.).

Please note:

- In the first and second year of a BEng (4yr), you may only use the prescribed type of pocket calculator in tests, main assessments and examinations.
- In other years of study, some lecturers may also require that you use only the prescribed type of calculator for certain assessments.

2.11 Programme structure and content

2.11.1 Interpreting the curriculum tables

Symbols used

In the tables below, you can find each module's credit value and lecture load. The symbols mean the following:

L Number of lecture periods per week

P Number of laboratory practicals per week

T Number of tutorials periods per week

S Number of seminar periods per week

c Credit value (SAQA credits: Total number of hours it would typically take a student to complete the module, divided by 10)

Time allocations

Lecture, seminar and single tutorial periods are 50 minutes long and normally in the morning. The following applies for consecutive laboratory practical and tutorial periods:

- The ten-minute break between periods is included in the contact time. A load of 2,25 for consecutive tutorial or practical periods in the afternoon means that you start at 14:00 and finish at 16:15. A load of 2,5 consecutive tutorial or practical periods in the afternoon means that you start at 14:00 and finish at 16:30.
- A load of 0,75 typically means that every second week you do a tutorial or practical which takes up half an afternoon (1 hour 20 minutes to 1 hour 30 minutes) or, every fourth week, a full afternoon of three hours.
- When the venue timetable is prepared, a room is allocated for the required number of periods, for example three periods for 2,25 consecutive tutorial or practical periods.

2.11.2 Curriculum of BEng (EDP)

The first year of the BEng (EDP) in all fields of study is coordinated by the Science Faculty. From the second year onwards, the curriculum for the EDP in each field of engineering study is the same as the curriculum of the first and later years of the corresponding BEng (4yr) programme and is coordinated by the relevant department.

Year 1 (EDP) – all fields

The curriculum of the first-year of the BEng (EDP) in all fields of study is as follows:

Both semesters

	L	***P***	***T***	***S***	***c***
Chemistry 176	3	3	0	0	32
Computer Skills 176	1	0	4	0	8
Mathematics 186	3	0	3	0	32
Physics 176	3	3	0	0	32
University Practice in the Natural Sciences 176*	3	0	0	0	8
TOTALS	**13**	**6**	**7**	**0**	**112**

** 5L in the first semester and 1L in the second semester.*

First semester

	L	***P***	***T***	***S***	***c***
Scientific Communication Skills 116	3	0	3	0	12
TOTALS	**3**	**0**	**3**	**0**	**12**

Second semester

	L	***P***	***T***	***S***	***c***
Preparatory Technical Drawings 146	3	3	0	0	16
Scientific Communication Skills 146	3	0	0	0	6
TOTALS	**6**	**3**	**0**	**0**	**22**

Year 2 (EDP) and further

The curricula of the second and later years of study of each BEng (EDP) are the same as the first and later years of the corresponding BEng (4yr).

2.11.3 Curriculum of the first year of all BEng (4yr) programmes

The curriculum of the first year of the BEng (4yr) is the same for all fields of study:

First semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 124	4	0	2	0	15
Engineering Chemistry 123	4	0	2	0	15
Engineering Drawings 123**	1	3	3	0	15
Engineering Mathematics 115	5	0	2	0	15
Engineering Physics 113	2	0,5	0,5	0	8
Professional Communication 113	2	0	1	0	8
Probability Theory and Statistics 114*	3	0	3	0	16
TOTALS	**18 or 20**	**0,5 or 3,5**	**10,5**	**0**	**76 or 77**

** Only for the Data Engineering focus area in BEng (Electrical and Electronic Engineering)*

*** Not for the Data Engineering focus area in BEng (Electrical and Electronic Engineering)*

Second semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 154	4	0	2	0	15
Computer Programming 143	3	2	0	0	12
Data Science 141*	3	0	3	0	16
Electrotechnique 143	3,5	1	2	0	15
Engineering Mathematics 145	5	0	2	0	15
Strength of Materials 143**	3	0	2	0	12
One of the following modules according to the corresponding programme (see note below):					
Chemistry C 152	0	3	0	0	6
Electronic Engineering 152**	0	0	3	0	6
Engineering Physics 152	2	0	1	0	6
Industrial Engineering 152	0	0	3	0	6
Mechanical Engineering 152	0	0	3	0	6
Mechatronic Engineering 152	0	0	3	0	6
TOTALS	**18,5 or 20,5**	**3 or 6**	**8, 9 or 11**	**0**	**73 or 75**

** Only for the Data Engineering focus area in BEng (Electrical and Electronic Engineering)*

*** Not for the Data Engineering focus area in BEng (Electrical and Electronic Engineering)*

Note: Engineering Physics 152 is part of the BEng Civil Engineering programme, and Chemistry C 152 is part of BEng Chemical Engineering. The modules for the other programmes are as indicated by their names. This choice will not prevent you from changing to another degree programme at the end of the first year if you are eligible for

such a change. (Refer to Section 2.5 above for details on changing your degree programme.)

2.11.4 Curriculum of four-year BEng Chemical Engineering

Home department: Process Engineering

Year 1

The common first-year curriculum for BEng (4yr) (see Section 2.11.3).

Year 2

First semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 224	3	0	3	0	15
Chemical Engineering 224	3	0	3	0	15
Chemistry C 224	4	2	0	0	15
Engineering Mathematics 214	4	0	2	0	15
Practical Workshop Training 211	0	0	0	0	0
Thermodynamics A 224	3	1	2.5	0	15
TOTALS	**17**	**3**	**10,5**	**0**	**75**

Second semester

	L	*P*	*T*	*S*	*c*
Chemical Engineering 254	3	0	3	0	15
Chemical Engineering 264	3	1	2	0	15
Chemistry C 254	4	2	0	0	15
Engineering Mathematics 242	2	0	1	0	8
Engineering Statistics 243	3	1	2,5	0	15
Numerical Methods 262	2	0	1	0	8
TOTALS	**17**	**4**	**9,5**	**0**	**76**

Year 3

Both semesters

	L	*P*	*T*	*S*	*c*
Internship (Eng) 392*	0	0	0	0	0
Internship (Eng) 393*	0	0	0	0	0

** These are optional modules that allow selected students to interrupt their credit-bearing studies for one year to complete internships at approved organisations, or to complete a semester of credit-bearing exchange; consult the module contents in Section 4.3 for further details. These optional modules may not be available in all years and you should confirm their availability before making any arrangements.*

First semester

	L	*P*	*T*	*S*	*c*
Chemical Engineering 316	3	1	2	0	15
Chemical Engineering 317	3	1	2	0	15
Complementary Studies (Eng) 311*	2	0	3	0	8
Heat Transfer A 326	3	1	2	0	15
Particle Technology 316	3	1	2	0	15
Philosophy and Ethics 314*	2	0	0	0	4
TOTALS	**16**	**4**	**11**	**0**	**72**

** Lecture periods used only in first term*

Second semester

	L	*P*	*T*	*S*	*c*
Chemical Engineering 344	3	0	2	0	15
Chemical Engineering 354	3	0	2	0	15
Chemical Engineering 367	3	0	2	0	15
Chemical Engineering D 356	1	6	0	0	15
Mineral Processing 345	3	1	2	0	15
Vacation Training 361	0	0	0	0	0
TOTALS	**13**	**7**	**8**	**0**	**75**

Year 4

Both semesters

	L	*P*	*T*	*S*	*c*
Final-year Project (C) 478	0	6	0	0	32*
TOTALS	**0**	**6**	**0**	**0**	**32***

** 6 credits in the first semester and 26 credits in the second semester.*

First semester

	L	*P*	*T*	*S*	*c*
Chemical Engineering 424	3	1	2	0	15
Chemical Engineering 426	3	1	2	0	15
Environmental Engineering 414	3	0	2,5	0	15
Mineral Processing 415	3	0	2	0	15
Project Management 412	3	0	1	0	12
TOTALS	**15**	**2**	**9,5**	**0**	**72**

Second semester

	L	*P*	*T*	*S*	*c*
Design Project 488	2	0	2	0	48
TOTALS	**2**	**0**	**2**	**0**	**48**

2.11.5 Curriculum of four-year BEng Civil Engineering

Home department: Civil Engineering

Year 1

The common first-year curriculum for BEng (4yr) (see Section 2.11.3)

Year 2

First semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 224	3	0	3	0	15
Civil Engineering 224	3	0	2,5	0	15
Engineering Geology 214	3	3	0	0	15
Engineering Mathematics 214	4	0	2	0	15
Strength of Materials 224	3	0	2,5	0	15
TOTALS	**16**	**3**	**10**	**0**	**75**

Second semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 242	2	0	1,5	0	8
Applied Mathematics B 252	2	0	1	0	8
Building Materials 254	3	2	1	0	15
Engineering Informatics 244	3	0	2,5	0	15
Geotechnique 254	3	0	2,5	0	15
Strength of Materials 254	3	0	2,5	0	15
Vacation Training 241	0	0	0	0	0
TOTALS	**16**	**2**	**11**	**0**	**76**

Year 3

Both semesters

	L	*P*	*T*	*S*	*c*
Internship (Eng) 392*	0	0	0	0	0
Internship (Eng) 393*	0	0	0	0	0

** These are optional modules that allow selected students to interrupt their credit-bearing studies for one year to complete internships at approved organisations, or to complete a semester of credit-bearing exchange; consult the module contents in Section 4.3 for further details. These optional modules may not be available in all years and you should confirm their availability before making any arrangements.*

First semester

	L	*P*	*T*	*S*	*c*
Data Analytics (Eng) 324**	3	0	2,5	0	15
Engineering Informatics 314	3	0	2,5	0	15
Engineering Statistics 314*	3	0	2,5	0	15
Hydraulics 324	3	0	2,5	0	15
Transport Science 324	3	1	1,5	0	15
Water Treatment 324	3	0	2,5	0	15
TOTALS	**15**	**1**	**11,5**	**0**	**75**

** Until 2020*

***From 2021*

Second semester

	L	*P*	*T*	*S*	*c*
Geotechnique 354	3	1,5	1	0	15
Hydraulics 354	3	0,5	2	0	15
Structural Design 354	3	0	2,5	0	15
Theory of Structures 354	3	0	2,5	0	15
Transport Science 364	3	1	1,5	0	15
Vacation Training 342	0	0	0	0	0
TOTALS	**15**	**3**	**9,5**	**0**	**75**

Year 4

First semester

	L	*P*	*T*	*S*	*c*
Hydraulic Engineering 424	3	0	2,5	0	15
Hydrology 424	3	0	2,5	0	15
Philosophy and Ethics 414*	2	0	0	0	4
Project Management 412	3	0	1	0	12
Structural Design 424	3	0	2,5	0	15
Transport Science 434	3	1	1,5	0	15
TOTALS	**17**	**1**	**10**	**0**	**76**

** Lecture periods used only in first term*

Second semester

	L	*P*	*T*	*S*	*c*
Advanced Design (Civil) 446	2	6	0	0	15
Complementary Studies (Eng) 441*	2	0	3	0	8
Engineering Management 454	4	0	1	0	12
Environmental Engineering 452**	3	0	2,5	0	8
Project (Civil Engineering) 458	1	20	0	0	30
TOTALS	**12**	**26**	**6,5**	**0**	**73**

** Lecture periods used only in third term*

*** Presented during the first seven weeks of the semester.*

2.11.6 Curriculum of four-year BEng Electrical and Electronic Engineering

Home department: Electrical and Electronic Engineering

The following focus areas are offered:

- Data Engineering
- Electromagnetics and Telecommunication
- Energy
- Informatics
- Robotics

These focus areas give you the opportunity to partially focus you degree programme in your direction of choice as preparation for modern industry and/or postgraduate study.

If you choose the Data Engineering focus area, you must do so from your first year. Otherwise, in the second semester of the third year, you must choose one of the remaining focus areas.

Year 1

The common first-year curriculum for BEng (4yr) (see Section 2.11.3).

Year 2

First semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 224	3	0	3	0	15
Computer Systems 214	3	2	1	0	15
Computer Science E 214	3	3	0	0	15
Engineering Mathematics 214	4	0	2	0	15
Mathematical Statistics 214*	3	0	3	0	16
Systems and Signals 214**	3	1	2	0	15
TOTALS	**16**	**5 or 6**	**8 or 9**	**0**	**75 or 76**

** Only for the Data Engineering focus area, from 2021*

***Not for the Data Engineering focus area*

Second semester (all focus areas except Data Engineering)

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 242	2	0	1,5	0	8
Computer Systems 245	3	3	0	0	15
Electronics 245	3	1	2	0	15
Energy Systems 244	3	0,5	2,5	0	15
Engineering Mathematics 242	2	0	1	0	8
Systems and Signals 244	3	1,5	1,5	0	15
TOTALS	**16**	**6**	**8,5**	**0**	**76**

Second semester (only Data Engineering focus area, from 2021)

	L	*P*	*T*	*S*	*c*
Computer Systems 245	3	3	0	0	15
Data Engineering 245	3	1	1	0	12
Engineering Mathematics 242	2	0	1	0	8
Mathematical Statistics 245	2	0	1	0	8
Mathematical Statistics 246	2	1	0	0	8
Numerical Methods 262	2	0	1	0	8
Systems and Signals 244	3	1,5	1,5	0	15
TOTALS	**17**	**6,5**	**5,5**	**0**	**74**

Year 3

Both semesters

	L	*P*	*T*	*S*	*c*
Internship (Eng) 392*	0	0	0	0	0
Internship (Eng) 393*	**0**	**0**	**0**	**0**	**0**

** These are optional modules that allow selected students to interrupt their credit-bearing studies for one year to complete internships at approved organisations, or to complete a semester of credit-bearing exchange; consult to the module contents in Section 4.3 for further details. These optional modules may not be available in all years and you should confirm their availability before making any arrangements.*

First semester (all focus areas except Data Engineering)

	L	*P*	*T*	*S*	*c*
Control Systems 314	3	1,5	1,5	0	15
Design (E) 314	1	3	0	0	15
Electromagnetics 314	3	1	2	0	15
Electronics 315	3	1,5	1,5	0	15
Systems and Signals 315	3	1,5	1,5	0	15
TOTALS	**13**	**8,5**	**6,5**	**0**	**75**

First semester (only Data Engineering focus area, from 2022)

	L	*P*	*T*	*S*	*c*
Computer Science 314	3	3	0	0	16
Computer Science 315	3	3	0	0	16
Design (E) 314	1	3	0	0	15
Mathematical Statistics 312	3	1	0	0	16
Mathematical Statistics 316	3	1	0	0	16
TOTALS	**13**	**11**	**0**	**0**	**79**

Second semester (all focus areas except Data Engineering)

	L	*P*	*T*	*S*	*c*
Control Systems 344	3	1,5	1,5	0	15
Design (E) 344	1	3	0	0	15
Electronics 365	3	1	2	0	15
Systems and Signals 344	3	1	2	0	15
Choose one of the following elective modules (see note below):					
Electromagnetics 344	3	1,5	1,5	0	15
Energy Systems 344	3	1	2	0	15
TOTALS	**13**	**8/7,5**	**7/7,5**	**0**	**75**

Note: Electromagnetics 344 is a prerequisite for the Electromagnetics and Telecommunication

focus area in Year 4 and Energy Systems 344 is a prerequisite for the Energy focus area in Year 4. For the other two focus areas, you may choose either of the two elective modules.

Second semester (only Data Engineering focus area, from 2022)

	L	*P*	*T*	*S*	*c*
Computer Science 344	3	3	0	0	16
Data Analytics (Eng) 344	3	0	3	0	15
Data Engineering 344	3	1,5	1,5	0	15
Operations Research (Eng) 345	3	0	3	0	15
Mathematical Statistics 344	3	1	0	0	16
TOTALS	**15**	**5,5**	**7,5**	**0**	**77**

Year 4

First semester: focus area Electromagnetics and Telecommunication

	L	*P*	*T*	*S*	*c*
High Frequency Technique 414	3	1	1	0	15
Philosophy and Ethics 414*	2	0	0	0	4
Project Management 412	3	0	1	0	12
Systems and Signals 414	3	1	1	0	15
Telecommunication 414	3	1	1	0	15
Choose one of the following elective modules:					
Computer Systems 414	3	1	1	0	15
Data Analytics (Eng) 414	3	1	1	0	15
Electronics 414	3	1	1	0	15
TOTALS	**17**	**4**	**5**	**0**	**76**

** Lecture periods used only in first term*

First semester: focus area Informatics

	L	*P*	*T*	*S*	*c*
Computer Science 334	3	3	0	0	16
Computer Science (E) 414	3	0,5	0,5	0	15
Philosophy and Ethics 414*	2	0	0	0	4
Project Management 412	3	0	1	0	12
Systems and Signals 414	3	1	1	0	15
Choose one of the following elective modules:					
Computer Systems 414	3	1	1	0	15
Telecommunication 414	3	1	1	0	15
TOTALS	**17**	**5,5**	**3,5**	**0**	**77**

** Lecture periods used only in first term*

First semester: focus area Energy

	L	*P*	*T*	*S*	*c*
Electronics 414	3	1	1	0	15
Energy Systems 414	3	0,5	1,5	0	15
Energy Systems 424	3	0,5	1,5	0	15
Philosophy and Ethics 414*	2	0	0	0	4
Project Management 412	3	0	1	0	12
Choose one of the following elective modules:					
Computer Systems 414	3	1	1	0	15
Control Systems 414	3	1	1	0	15
Data Analytics (Eng) 414	3	1	1	0	15
TOTALS	**17**	**3**	**6**	**0**	**76**

** Lecture periods used only in first term*

First semester: focus area Robotics

	L	*P*	*T*	*S*	*c*
Computer Science (E) 414	3	3	0	0	15
Control Systems 414	3	1	1	0	15
Philosophy and Ethics 414*	2	0	0	0	4
Project Management 412	3	0	1	0	12
Systems and Signals 414	3	1	1	0	15
Choose one of the following elective modules:					
Computer Systems 414	3	1	1	0	15
Electronics 414	3	1	1	0	15
TOTALS	**17**	**6**	**4**	**0**	**76**

** Lecture periods used only in first term*

First semester: focus area Data Engineering (from 2023)

	L	*P*	*T*	*S*	*c*
Computer Science 334	3	3	0	0	16
Data Engineering 424	3	1	1	0	15
Operations Research (Eng) 415	3	0	3	0	15
Optimisation (Eng) 414	3	0	3	0	15
Philosophy and Ethics 414*	2	0	0	0	4
Project Management 412	3	0	1	0	12
TOTALS	**17**	**4**	**8**	**0**	**77**

** Lecture periods used only in first term*

Second semester: all focus areas

	L	*P*	*T*	*S*	*c*
Complementary Studies (Eng) 441*	2	0	3	0	8
Entrepreneurship (Eng) 444	3	0	3	0	15
Environmental Engineering 442**	3	0	2	0	8
Project (E) 448	0	20	0	0	45
TOTALS	**8**	**20**	**8**	**0**	**76**

** Lecture periods used only in third term*

*** Presented during the first seven weeks of the semester*

2.11.7 Curriculum of four-year BEng Industrial Engineering

Home department: Industrial Engineering

Year 1

The common first-year curriculum for BEng (4yr) (see Section 2.11.3)

Year 2

First semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 224	3	0	3	0	15
Electrotechnique 214	3	1	2	0	15
Engineering Economics 212	2	0	2	0	8
Engineering Mathematics 214	4	0	2	0	15
Practical Workshop Training 211	0	0	0	0	0
Production Management 212	2	0	2	0	8
Thermofluid Dynamics 214	3	1	2	0	15
TOTALS	**17**	**2**	**13**	**0**	**76**

Second semester

	L	*P*	*T*	*S*	*c*
Industrial Programming 244	2	0	3	0	15
Introductory Machine Design 244	1	3	2	0	15
Engineering Mathematics 242	2	0	1	0	8
Manufacturing Processes 244	2	1,5	1	0	15
Material Science A 244	3	3	0	0	15
Numerical Methods 262	2	0	1	0	8
TOTALS	**12**	**7,5**	**8**	**0**	**76**

Year 3

Both semesters

	L	*P*	*T*	*S*	*c*
Internship (Eng) 392*	0	0	0	0	0
Internship (Eng) 393*	0	0	0	0	0

** These are optional modules that allow selected students to interrupt their credit-bearing studies for one year to complete internships at approved organisations, or to complete a semester of credit-bearing exchange; consult the module contents in Section 4.3 for further details. These optional modules may not be available in all years and you should confirm their availability before making any arrangements.*

First semester

	L	*P*	*T*	*S*	*c*
Complementary Studies (Eng) 311*	2	0	3	0	8
Control Systems 314	3	1,5	1,5	0	15
Engineering Statistics 314	3	0	2,5	0	15
Manufacturing Systems 314	2	0	2	0	15
Philosophy and Ethics 314*	2	0	0	0	4
Production Management 314	3	1	2	0	15
TOTALS	**15**	**2,5**	**11**	**0**	**72**

** Lecture periods used only in first term*

Second semester

	L	*P*	*T*	*S*	*c*
Data Analytics (Eng) 344	3	2	1	0	15
Engineering Economics 354	3	0	3	0	15
Industrial Management 354	3	0	3	0	15
Operations Research (Eng) 345	3	0	3	0	15
Quality Assurance 344	3	0	3	0	15
Vacation Training 351	0	0	0	0	0
TOTALS	**15**	**2**	**13**	**0**	**75**

Year 4

Both semesters

	L	*P*	*T*	*S*	*c*
Industrial Project 498	0	0	0	1	30*
TOTALS	**0**	**0**	**0**	**1**	**30***

** 15 credits in the first semester and 15 credits in the second semester.*

First semester

	L	*P*	*T*	*S*	*c*
Industrial Ergonomics 414	3	0	1,5	0	15
Information Systems 414	2	1,2	2	0	15
Operations Research (Eng) 415	3	0	3	0	15
Project Management 412	3	0	1	0	12
TOTALS	**11**	**1,2**	**7,5**	**0**	**57**

Second semester

	L	*P*	*T*	*S*	*c*
Industrial Practice 442	2	0	1	1	8
Environmental Engineering 442*	3	0	2	0	8
Enterprise Design 444	2	0	2	0	15
Quality Management 444	2	0	3	0	15
Simulation 442	3	1	2	0	12
Vacation Training 451	0	0	0	0	0
TOTALS	**12**	**1**	**10**	**1**	**58**

** Presented during the first seven weeks of the semester.*

2.11.8 Curriculum of four-year BEng Mechanical Engineering

Home department: Mechanical and Mechatronic Engineering

Year 1

The common first-year curriculum for BEng (4yr) (see Section 2.11.3).

Year 2

First semester

	L	*P*	*T*	*S*	*c*
Applied Mathematics B 224	3	0	3	0	15
Electrotechnique 214	3	1	2	0	15
Engineering Mathematics 214	4	0	2	0	15
Strength of Materials 224	3	0	2,5	0	15
Thermodynamics A 214	3	0	3	0	15
Choose either the following elective module or the corresponding elective module in the second semester:					
Practical Workshop Training 211	0	0	0	0	0
TOTALS	**16**	**1**	**12,5**	**0**	**75**

Second semester

	L	*P*	*T*	*S*	*c*
Engineering Mathematics 242	2	0	1	0	8
Fluid Mechanics 244	3	1	2	0	15
Introductory Machine Design 254	2	3	1	0	15
Material Science A 244	3	3	0	0	15
Numerical Methods 262	2	0	1	0	8
Strength of Materials W 244	3	1	2	0	15
Choose either the following elective module or the corresponding elective module in the first semester:					
Practical Workshop Training 241	0	0	0	0	0
TOTALS	**15**	**8**	**7**	**0**	**76**

Year 3

Both semesters

	L	*P*	*T*	*S*	*c*
Internship (Eng) 392*	0	0	0	0	0
Internship (Eng) 393*	0	0	0	0	0

** These are optional modules that allow selected students to interrupt their credit-bearing studies for one year to complete internships at approved organisations, or to complete a semester of credit-bearing exchange; consult the module contents in Section 4.3 for further details. These optional modules may not be available in all years and you should confirm their availability before making any arrangements.*

First semester

	L	*P*	*T*	*S*	*c*
Complementary Studies (Eng) 311*	2	0	3	0	8
Electrical Drive Systems 324	3	1	2	0	15
Philosophy and Ethics 314*	2	0	0	0	4
Machine Design A 314	2	2	2	0	15
Modelling 334	4	1	2	0	18
Strength of Materials W 334	3	1	2	0	15
TOTALS	**16**	**5**	**11**	**0**	**75**

** Lecture periods used only in first term*

Second semester

	L	*P*	*T*	*S*	*c*
Control Systems 354	4	1	2	0	18
Data Analytics (Eng) 344**	3	2	1	0	15
Electronics 344*	3	1,5	1,5	0	15

Machine Design B 344	2	2	2	0	15
Thermofluid Dynamics 344	3	1	2	0	15
Vacation Training 341	0	0	0	0	0
Vibration and Noise 354	3	1	1	0	12
TOTALS	**15**	**6,5 or 7**	**8 or 8,5**	**0**	**75**

** Until 2020*

***From 2021*

Year 4

Both semesters

	L	***P***	***T***	***S***	***c***
Mechanical Project 478	2	3	0	0	45*
TOTALS	**2**	**3**	**0**	**0**	**45***

** 3 credits in the first semester and 42 credits in the second semester*

First semester

	L	***P***	***T***	***S***	***c***
Energy Systems M 434	3	1	2	0	15
Heat Transfer A 414	3	1	2	0	15
Mechatronics 424*	3	3	0	0	18
Project Management 412	3	0	1	0	12
Choose one of the following elective modules:					
Finite Element Methods 414	3	1	2	0	15
Maintenance Management 414	3	0,5	2,5	0	15
Mechanical Engineering 414**	3	1	2	0	15
Numerical Fluid Dynamics 414	3	1	2	0	15
TOTALS	**15**	**5,5 or 6**	**7 of 7,5**	**0**	**75**

** A part of this module is presented before the normal start of the semester until 2021, where after the module's credits change to 15.*

*** Not presented every year.*

Second semester

	L	*P*	*T*	*S*	*c*
Mechanical Design 444	3	3	0	0	15
Environmental Engineering 442*	3	0	2	0	8
Production Management 444	3	0	2	0	12
Vacation Training 441	0	0	0	0	0
TOTALS	**9**	**3**	**4**	**0**	**35**

** Presented during the first seven weeks of the semester.*

2.11.9 Curriculum of four-year BEng Mechatronic Engineering

Home department: Mechanical and Mechatronic Engineering

Year 1

The common first-year curriculum for BEng (4yr) (see Section 2.11.3).

Year 2

The same as BEng Mechanical Engineering.

Year 3

Both semesters

	L	*P*	*T*	*S*	*c*
Internship (Eng) 392*	0	0	0	0	0
Internship (Eng) 393*	0	0	0	0	0

** These are optional modules that allow selected students to interrupt their credit-bearing studies for one year to complete internships at approved organisations, or to complete a semester of credit-bearing exchange; consult the module contents in Section 4.3 for further details. These optional modules may not be available in all years and you should confirm their availability before making any arrangements.*

First semester

	L	*P*	*T*	*S*	*c*
Complementary Studies (Eng) 311*	2	0	3	0	8
Computer Systems 214	3	2	1	0	15
Electrical Drive Systems 324	3	1	2	0	15
Philosophy and Ethics 314*	2	0	0	0	4
Machine Design A 314	2	2	2	0	15
Modelling 334	4	1	2	0	18
TOTALS	**16**	**6**	**10**	**0**	**75**

** Lecture periods used only in first term*

Second semester

	L	*P*	*T*	*S*	*c*
Computer Systems 245	3	3	0	0	15
Control Systems 354	4	1	2	0	18
Data Analytics (Eng) 344**	3	2	1	0	15
Electronics 245	3	1	2	0	15
Machine Design B 344*	2	2	2	0	15
Vacation Training 341	0	0	0	0	0
Vibration and Noise 354	3	1	1	0	12
TOTALS	**15 or 16**	**8**	**6 or 7**	**0**	**75**

** Until 2020*

***From 2021*

Year 4

Both semesters

	L	*P*	*T*	*S*	*c*
Choose one of the following elective modules:					
Mechatronic Project 478	2	3	0	0	45*
Mechatronic Project 488	2	3	0	0	45*
TOTALS	**2**	**3**	**0**	**0**	**45***

** 3 credits in the first semester and 42 credits in the second semester.*

First semester

	L	*P*	*T*	*S*	*c*
Design (E) 314	1	3	0	0	15
Electronics 315	3	1,5	1,5	0	15
Heat Transfer A 414	3	1	2	0	15
Mechatronics 424*	3	3	0	0	18
Project Management 412	3	0	1	0	12
TOTALS	**13**	**8,5**	**4,5**	**0**	**75**

** A part of this module is presented before the normal start of the semester until 2021, where after the module's credits change to 15.*

Second semester

	L	*P*	*T*	*S*	*c*
Mechanical Design 444	3	3	0	0	15
Environmental Engineering 442*	3	0	2	0	8
Production Management 444	3	0	2	0	12
Vacation Training 441	0	0	0	0	0
TOTALS	**9**	**3**	**4**	**0**	**35**

** Presented during the first seven weeks of the semester.*

2.11.10 Measures for repeating modules that have been removed from programmes

As a result of programme changes, transitional measures are being implemented to accommodate students who must repeat modules that are no longer part of a particular programme. If you must repeat a module, look below under the name of the relevant field of study for the measures that apply to you.

Chemical Engineering including Mineral Processing

Module previously in programme	Last year offered	Transitional measure
Chemical Engineering 414	2020 (only for repeating students)	If you have already passed Design 488, you must follow Chemical Engineering 414. If you do Design 488 in 2020 or later, you need not do Chemical Engineering 414.
Environmental Engineering 454	2019	You must follow Environmental Engineering 414.

Civil Engineering

Module previously in programme	Last year offered	Transitional measure
Engineering Statistics 314	N/a (continued for BEng Industrial Engineering)	You must follow Data Analytics (Eng) 324.
Environmental Engineering 454	2019	You must follow Environmental Engineering 452.

Electrical and Electronic Engineering

Module previously in programme	Last year offered	Transitional measure
Computer Science 315	N/a (part of BSc programmes)	You must follow Computer Science (E) 414.

Industrial Engineering

Module previously in programme	Last year offered	Transitional measure
Manufacturing Systems 414	2019	You must follow Manufacturing Systems 314

Mechanical Engineering

Module previously in programme	Last year offered	Transitional measure
Electronics 344	2020	You must follow Data Analytics (Eng) 344.
Introductory Machine Design 244	N/a (continued for BEng Industrial Engineering)	Students who have passed Modelling 334 with the modelling of mechanical systems content should follow Introductory Machine Design 244; otherwise follow Introductory Machine Design 254.

Mechatronic Engineering

Module previously in programme	Last year offered	Transitional measure
Introductory Machine Design 244	N/a (continued for BEng Industrial Engineering)	Students who have passed Modelling 334 with the modelling of mechanical systems content should follow Introductory Machine Design 244; otherwise follow Introductory Machine Design 254.
Machine Design B 344	N/a (continued for BEng Mechanical Engineering)	You must follow Machine Design B 344.

3 Postgraduate Programmes

In this chapter you will find Faculty-wide rules that apply to postgraduate study in engineering at this University. Please contact the relevant departmental chairperson for further details. For contact details, see Section 1.1.2 in the chapter "General Information" above.

3.1 Qualifications and fields of study

Qualifications

The Faculty awards the following postgraduate qualifications:

Please note: Figure 3.1 in Section 3.2 illustrates the postgraduate structure and admission paths.

- **PGDip (Engineering): Postgraduate Diploma in Engineering**
  The postgraduate diploma comprises an in-depth study in preparation for a master's programme or a broadened study involving more than one engineering discipline. The PGDip (Eng) does not lead to registration as a professional engineer.
- **PGDip (Engineering Science): Postgraduate Diploma in Engineering Science**
  The postgraduate diploma comprises an in-depth study in preparation for a master's programme in engineering science. The Faculty expects that this qualification will be approved late in 2019.
- **MEng: Master of Engineering**
  Two MEng qualifications are offered by the Faculty:
  - The MEng (Structured) is based on coursework and the emphasis is on the advanced application of engineering sciences in design.
  - The MEng (Research) consists of a research project, which must culminate in a satisfactory thesis about the research project.
- **MEngSc**
  - The MEngSc (Structured) is based on coursework and the emphasis is on the advanced application of engineering sciences.
  - The MEngSc (Research) consists of a research project that must culminate in a satisfactory thesis about that research project. The Faculty expects that this qualification will be approved late in 2019.
- **PhD: Doctor of Philosophy**
  The PhD degree programme comprises a research project and a dissertation on that project. The Faculty will only award the degree if the candidate has generated new knowledge through research.
- **DEng: Doctor of Engineering**
  The DEng may be awarded to candidates whose research has, over a number of years, made a substantial contribution towards humanity's knowledge in the field of engineering.

The following qualification has been phased out:

- **MScEng: Master of Science in Engineering**
  The last students started in this programme in February 2011.

Fields of study

The PGDip (Engineering), MEng (Structured), MEng (Research) and PhD can be awarded in the following fields of study:

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Electronic Engineering
- Engineering Management
- Industrial Engineering
- Mechanical Engineering
- Mechatronic Engineering

Further, the Faculty offers the following qualifications and fields of study:

- PGDip (Engineering Science) aimed at bridging students between BSc programmes and an MEngSc in Biomedical Engineering (approval pending)
- MEngSc (Research) in Biomedical Engineering (approval pending)
- MEngSc (Research) aimed at interdisciplinary study (approval pending)
- MEngSc (Structured) in Biomedical Engineering
- PhD in Biomedical Engineering

Unless stated otherwise, the arrangements given below for the PGDip (Engineering), MEng and PhD also apply to the corresponding programmes in engineering science and biomedical engineering.

Not all the programmes, fields of study and postgraduate modules are presented in a given year.

3.2 Postgraduate admission model for the Faculty of Engineering

The postgraduate programme structure and paths for admission are illustrated in Figure 3.1 below and apply to all postgraduate students who have been admitted from 2005 onwards. If you do not meet the qualification requirements shown in the model, the Faculty Board must first approve your admission to the relevant postgraduate programme.

The credit values in Figure 3.1 correspond to 1 credit for 10 hours of work for you as a student. The NQF levels refer to the National Qualification Framework.

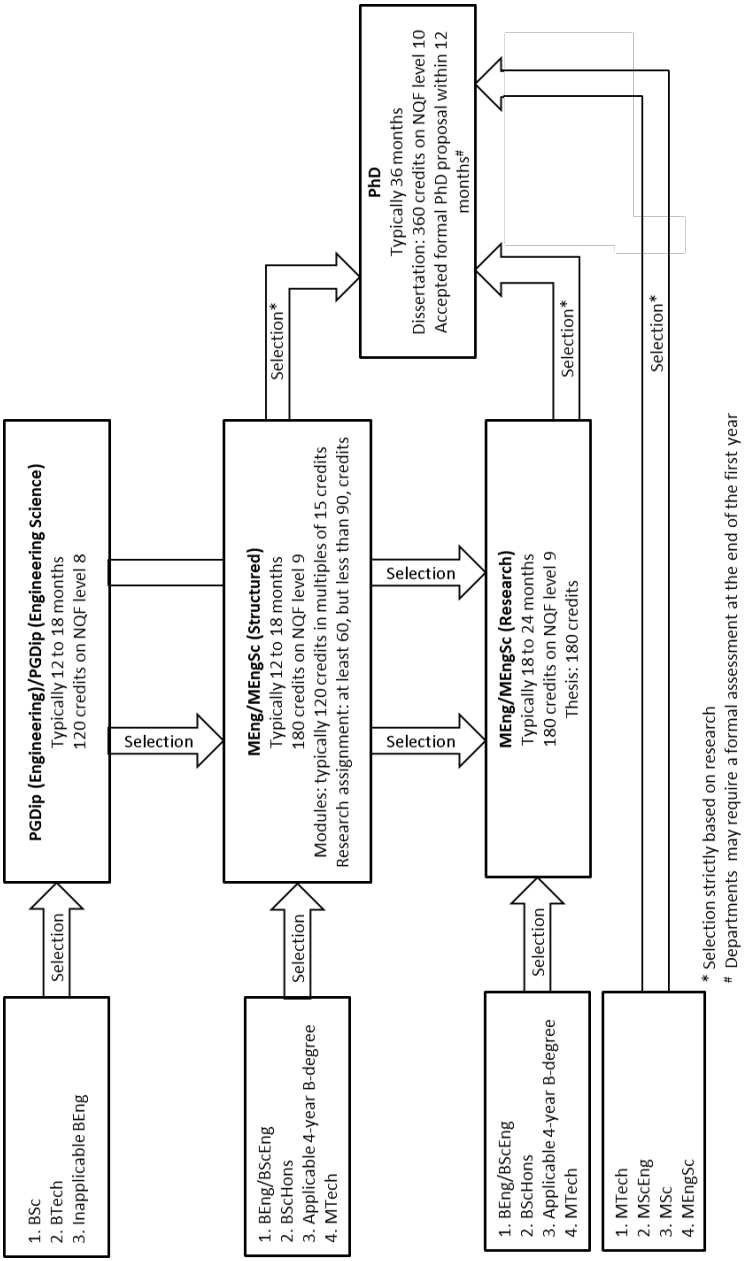

Figure 3.1: Postgraduate admission model

3.3 Recognition of prior learning

Sections 2.4.2.2 and 2.4.2.7 in the chapter "Undergraduate Programmes", regarding the recognition of modules that you have completed elsewhere, also apply here, except for the following:

- Exemption from module(s) can be granted on the strength of short courses you have completed that fall outside of the HEQSF (in other words, non-credit-bearing short courses), on condition that the course contents, duration and assessment of the short course are at least equivalent to the same of the relevant module(s).
- If you hold the required qualification for admission, but did not perform well enough, the departmental committees for Recognition of Prior Learning / Credit Accumulation and Transfer (RPL/CAT) may recognise supplementary learning and work experience to grant you admission, provided that your learning and experience show that you now have the potential to complete the relevant programme successfully.

  For example, if you did not achieve 60% in the final year of your previous qualification, but you have completed advanced projects successfully, then an RPL/CAT committee may allow you to enrol for a master's degree.
- Departmental RPL/CAT committees can consider recognising your work experience and projects for module credits, but not for research modules. Note that such work experience and projects must be of an appropriate scope and advanced nature.

3.4 Provisions regarding enrolment and conversion of programmes

3.4.1 Periods of enrolment

Table 3.1 below shows the following for the respective postgraduate programmes:

- the minimum number of years you must be enrolled,
- for how long you can normally expect to be enrolled,
- how many years you may enrol without having to apply for readmission (that is, the maximum period of enrolment for each postgraduate programme, as approved by the Faculty Board in 2004), and
- the year you will require permission for readmission, if you have not completed the programme by then.

Table 3.1: Periods of enrolment for postgraduate programmes

Programme	**Years of Enrolment**								
	1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***
PGDip (Eng) Full-time	*M*	*F*	***X***	-	-	-	-	-	-
PGDip (Eng) Part-time	*M*	*N*	*F*	***X***	-	-	-	-	-
MEng (Structured) Full-time	*M*	*F*	***X***	-	-	-	-	-	-
MEng (Structured) Part-time	*M*	*N*	*N*	*F*	***X***	-	-	-	-
MEng (Research) Full-time	*M*	*N*	*F*	***X***	-	-	-	-	-
MEng (Research) Part-time	*M*	*N*	*N*	*N*	*F*	***X***	-	-	-
MScEng Full-time	*M*	*N*	*F*	***X***	-	-	-	-	-
MScEng Part-time	*M*	*N*	*N*	*N*	*F*	***X***	-	-	-
PhD Full-time (after master's)	*M*	*M*	*N*	*F*	***X***	-	-	-	-
PhD Full-time (after BEng, no master's)	*M*	*M*	*M*	*N*	*F*	***X***	-	-	-
PhD Part-time (after master's)	*M*	*M*	*N*	*N*	*N*	*N*	*F*	***X***	-
PhD Part-time (after BEng, no master's)	*M*	*M*	*M*	*N*	*N*	*N*	*N*	*F*	***X***

Key:

M	Minimum enrolment period	Normal maximum period of enrolment
N	Normal enrolment after minimum	
F	Final concessional year (may register without having to apply for readmission)	
X	Enrolment only if readmission has been approved by the Faculty Board or, for a PhD, the Senate.	Allowed in exceptional circumstances
-	Further registrations normally not allowed	

3.4.2 Continued enrolment during the maximum period of enrolment

You must register as a student every year for the full duration of your studies, until you are awarded the degree or diploma concerned (see the section "Continuation of Registration for Postgraduate Programmes" in Part 1 of the University Calendar), except if the Faculty Board approves an interruption of your studies (consult Section 3.4.4 "Interruption of studies" below).

You must make sufficient progress in your studies each year to be permitted to register again. If your progress is insufficient, the relevant departmental chairperson may recommend to the Faculty Board that the Board prevent you from continuing your postgraduate studies. The Faculty Board could, among other things, consider the following:

- whether it is reasonable to expect you to complete the programme within the relevant maximum period of enrolment, taking into account your progress to date; and
- to what extent you have, to date, shown that you can work independently, regarding assignments, theses and dissertations.

3.4.3 Continued enrolment after the maximum period of enrolment

After the normal maximum enrolment period, you may only re-register as a postgraduate student if:

- you apply to be readmitted in order to continue your studies:
  - to the chairperson of the relevant department
  - by **15 January** of the year in which you want to continue your enrolment;
- the particular departmental chairperson recommends approving the application; and
- as a PGDip (Eng), MEng or MScEng student, you have obtained the Faculty Committee's permission; *or*

  as a PhD student, you have obtained the Senate's permission, on the Faculty Board's recommendation.

The Faculty Committee and Board will normally only once grant or recommend that your permitted maximum period of enrolment be extended.

See Table 3.1 above in Section 3.4.1 for the maximum periods of enrolment for the respective postgraduate programmes.

3.4.4 Interruption of studies

The Faculty Board may approve an interruption of your studies according to the section "Interruption of Master's and Doctoral Studies" in Part 1 of the Calendar (also see the section "Continuation of Registration for Postgraduate Programmes" in Part 1). Otherwise you must register as a student every year for the full duration of your studies until you are awarded the degree or diploma concerned. If the Faculty Board has approved your interruption of studies, the particular period will not be taken into account when it is determined whether or not you have exceeded the maximum allowed enrolment period. If the Faculty Board has not approved the interruption, the period of the interruption will be taken into account.

If you interrupted your studies without approval from the Faculty Board, you must apply anew at the relevant department for admission before you may enrol again. If the interruption was for two

or more years, the relevant department may require you to start the programme over, with a different research topic (if applicable).

3.4.5 Permission required for part-time enrolment

If you want to enrol part time, you must obtain approval from the departmental chairperson of your prospective home department. To get this approval, you must show that you will be a bona fide part-time student. Follow your prospective home department's procedures for submitting your application to study part time.

The Faculty will normally not allow you to change from full-time to part-time enrolment in its postgraduate programmes. In exceptional circumstances you may submit an application for such a change during the normal duration of the programme. Follow the procedure of your home department. The relevant departmental chairperson will make a recommendation to the Dean, who will consider permission for the change.

3.4.6 Converting between postgraduate programmes

3.4.6.1 From PGDip (Eng) to MEng

If your case is deserving, the Faculty Board may recommend to the Senate that your registration for a PGDip (Eng) be converted to registration for an MEng. You may convert if you:

- have progressed above the expected standards in your studies and
- want to continue studying at a master's level.

3.4.6.2 From MEng to MScEng

Since the MScEng programme is being phased out, you may no longer convert to it.

3.4.6.3 From MScEng and MEng (Research) to PhD

If your case is deserving, the Faculty Board may recommend to the Senate that your registration for a master's degree in engineering may be converted to registration for a doctorate degree. This applies only to registration for MScEng and MEng (Research). Applications are handled according to the rules in Part 1 of the Calendar, and the procedure described in the Faculty's "Minimum Standards Regarding Upgrading from MEng to PhD" (see Section 1.6 above for access to this document).

3.5 Postgraduate Diploma in Engineering (PGDip (Eng))

3.5.1 Admission requirements

To be considered for admission to a PGDip (Eng) programme, you must:

- hold at least an approved BTech, BEng or BSc degree from a South African university or university of technology; *or*
- hold other academic degree qualifications and appropriate experience that have been approved by the Faculty Board. The relevant department's chairperson must make a recommendation regarding such qualification and experience to the Faculty Board.

Also refer to the postgraduate admission model in Figure 3.1 in Section 3.2 near the beginning of this chapter.

3.5.2 Selection

Irrespective of the admission requirements above, you must be selected for the PGDip programme by the home department of the relevant field of study.

3.5.3 Application procedure

Submit your written application for admission to the PGDip (Eng) to the Registrar at least three months before the start of the first semester. Official application forms will then be sent to you. You must also provide the following information to the University along with your application forms:

- details of qualifications already obtained and appropriate experience gained,
- certified copies of the relevant certificates,
- the field of study of the PGDip (Eng) that you want to follow.

To obtain further details about the application procedure, please send an e-mail to the address at "Postgraduate enquiries" under the relevant home department in Section 1.1.2.

3.5.4 Duration and period of enrolment

- Table 3.1 in Section 3.4.1 earlier in this chapter shows the minimum, normal and maximum time you have available to complete the PGDip (Engineering) as a full-time or part-time student. Full-time students can normally complete the programme in one academic year (from February to November).

3.5.5 Pass requirements

You must obtain a final mark of at least 50% in each of the modules prescribed by the home department's chairperson.

If you required the approval of the Faculty Board for readmission (refer to Section 3.4.1 above), you will not be awarded the diploma *cum laude*, even if your marks otherwise would have permitted it.

3.5.6 Programme structure

- Depending on the composition of a PGDip (Eng), it may be presented in semester, self-study or block courses.
- The programme must include at least 120 credits on NQF level 8 (modules with a 7xx number).
- The chairperson of the home department may prescribe that you to undertake preparatory and/or supplementary study.
- As a student in a PGDip programme, you may normally not register for modules on NQF level 9 (i.e. modules with an 8xx module number).

3.6 Master of Engineering (MEng)

3.6.1 Admission requirements

To be considered for admission to the MEng (Research) and MEng (Structured) programmes, you must:

- hold at least a BEng, a BScHons, another relevant four-year bachelor's degree, an MTech, or a PGDip (Eng); *or*
- hold other academic degree qualifications and appropriate experience that have been approved by the Faculty Board. The relevant department's chairperson must make a recommendation regarding such qualification and experience to the Faculty Board.

Also refer to the postgraduate admission model in Figure 3.1 in Section 3.2 near the beginning of this chapter.

3.6.2 Selection

Irrespective of the admission requirements above, you must be selected for an MEng programme by the home department of the relevant field of study.

3.6.3 Application procedure

You must apply in writing to the Registrar for admission as a master's student. Provide the following information:

- details of qualifications already obtained,
- certified copies of the relevant certificates,
- your proposed field of study or subject of your thesis.

To obtain further details about the application procedure, please send an e-mail to the address at "Postgraduate enquiries" under the relevant home department in Section 1.1.2.

3.6.4 Duration and period of enrolment

Table 3.1 in Section 3.4.1 above shows the minimum, normal and maximum time available to you to complete the MEng (Structured) and the MEng (Research) as a full-time or part-time student. Note that the MEng (Structured) takes at least 12 months to complete if you are a full-time student, that is from February in the first year to January in the second year. Module scheduling constraints, however, often lead to full-time students only completing the programme at the end of the second year. Many full time MEng (Research) students complete the programme in two academic years by starting in February of the first year and receiving the degree in March of the third year.

3.6.5 Programme description: MEng (Structured)

The MEng (Structured) programme consists of 180 credits on NQF level 9. It comprises:

- a research assignment that contributes a minimum of 60 credits, but fewer than 90 credits, at NQF level 9;
- a number of required modules that contribute the balance of the required 180 credits at NQF level 9 after the credits of the research assignment have been considered; and
- possibly some supplementary modules.

The required and supplementary modules are prescribed by the chairperson of the relevant home department, while the topic of the research assignment is subject to the chairperson's approval. In the research assignment the emphasis is on the practical application of the theory and on assessing how valuable the impact of this application is.

Depending on their content, the modules in MEng (Structured) programmes may be presented in semester or block format. Particulars should be requested from the home department of the module (see the address for postgraduate enquiries under the home department in Section 1.1.2).

3.6.6 Programme description: MEng (Research)

For the MEng (Research) programme you must complete a thesis with a minimum credit value of 180 on NQF level 9.

Supplementary modules

In the following cases you must normally also complete supplementary modules:

- if you are admitted to any MEng (Research) programme without meeting the admission requirements.
- if supplementary modules are prescribed for all students in some MEng (Research) programmes (refer to the relevant department's website).

Supplementary modules are prescribed by the chairperson of your home department on the basis of:

- the requirements of the specific field of study.
- the specific objectives of your studies, your academic background and your experience.
- the availability of lecturing personnel who can lead students in the specific fields of study and modules.

Supplementary modules are normally taken from MEng (Structured), PGDip (Eng) or even BEng programmes.

Thesis requirements

You must satisfactorily complete a research project that has been approved by the chairperson of the relevant home department and submit a thesis on this project. It must be evident from your thesis that you are capable of independent scientific and technical investigation and interpretation of the results. You must add a declaration to your thesis, stating that the thesis has not been submitted at another university for a degree and that it is your own work. You must write the entire thesis yourself. The body of the thesis must form a coherent whole. This normally comprises an introduction, a background study, one or more chapters where the core contribution is developed or designed, a set of experiments by which the quality of the contribution is tested and a conclusion chapter. The thesis must also include a complete list of the references used.

The thesis has to satisfy the length restrictions imposed by your home department and it will not be submitted to the examiners if it does not comply with these restrictions.

If you want to graduate at the December graduation ceremony, you must submit your thesis for final examination on or before **1 September**, unless your home department specifies differently. If you want to graduate in March, you must normally submit your thesis on or before **1 November**, unless your home department specifies differently.

3.6.7 Examination and requirements to pass: MEng (Structured)

To be awarded the degree MEng (Structured), you must:

- attend all classes as required by the chairperson of the relevant home department;
- pass all required and supplementary modules, as well as the research assignment. This may include independent study, assignments and other forms of assessment. To pass you must achieve a minimum final mark of at least 50, or a final result of "satisfactorily completed".

How your final mark is determined

Your weighted average, which is determined based on the credit weighting of all required modules and the research assignment, is normally used as your final mark for the MEng (Structured). However, if you required the approval of the Faculty Board for readmission (refer to Section 3.4.1 above), you will not be awarded the degree *cum laude*, even if your marks otherwise would have permitted it. Your marks for supplementary modules are not used for determining your final mark.

3.6.8 Examination and requirements to pass: MEng (Research)

To be awarded the degree MEng (Research), you must:

- attend all classes as required by the chairperson of the relevant home department;
- pass all prescribed and supplementary modules. This may include independent study, assignments and other forms of assessment. To pass you must have achieved a final mark of at least 50, or a final result of "satisfactorily completed". These modules must be passed as soon as possible. You cannot submit your thesis to the examiners before you have passed these modules;
- satisfactorily complete an oral examination;
- obtain a final mark of at least 50 for your thesis examination; and
- submit at the oral examination a journal article on your thesis research, which has been approved by your supervisor(s) (or when requested by the departmental chairperson, if the requirement for an oral examination was waived for you). Your supervisor(s) may decide whether or not the article will be submitted to a journal or a conference. Even if the thesis is classified as confidential or secret, you must still submit the article at the oral examination.

You must normally be present at your host department when the oral examination is conducted.

Details about the examination process are given in the Faculty's "Minimum Standards for MEng Examination Procedures" (Section 1.6 above indicates how to access this document).

How your final mark is determined

Only the mark awarded for your thesis is normally used to determine your final mark for the MEng (Research). However, if you required the approval of the Faculty Board for readmission (refer to 3.4.1 above), your final mark may not exceed 70. Your marks for supplementary modules are not used for determining the final mark.

3.7 Doctor of Philosophy (PhD) in the Engineering Faculty

3.7.1 Admission requirements and continued admission after your first year of study

To be considered for admission to the PhD-programme you must:

- hold at least an MScEng, MSc, MEng, or MTech degree, all with a significant research component; *or*
- have reached (in another manner) a standard of competence in your field of study which is deemed sufficient for this purpose by the Senate.

Also refer to the postgraduate admission model in Figure 3.1 in Section 3.2 near the beginning of this chapter.

Within your first year of PhD studies, you must get permission to continue your registration. To get this permission you must:

- complete a formal assessment of your research proposal to the satisfaction of the Faculty Board (please refer to the Faculty's "Minimum Standards Regarding PhD Registration"; see Section 1.6 for access details); *and*
- after completing this assessment, receive the Faculty Board's approval of your dissertation topic and supervisor(s).

3.7.2 Selection

Irrespective of the admission requirements above, you must be selected for the PhD programme by the home department of the relevant field of study.

3.7.3 Application procedure

You must apply in writing to the Registrar for admission as a PhD student. Provide the following information:

- your contact information,
- qualifications you have already completed (also provide certified copies of these qualifications if you did not obtain them from Stellenbosch University),
- the date you intend to begin your PhD studies,
- the name of a supervisor and, if applicable, the names of one or more co-supervisors.

To obtain further details about the application procedure, please send an e-mail to the address at "Postgraduate enquiries" under the relevant home department in Section 1.1.2. Also refer to the Faculty's "Minimum Standards Regarding PhD Registration" (see Section 1.6 for access details).

3.7.4 Duration and periods of enrolment

Table 3.1 in Section 3.4.1 earlier in this chapter shows the minimum, normal and maximum time available to you to complete your PhD studies as a full-time or part-time student. Many full-time PhD students complete the programme in three academic years by starting in February of the first year and receiving the degree in March of the fourth year.

3.7.5 Programme composition and requirements for obtaining the PhD degree

The PhD programme comprises 360 credits of research on NQF level 10 that leads to a dissertation.

The University can award the PhD degree to you if you have, in addition to meeting the minimum registration requirements:

- done original research in the field of engineering sciences:
  - under the supervision of a supervisor; and
  - to the satisfaction of the University.
- submitted a satisfactory dissertation which in the Senate's view shows that:
  - you have made a specific contribution that enriches knowledge in the particular subject area, and
  - that you have exhibited independent critical judgement.

  Also note that along with the dissertation you must submit a declaration stating that the dissertation has not already been submitted at another university for the purpose of obtaining a degree, and that it is your own work.
- satisfactorily completed an oral examination, except in special circumstances where the Senate has approved exemption from the oral examination; and
- submitted proof at your oral examination that you have already submitted a journal article to a journal of acceptable standard. The article must report the research of your dissertation. If the dissertation is classified as confidential or secret, you must submit the journal article to the examination committee at the oral examination.

You must normally be present at your host department when the oral examination is conducted.

Details about the examination process are given in the Faculty's "Minimum Standards for PhD Examination Procedures" (Section 1.6 above indicates how to access this document).

3.7.6 Submitting your dissertation for examination

The examination is arranged according to the procedures given in the Faculty's "Minimum Standards for PhD Examination Procedures" (Section 1.6 above indicates how to access this document).

If you want to graduate at the **December graduation** ceremony, you must submit your dissertation for final examination on or before **1 August**, unless your home department specifies differently. For the **March graduation** ceremony you must submit your dissertation on or before **1 November**, unless your home department specifies differently.

As a PhD candidate you must get written permission from your supervisor(s) to submit your dissertation for examination.

You can submit your dissertation in any of the formats described in the relevant section of the chapter "Postgraduate Qualifications" in Part 1 of the Calendar. The requirements regarding the number of copies you must submit, as well as the other requirements you must meet before the degree can be awarded to you, are set out in the same chapter.

If your dissertation contains research in the form of published and/or unpublished articles:

- it should at least contain:
  - an introductory overview,
  - an overview of the dissertation's structure with a summary of the most important results,
  - conclusions that detail the originality and importance of the research, and
  - recommendations that explain the basis of future work;
- it may only present research if the research work and the originality of the research are substantially your own work. For each article, the dissertation must include a declaration in which you indicate your contribution to the article in the format prescribed in the relevant section of the chapter "Postgraduate Qualifications" in Part 1 of the Calendar.

3.8 Doctor of Engineering (DEng)

The DEng is a senior doctorate, usually awarded to persons who already have a PhD in Engineering and who have made a significant and outstanding contribution to a field of the engineering sciences over a period of several years.

3.8.1 Admission requirements

To be considered for admission to the DEng you must:

- have completed at least one of the following periods of study and work:
  - at least two years must have passed after you obtained the PhD in Engineering; *or*
  - at least five years must have passed after you obtained an MSc, MScEng or MEng degree; *or*
  - a period of at least nine years must have passed after you obtained a BEng degree; *or*
  - after you reached a standard of competence in your field of study in another manner that is the Senate considers sufficient for this purpose;
- after completing the specified periods of study, have been working full-time in your field to the satisfaction of the Senate; and
- have performed advanced original research and/or creative work to the satisfaction of the University in a field of the engineering sciences.

3.8.2 Selection

Irrespective of the admission requirements above, you must be selected for the DEng by the home department of the relevant field of study.

The Faculty Board's approval is required for admission to the DEng. Also refer to the Faculty's "Minimum Standards Regarding DEng Registration" (see Section 1.6 for access details).

3.8.3 Application procedure

The Faculty or a department usually nominates a DEng candidate, but you can also apply to be admitted to the DEng by contacting the chairperson of the relevant home department. You must provide your CV, including a complete list of all your publications.

To apply for the DEng or to obtain further details about the application procedure, please send an e-mail to "Postgraduate enquiries" of the relevant home department in Section 1.1.2.

3.8.4 Duration and period of enrolment

The normal period of enrolment for a DEng degree is one year. This is also the minimum required period of enrolment.

3.8.5 Programme composition and requirements for obtaining the DEng degree

The programme comprises the preparation of a dissertation that:

- is based on your original and previously published works; and
- describes your contribution to the enrichment of knowledge of the engineering sciences.

To obtain the DEng degree, your dissertation must demonstrate, in the Senate's judgement, that you have made a significant and outstanding contribution to the enrichment of knowledge of the engineering sciences.

3.8.6 Examination of the dissertation

The requirements relating to the submission date and the number of copies you must submit, as well as the other requirements you must meet before the degree can be awarded to you, can be requested by e-mail from the address for postgraduate enquiries under the relevant home department listed in Section 1.1.2. Also refer to the chapter "Postgraduate Qualifications" in Part 1 of the Calendar.

DEng candidates are not required to do an oral examination.

Also refer to the Faculty's "Minimum Standards for DEng Examination Procedures" (see Section 1.6 for access details).

4 Undergraduate Subjects, Modules and Module Contents

4.1 Explanation of numbering system and abbreviations

It is important that you take note of the definitions of a few terms in order to understand and use this chapter fully. The example below shows how these terms will appear in the module descriptions in Section 4.3, "Undergraduate subjects, modules and module contents", further on in this chapter.

Example:

The entry for the module normally referred to as **Engineering Mathematics 145**, is as follows:

38571 Engineering Mathematics

145 (15) Further Differential and Integral Calculus (5L; 2T)

Complex numbers; transcendental functions; integration techniques; improper integrals; conic sections; polar coordinates; partial derivatives; introduction to matrices and determinants.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 115

Explanation of terms in the example:

- **Five-digit subject number and name –** 38571 Engineering Mathematics
  - The subject number in the example is **38571** and it is associated with the subject name **Engineering Mathematics**.
- **Module code – 145 (15) Further Differential and Integral Calculus**

  The module code consists of a three-digit number that is unique to the specific module that resorts under the particular subject. The module code of this module is **145** and has the following meaning:
  - The first digit refers to the year of study in which the module is presented, for example:

    *Year 1: **1**45*
    *Year 2: **2**45*
    *Year 3: **3**45*
    *Year 4: **4**14*

    Engineering Mathematics **1**45 is therefore normally presented in the first year.

    (Honours degree programmes and postgraduate diplomas are indicated with a 7, master's degree programmes with an 8 and doctoral degree programmes with a 9.)

- The second digit indicates the semester that the module will be presented in. The numbers that indicate semesters are as follows:
  - **1, 2 or 3** – modules are presented in the first semester.

    *Semester 1: 2**1**4, 3**2**4, 3**3**4*
  - **4**, **5** or **6** – modules are presented in the second semester.

    *Semester 2: 3**4**2, 3**5**4, 3**6**4*
  - **7**, **8** or **9** – modules are presented in both semesters, which are year modules.

    *Year module (both semesters): 2**7**8, 2**8**8, 3**9**1*

  Engineering Mathematics 1**4**5 is presented in the **second semester**.
- The third digit distinguishes between various modules of the same subject that have the same first two digits. In Engineering Mathematics 14**5** this digit is **5**.

- **Credit value – 145 (15) Further Differential and Integral Calculus**
  - The number between brackets after the module code indicates the credit value of the module. According to the example you can therefore obtain **15 credits** by passing Engineering Mathematics 145. According to the SAQA definition, the credit value is one tenth of the number of hours of work that you would typically have to do to complete the module (which includes your own study time, tests, examinations and contact sessions such as lectures). For a module of 15 credits you will therefore have to do approximately 150 hours of work. For typical 15-credit engineering modules, this means that a student should work 10 hours per week (including contact time) during the semester, which typically has 12 weeks of lectures. That leaves about 30 hours for preparing for and writing the main assessments.
- **Module topic – 145 (15) Further Differential and Integral Calculus**
  - **Further Differential and Integral Calculus** indicates the topic that will be dealt with in this specific module.
- **Teaching load – (5L; 2T)**
  - The teaching load of a module gives you both the teaching load and the type of teaching per week that you can expect in a particular module. For the module Engineering Mathematics 145 you can expect **five lectures and two tutorials** per week for the duration of the module. The following abbreviations are used for the teaching load:
    - **L** – Lectures lasting 50 minutes each, for example 5L
    - **P** – Practical periods lasting 50 minutes, for example 1P, 2P, 3P
    - **T** – Tutorials lasting 50 minutes, for example 1T, 2T
    - **S** – Seminars lasting 50 minutes, for example 1S
  - Also see Section 2.11.1 above for more details about the timetabling of laboratory practicals and tutorial periods.

- **Method of assessment**
  - The method of assessment normally appears after the content description of each module. If no method of assessment appears, then the default method applies, that is Examination with P=0,4K+0,6E. The symbols in the formula for final mark, which is indicated with some modules, have the following meaning:
    - P = final mark
    - K = class mark
    - E = examination mark
  - Please refer to Section 4.2 below for details on how final marks are determined.
- **Required modules**
  - The required modules indicate the modules that are required before you may register for a particular module. There are three requirement categories: prerequisite pass, prerequisite and corequisite modules, as indicated below by the letters **PP**, **P** and **C**:
    - **PP** – Prerequisite pass module

      A prerequisite pass module is a module that you must pass before you can take the module(s) for which it is a prerequisite pass module.
    - **P** – Prerequisite module

      A prerequisite module is a module in which you must obtain a class mark of at least 40 (for modules where the method of assessment is "examination"), or a final mark of at least 40 (for modules using other assessment methods rather than examination, like "flexible assessment"), before you can take the module for which it is a prerequisite module.
    - **C** – Corequisite module

      A corequisite module is a module that you must take in the same academic year as the module for which it is a corequisite, or in an earlier academic year. You must pass the corequisite module before you can obtain the relevant degree or diploma.
  - For certain modules you must also first have departmental approval before you may register for that module. Various requirements may be considered by a departmental chairperson (or his/her delegate) before granting such approval and you should not assume that approval will always be granted. For example, the Department of Industrial Engineering must judge that you have a reasonable chance to graduate in a particular year (in other words, you must be admitted to the final year) before you may register for Industrial Project 498 in that year.

Please note that if different module particulars appear for the same module in different parts of the University Calendar, the version in the Calendar part of the faculty that offers the module, will take precedence.

4.2 Determining final marks

Your performance in a module is usually determined by means of **examination** or **flexible assessment**. The University's regulations in this regard are set out in Part 1 of the Calendar.

In certain modules in the Faculty of Engineering, the final mark is primarily determined by assignments, designs and project reports. This method of determining the final mark is known as **project assessment**.

There are also modules in which **satisfactory attendance** is the only requirement and where you do not receive a final mark. You must execute **all** your **assignments** satisfactorily to be credited with the module.

In some modules there are outcomes that you must achieve to pass the module, but that are not part of the formula normally used in a given module to calculate your final mark. To assess your achievement of those outcomes, **subminima** are normally used on certain assessments (or parts of assessments). The outcomes and subminima are made known at the start of the semester (normally in the relevant module framework). If you do not satisfy the subminimum for a certain outcome, it means that you have not met that outcome. In that case, your final mark for the module may not exceed 45. During or after the completion of the semester's classes it may also become clear that you can no longer pass the module because of a subminimum. If that happens, you will normally not be admitted to further assessment opportunities for the particular module. In examination modules this can lead to your class mark being limited to 35 or less.

4.3 Undergraduate subjects, modules and module contents

36315 Advanced Design (Civil)

446 (15) Design Project (2L; 6P)

Each student completes a comprehensive design. The design can be done from any of the three subject areas. The detailed design is done by each student individually.

Home department: Civil Engineering

Method of Assessment: Project

Required modules:
Departmental approval

20753 Applied Mathematics B

124 (15) Statics (4L; 2T)

Vectors; forces; sum of forces at a point; direction cosines and direction angles; components and component vectors; scalar products; vector products; moment of a force; force systems on rigid bodies; equivalent force systems; couples; line of action of the resultant; equilibrium of a rigid body; friction; centre of mass; centroid; volumes; definite integration; moment of inertia of areas.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

154 (15) Dynamics (4L; 2T)

Kinematics in one and two dimensions; relative velocities; the equations of motion; rectilinear motion with constant forces; forces in a plane; parabolic motion; circular motion; the principle of work and energy; power; conservation laws; impulse and momentum; angle impulse and angle momentum; kinetics of particle systems.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
C Engineering Mathematics 115
P Applied Mathematics B 124

224 (15) Dynamics of Rigid Bodies (3L; 3T)

Plane kinetics of rigid bodies; rotation and translation; absolute motion; relative motion; instantaneous centre of zero velocity. Properties of rigid bodies; definite and multiple integrals; Cartesian, polar, cylindrical and spherical coordinate systems; areas, volumes, centres of mass and moments of inertia. Plane kinetics of rigid bodies; Newton's laws; energy methods. Introduction to three-dimensional dynamics of rigid bodies. Vibrations of rigid bodies.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Applied Mathematics 144 or P Applied Mathematics B 154

242 (8) Vector Analysis (2L; 1,5T)

The straight line and the plane; space curves, derivatives and integrals of vectors, curves, the unit tangent, arc length; surfaces, partial derivatives of vectors, the gradient vector, vector fields, vector differential operators; line integrals, gradient fields; surface integrals in the plane, Green's theorem, surface integrals in space, Stokes' theorem; volume integrals; Gauss' divergence theorem; centres of mass and moments of inertia of 1-, 2- and 3-dimensional bodies.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
C Applied Mathematics B 224
P Engineering Mathematics 145

252 (8) Applied Mathematics for Civil Engineers (2L; 1T)

Mathematical modelling: correct identification of problems and specification of assumptions; formulation of ordinary and partial differential equations; analytical solutions; interpretation of a solution in terms of the initial problem.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

39020 Building Materials

254 (15) Basic Building Materials Practice (3L; 2P; 1T)

Composition, manufacturing, mechanical behaviour and durability of construction materials in civil engineering, including concrete, masonry, polymers, steel and timber; test methods for control and characterisation.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Chemistry 123

11576 Chemical Engineering

224 (15) Principles and Processes of Chemical Engineering (3L; 3T)

Introduction to processes and design; process modelling using conservation principles; analysis methods for chemical processes.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Chemistry 123
C Thermodynamics A 224

254 (15) Mass and Energy Balances (3L; 3T)

Mass balances, unsteady mass balances, energy balances, heats of reaction and of solution, energy balances over process systems, combined mass and energy balances, non-ideal gases and compressibility, steam tables and physical properties of chemical components. Home assignments comprising self-study, tutorial problems, designs or seminars form an integral part of this module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Chemical Engineering 224
P Engineering Mathematics 214

264 (15) Fluid Mechanics for Chemical Engineers (3L; 1P; 2T)

3 Practicals per semester

Physical properties of liquids and gases; fluid statics; fluid kinematics; fluid dynamics; continuity, momentum and energy equations; viscous flow in pipes and closed ducts; friction charts; flow in non-round channels; flow measurement; losses in pipe systems, series and parallel pipes; boundary layers; turbomachinery; design of pump and piping systems; compressible flow; pipes and fittings.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Applied Mathematics B 224
P Thermodynamics A 224
P Engineering Mathematics 214

271 (15) Supplementary Studies A (3L; 3T)

The module content is arranged according to the requirements of individual students.

Home department: Process Engineering

316 (15) Reaction Engineering I (3L; 1P; 2T)

1 Practical per semester

Chemical reactor theory; homogeneous and heterogeneous reactions; the reaction rate equation; interpretation of batch reaction data; principles of reactor design; ideal batch, plug flow and constant flow stirred tank reactors; design for simple reactions; influence of temperature and pressure; non-ideal flow; various reaction systems. Home assignments comprising self-study, tutorial problems, designs or seminars form an integral part of this module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Chemical Engineering 317
C Heat Transfer A 326

317 (15) Thermodynamics (3L; 1P; 2T)

1 Practical per semester

Equations of state for real gases and thermodynamic transformation relationships, thermodynamic properties of pure components, mixing rules for non-ideal vapour mixtures, vapour liquid equilibria, theory and application of solution thermodynamics, chemistry of reaction equilibria, multi-component and multi-phase equilibrium with application in solid-liquid-vapour systems. Simulation of phase equilibrium and reaction equilibrium on computer with use of standard process simulation packages.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Thermodynamics A 224
PP Chemical Engineering 254
PP Chemical Engineering 264
Any two of the above three modules are required.
P Thermodynamics A 224
P Chemical Engineering 254
P Chemical Engineering 264
P Engineering Mathematics 214
P Engineering Mathematics 242

344 (15) Process Modelling and Analysis (3L; 2T)

Steady and unsteady state mass and energy balances. Dynamic modelling and simulation of integrated process units. Process data analysis and introduction to machine learning.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Mathematics 214
P Engineering Statistics 243
P Numerical Methods 262
C Chemical Engineering 316

354 (15) Reaction Engineering II (3L; 2T)

Energy balances in reactor design; design of complex homogeneous and/or heterogeneous reaction systems; solid phase catalytic reactions; deactivation of catalysts; mass transfer limitations; fluid-particle reactions; fluid reactions. Home assignments comprising self-study, tutorial problems, designs or seminars form an integral part of this module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 316

367 (15) Mass Transfer Operations (3L; 2T)

Distillation: batch and continuous distillation; McCabe-Thiele and Ponchont-Savarit graphical methods; multicomponent distillation; plate and packed columns; gas absorption; other mass transfer unit operations consisting of a selection from: cooling towers, drying, liquid-liquid extraction and adsorption. Tutorials, designs and seminars form an integral part of the module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 264
P Chemical Engineering 317

371 (15) Supplementary Studies (1L)

The module content is arranged according to the requirements of individual students.

Home department: Process Engineering

414 (15) Process Design (3L; 2T)

Methods of conceptual process design including heuristics for separation system design; complex mass and energy balances and diagrams for integrated unit operations; plant layout; pipe and equipment selection and layout for multi-phase transport and processing; piping and instrumentation diagrams; loss control; risk analysis; preliminary hazard analysis and inherently safe process design; HAZOP and HAZAN studies; capital cost estimation, time-value of money, discounted cash flow, net present value, profitability standards; case studies.

Home assignments comprising self-study, tutorial problems, designs or seminars form an integral part of this module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Heat Transfer A 326
C Chemical Engineering 316
C Chemical Engineering 367

424 (15) Bioprocess Engineering (3L; 1P; 2T)

1 Practical per semester

Chemical composition of cells; cellular structure and classification; nutrient requirements; metabolic macromolecules, their structures and functions; energy generation, storage and transfer; basic cellular metabolism; basic recombinant DNA technology; process design equations for batch, fed-batch and continuous bioprocesses; endogenous respiration and energy

of maintenance concepts; measurement and prediction of oxygen transfer rate; bioreactor scale-up; thermal death and degradation kinetics; batch and continuous sterilisation; downstream processing.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 254
C Chemical Engineering 316

426 (15) Process Control (3L; 1P; 2T)

1 Practical per semester

Dynamic behaviour of processes and equipment; measurement instruments; valves; application of Laplace transforms; stability criteria; multi-variable control systems; non-linear control systems; state analysis; digital process control; optimal control; process identification; simulation/design of control systems on computer (PC).

Home assignments comprising self-study, tutorial problems, designs or seminars form an integral part of this module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Mathematics 242
P Chemical Engineering 316
P Chemical Engineering 344

41696 Chemical Engineering D

356 (15) Pilot Plant Laboratory III (1L; 6P)

4 Major practicals per semester

Carrying out practical experiments on pilot plant scale. Evaluation, interpretation and writing complete technical reports on the experiments. Sampling and practical data interpretation on chemical plants.

[Presented by the Department of Process Engineering (85%)]

Techniques in analytical chemistry: principles of analysis, choice of analytical method, sample preparation. Selected methods, among others UV/vis, AA and mass spectroscopy, chromatography, ICP (8 *l*, 3 demonstrations).

[Presented by the Department of Chemistry and Polymer Science (15%)]

Home department: Process Engineering

Method of Assessment: Project

Required modules:
C Heat Transfer A 326
C Chemical Engineering 316
C Chemical Engineering 367
C Mineral Processing 345
P Engineering Statistics 243

11479 Chemistry

176 (32) Introduction to Chemistry (3L; 3P)

For students in the BSc (Extended Degree Programme). This module deals with the following themes: classification of matter; atoms, molecules and ions; stoichiometry; reactions in aqueous solutions; atomic structure; chemical bonding and molecular structure; the periodic table; weak acid and weak bases. Examples that illustrate the importance and relevance of science as an everyday phenomenon.

Home department: Chemistry and Polymer Science

Method of Assessment: Flexible Assessment

48321 Chemistry C

152 (6) Chemistry Laboratory Practicals (3P)

Development of laboratory skills by performing introductory chemistry experiments.

Home department: Chemistry and Polymer Science

Method of Assessment: Project

Required modules:
P Engineering Chemistry 123

224 (15) Industrial Chemistry I (4L; 2P)

8 Practicals per semester

Bonding models; solid-state chemistry; introduction to coordination chemistry. Thermochemistry, chemical and phase equilibrium, electrochemistry, colligative properties, elementary chemical kinetics.

Home department: Chemistry and Polymer Science

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Chemistry 123
PP Chemistry C 152

254 (15) Industrial Chemistry II (4L; 2P)

8 Practicals per semester

Organic chemistry: basic nomenclature, introduction to preparation and reactions of *inter alia* alkenes, alkynes, alkyl halides, alcohols, ketones, carboxylic acids and esters; Introduction to polymer chemistry: chemistry of polymerisation reactions, *inter alia* polyesters, polyamides.

Home department: Chemistry and Polymer Science

Method of Assessment: Flexible Assessment

Required modules:
P Chemistry C 224

18481 Civil Engineering

224 (15) Measurement, Problem-solving and Communication skills (3L; 2,5T)

Problem solving theory and practice; outcome prediction and assessment; risk evaluation and mitigation; complexity and uncertainty. Effective written and oral communication; development of sound argument; synthesis and interpretation; paraphrasing, quoting and referencing. Utilisation of data: Microsoft Excel functions, data visualisation tools, basic data sets. Introduction to statistics: discrete and continuous random variables, medians, standard deviation.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 115

13362 Complementary Studies (Eng)

311 (8) Community Interaction and Leadership Development (2L; 3T)

Community interaction in the context of Stellenbosch University and South Africa. Contextual leadership themes, challenges and opportunities. Intercultural competencies.

[Presented by the Department of Mechanical and Mechatronic Engineering (50%) and Engineering (Admin) (50%)]

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

Required modules:
Must be in at least third year of registration in a four-year BEng programme, or fourth year of registration in a BEng extended degree programme

441 (8) Community Interaction and Leadership Development (2L; 3T)

Community interaction in the context of Stellenbosch University and South Africa. Contextual leadership themes, challenges and opportunities. Intercultural competencies.

[Presented by the Department of Mechanical and Mechatronic Engineering (50%) and Engineering (Admin) (50%)]

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

Required modules:
Must be in at least third year of registration in a four-year BEng programme, or fourth year of registration in a BEng extended degree programme

30317 Computer Programming

143 (12) Computer Programming (3L; 2P)

Introduction to computer systems. Introduction to a programming environment; expressions; conditional statements; iterative structures; data types; static and dynamic data structures; file handling; abstract data types; objects; structured program design. Emphasis is placed on modular programming for engineering applications.

[Presented by the Department of Electrical and Electronic Engineering (75%) and by the Department of Mechanical and Mechatronic Engineering (25%)]

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

18139 Computer Science

314 (16) Concurrency (3L, 3P)

Introduction to programming techniques and principles of concurrent systems, from operating systems to application programs. This includes communication, synchronisation, scheduling and load balancing. Several parallel and distributed architectures will be covered.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Computer Science 214 and Computer Science 244
or
P Computer Science E 214 and Computer Systems 245

315 (16) Machine Learning (3L; 3T)

Dimension reduction techniques; machine-learning techniques based on maximum-likelihood, maximum-posterior and expectation-maximization estimates; modelling using logistic regression, Gaussian mixtures and hidden Markov models.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
PP Computer Science 144 or P Computer Science E 214
P Mathematical Statistics 244 or P Systems and Signals 344

334 (16) Databases and Web Centric Programming (3L; 3P)

Introduction to relational databases. Mapping relational model onto object model. Implementing a database application in the context of the web. Web services. Server-side scalability. Virtualization. Cloud Computing.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Computer Science 214
P Computer Science 244

For programmes in Engineering:
P Computer Science E 214
P Computer Systems 245

59536 Computer Science E

214 (15) Object-Oriented Programming (3L; 3P)

Formulation and solution of problems by means of computer programming in an object-oriented set-up; principles of testing and debugging; key concepts in object orientation: abstraction, encapsulation, inheritance and polymorphism; design patterns as abstractions for the creation of reusable object-oriented designs; searching and sorting algorithms; complexity theory for the analysis of algorithms; fundamental methods in the design of algorithms; dynamic data structures.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
PP Computer Programming 143
P Engineering Mathematics 115
P Engineering Mathematics 145

414 (15) Machine Learning (3L; 3T)

This module is identical to Machine Learning 799.

Prominent machine learning concepts and tasks. Selected feature extraction or dimensionality reduction techniques. Introduction to probabilistic modelling and latent variable models. Fundamental paradigms in parameter estimation.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Computer Science E 214 or Computer Science 144
P (Mathematical Statistics 245 and Mathematical Statistics 246) or Systems and Signals 344

50040 Computer Skills

176 (8) Computer Skills (1L; 4T)

This module is taken by students in the BSc (Extended Degree Programme). Utilisation of computers in computer users' areas on campus. Introduction to an operating system, Internet, E-mail, word processing, spreadsheet and presentation software.

Home department: Mathematical Sciences

Method of Assessment: The class mark will serve as the final mark.

36153 Computer Systems

214 (15) Introduction to Computer Systems (3L; 2P; 1T)

Boolean algebra; combinational and sequential circuit analysis and design; state machines; central processing unit; assembler language programming.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Computer Programming 143

245 (15) Microprocessors (3L; 3P)

Microprocessor programming; basic microprocessor architecture; bus, memory and input-output systems.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Computer Systems 214

414 (15) Computer Systems (3L; 1P; 1T)

Until 2020: Hardware/software co-design; embedded systems; computer networks.

From 2021: Programmable logic; hardware description languages; embedded systems; computer networks.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Computer Systems 245

23965 Control Systems

314 (15) Classical Control Systems (3L; 1,5P; 1,5T)

Classical feedback control of dynamic systems; feedback control architecture; dynamic modelling of mechanical, electronic and electro-mechanical systems; transfer functions; block diagrams; stability; transient effects and steady state error; root locus analysis and design; frequency response analysis and design; PID controllers; lead and lag compensation.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Engineering Mathematics 214

344 (15) Modern Control Systems (3L; 1,5P; 1,5T)

Continuous state space models, analysis and synthesis; continuous estimators; transient and steady state response of state variable representations; pole placement for finite time responses; Discrete systems, Z-transforms; ZOH circuits, difference equations; emulation design; discrete root locus; discrete state space analysis and design; practical issues: A/D and D/A convertors, quantisation effects and anti-aliasing filters.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Control Systems 314

354 (18) Design of Control Systems for Mechatronic Systems (4L; 1P; 2T)

Design of control systems: PID controllers; lead and lag compensation; frequency response analysis design. Continuous state space models, analysis and synthesis; continuous estimators; transient and steady state response of state variable representations; pole placement techniques. Discrete control systems, Z-transforms; ZOH circuits; difference equations; practical considerations: A/D and D/A converters and filters.

Until 2021: Root locus design; discrete root locus.

From 2022: Bode and polar plot diagrams

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Modelling 334

414 (15) Non-linear Control Systems (3L; 1P; 1T)

Modelling of non-linear systems; analysis and synthesis using describing functions, phase plane and Lyapunov methods. Discrete state-variable models for sampled plants, pole placement feedback and observer analysis and synthesis for regulators and servo trackers. Optimal LR and Kalman observer analysis and synthesis.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Control Systems 344

13856 Data Analytics (Eng)

324 (15) Statistics and Data Analytics for Civil Engineers (3L; 2,5T)

Offered from 2021.

Probability distributions, sampling theory, correlation analysis, statistical inference, regression. Formal data analytics processes: goal definition, data pre-processing, mining and modelling, validation and evaluation. Data cleaning: filtering, handling of missing data, inconsistency detection, outlier removal, data normalisation, reduction. Introduction to machine learning: supervised and unsupervised learning.

Presented by: Statistics and Actuarial Science (50%) and Electrical and Electronic Engineering (50%)

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Civil Engineering 224
PP Engineering Mathematics 115
PP Engineering Mathematics 145

344 (15) Data Analytics Applications in Industrial Engineering (3L; 2P; 1T)

The need for data analytics; formal data analytics processes, including CRISP-DM and KDD; data cleaning and data transformation with dimension reduction; supervised learning: regression, k-nearest neighbours, decision trees, random forests; unsupervised learning: k-means; data-driven decision-making; group project.

[From 2021: presented by the Department of Industrial Engineering (78%) and the Department of Mechanical and Mechatronic Engineering (22%)]

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Mathematics 214
P Engineering Statistics 314 or Modelling 334 2021 or later

414 (15) Data Analytics Applications in Electrical and Electronic Engineering (3L; 1P; 1T)

The goal of data analytics and machine learning; data cleaning and preparation; training, validation and test sets; regression: linear regression; classification: K-nearest neighbours, naive Bayes, logistic regression, decision trees; unsupervised learning: K-means; data visualisation: PCA, t-SNE; a brief introduction to neural networks; group project.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214
P Systems and Signals 344 or Mathematical Statistics 214.

Data Engineering

This subject will only be presented from 2021 and at the time of going to press a five-digit subject number for the subject was not available.

245 (12) Big Data Platforms (3L; 1P; 1T)

The various technologies and infrastructure required to support effective decision-making based on big data, including databases for big data, data warehouses, data platforms, data streams, data fusion and data visualisation.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Computer Programming 143

344 (15) Fundamentals of Deep Learning (3L; 1,5P; 1,5T)

Fundamentals of neural networks and their application in engineering problems. Limitations of neural networks. Design of feed-forward neural networks, auto-encoders, convolutional neural

networks and recurrent neural networks. A major design assignment that also involves experiments for validation, culminating in a report.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214
P Systems and Signals 344 or Mathematical Statistics 214.

424 (15) Probabilistic Graphical Models for Machine Learning (3L; 1P; 1T)

Representation: reasoning patterns, Bayes nets, Markov random fields, templates and temporal models. Inference: elimination, sum product, max product, max sum and junction tree algorithms. Learning: maximum likelihood, maximum posterior, Bayesian learning. Designing algorithms to implement the aforementioned.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Systems and Signals 344 or Mathematical Statistics 245

14026 Data Science

141 (16) Data Science (4L; 2P)

Fundamental data science concepts; data-analytic thinking; types of data; the data cycle; CRISP data mining process; describing a dataset numerically; describing a dataset graphically; organising data; file formats; data manipulation in Excel; introduction to predictive modelling; overfitting; data leakage; model evaluation; other data science tasks and techniques; data ethics; communicating results.

Home department: Statistics and Actuarial Science

Method of Assessment: Flexible Assessment (EMS rules)

46833 Design (E)

314 (15) Digital Design (1L; 3P)

Design philosophy; design techniques; milestones; data interpretation; development of simple software and hardware in order to demonstrate a small functional microprocessor system; debugging of digital circuits; report writing.

Home department: Electrical and Electronic Engineering

Method of Assessment: Project

Required modules:
C Computer Systems 245

344 (15) Electronic Design (1L; 3P)

Design of a complex electronic system with circuit and software components; problem solution; application of scientific and engineering knowledge; design techniques for software and circuits; experiments; data-interpretation; fault diagnosis; use of equipment and software; independent learning; professional communication.

Home department: Electrical and Electronic Engineering

Method of Assessment: Project

Required modules:
C Electronics 315
C Computer Science E 214

47929 Design Project

488 (48) Design (2L; 2P)

Methods of process design (including heuristics), inherently safe design, control, plant layout, process flow sheets, complex plant material and energy balances, piping and instrumentation diagrams, equipment selection, risk management, HAZOP studies, cost estimation, environmental impact and profitability. Application of procedural and non-procedural methods to develop the best process for a major plant design, and factors and criteria involved. The design of a complex process plant (or sub-process) with consideration of, inter alia, process thermodynamics, kinetics and transport phenomena.

Home department: Process Engineering

Method of Assessment: Project

Required modules:
Final-year Enrolment

11949 Electrical Drive Systems

324 (15) Principles of Electrical Machines and Power Electronics (3L; 1P; 2T)

Non-ideal transformer model; introduction to machine principles; alternating current machine principles; basic working in the steady state of synchronous generators, synchronous motors and induction motors; inverter-fed induction machine drives; basic working in the steady state of direct current motors and direct current generators; converter-fed direct current machine drives; basic working of single-phase induction motors; introduction to electrical energy storage technologies.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electrotechnique 214

51357 Electromagnetics

314 (15) Electromagnetics (3L; 1P; 2T)

Electrostatics; magnetostatics; Ohmic conduction; Lorentz force law; laws of Coulomb, Ampère, Faraday and Gauss; Maxwell's equations; capacitance; inductance.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Applied Mathematics B 224
C Applied Mathematics B 242

344 (15) Electromagnetics (3L; 1,5P; 1,5T)

Maxwell's equations; electromagnetic waves; transmission lines; antennas.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electromagnetics 314

39802 Electronic Engineering

152 (6) Introduction to Electronic Design (3T)

Basic structured electronic design and synthesis.

Home department: Electrical and Electronic Engineering

Method of Assessment: Project

12491 Electronics

245 (15) Electronics (3L; 1P; 2T)

Semiconductor physics; pn junctions; diode circuits; thyristors; bipolar transistors; MOSFETs; DC biasing of transistor circuits; transistor switches; logical gates.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Systems and Signals 214 or C Electrotechnique 214

315 (15) Electronics (3L; 1,5P; 1,5T)

Small-signal linearised model of transistors; single and multistage transistor amplifiers; amplifier topologies; frequency response of transistor amplifiers; power amplifiers.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electronics 245

344 (15) Introduction to Electronics (3L; 1,5P; 1,5T)

Semi-conductor physics; pn junctions; diode circuits; bipolar transistors; small signal dynamic transistor models.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

365 (15) Electronics (3L; 1P; 2T)

Current sources; differential amplifiers; feedback amplifiers and stability; non-ideal operational amplifiers; instrumentation amplifiers; integrated circuits applications.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electronics 315

414 (15) Electronics (3L; 1P; 1T)

The terminal properties of power electronic switches; the operation, analysis and design of thyristor-controlled rectifiers; basic DC-to-DC converters: the buck, boost and buck-boost converters; half-bridge and full-bridge converters; switch-mode power supplies; basic inductor and transformer design; simulation and closed-loop control of converters.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electronics 365
C Control Systems 314

12599 Electrotechnique

143 (15) Introduction to Circuit Theory (3,5L; 1P; 2T)

Introduction to basic circuit terminology and elements, including dependent sources; Ohm's law, Kirchhoff's laws; node-voltage analysis and mesh-current analysis; superposition; Thévenin and Norton equivalents; basic DC power and energy concepts; introduction to capacitors and inductors; first-order RC and RL circuit steady-state and transient analysis; modelling of physical systems using RL and RC circuits; introduction to magnetic circuits.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

214 (15) Electrotechnique (3L; 1P; 2T)

Sinusoidal sources; phasors; instantaneous, average, real and reactive power; passive circuit elements in the frequency domain; balanced three-phase circuits; first- and second-order transfer functions; Bode plots; cascaded circuits; resonance; ideal filters; ideal operational amplifiers.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electrotechnique 143

43915 Energy Systems

244 (15) Electrical Energy Systems (3L; 0,5P; 2,5T)

Introduction to power systems; single and three-phase alternating current theory; power transformers; per-unit system; modelling of transmission lines; steady-state operation of transmission lines; power flow studies.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Systems and Signals 214

344 (15) Energy Conversion (3L; 1P; 2T)

Introduction to electrical machine systems; AC machine principles; steady-state operation of synchronous and induction machines; DC machine principles; steady-state operation of DC machines; the converter-fed DC machine system; the converter-fed induction machine system; dq0 transformation; dq0 AC machine modelling and dynamics.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Energy Systems 244

414 (15) Renewable Energy Systems (3L; 0,5P; 1,5T)

Introduction to renewable energy resources; principle of renewable energy power conversion; commercially viable renewable energy technologies; renewable energy system sizing and design; maximum power point control technology; power conditioning and grid integration of renewable energy systems; economic benefits and environmental impact assessment.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Energy Systems 344

424 (15) Electrical Energy Systems (3L; 0,5P; 1,5T)

Until 2020: Power systems: power flow studies; symmetric and asymmetric faults, protection systems; power system stability. High voltage: HV measuring equipment; measuring techniques and tests; insulation coordination; theory and characteristics of insulating materials; electrical discharges.

From 2021: Power systems: symmetrical components; symmetric and asymmetric faults, protection systems; power system stability. High voltage: HV measuring equipment; measuring techniques and tests; insulation coordination; theory and characteristics of insulating materials; electrical discharges.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Energy Systems 244
C Energy Systems 344

51365 Energy Systems M

434 (15) Mechanical Energy Systems (3L; 1P; 2T)

Thermodynamic relationships for ideal and non-ideal gases, Joule-Thompson throttling effect; further applications of air-water-vapour mixtures in the psychrometrics of air conditioning systems and cooling towers; mass and energy balances for reactive systems; the principles of internal combustion engines. Boiler, pump and atmospheric cooling systems; advanced analysis of vapour and combination power cycles; Stirling cycle; high-pressure water and pebble bed modular nuclear reactor-based cycles; introduction to solar energy; analytical determination of available radiant energy; central collector; parabolic trough and solar chimney power station cycles. Wind and ocean energy.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Fluid Mechanics 244
P Thermodynamics A 214

49484 Engineering Chemistry

123 (15) Chemistry for Engineering Students (4L; 2T)

Basic concepts, units and dimensions, significant figures, conversion between unit systems; components of matter, atomic structure, the periodic table and chemical bonding; stoichiometry; chemical reactions (acid-base, precipitation and redox); properties of mixtures and solutions; chemical equilibrium; electrochemistry; gas laws, state functions and (T, P, V) relationships; introduction to basic engineering applications.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Engineering Mathematics 115

46825 Engineering Drawings

123 (15) Orthographic Drawings (1L; 3P; 3T)

Projection planes; points, lines and planes in space; trace points of lines and trace lines of planes; true lengths and true angles between lines and planes; true angles between planes; new projection planes; interpenetrations; developments; isometric projections. Works drawings: 1st- and 3rd-angle projections; line alphabet; dimensioning; scale; three-view drawing layout; auxiliary views; hidden detail; introduction to sections and cross-hatching. Introduction to 2D CAD and 3D parametric CAD.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

18791 Engineering Economics

212 (8) Engineering Economics (2L; 2T)

Introduction to accounting: financing, tax and growth of a business. Income, balance sheet and cash flow statements. Financial ratios.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

354 (15) Engineering Economics (3L; 3T)

The capital cycle, time value of money, discounted cash flow, equivalence and returns, after tax cash flow analyses, inflation and exchange rates. Working capital cycles, the cost of capital, cost accounting, budgets. Introduction to the macro economy and the SA budget.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Economics 212

59552 Engineering Geology

214 (15) Geology for Civil Engineers (3L; 3P)

This module does not grant admission to Geology 224, 244 and 254.

Identification of, classification of and distinguishing between the common rock-forming minerals, based on their chemistry and crystal structure. Classification of and distinguishing between the various sedimentary, igneous and metamorphic types. The basic processes affecting the earth and how they are interrelated through the paradigm of plate tectonics. Geological time and how the rock record preserves a history of past geological events. The general geological history and stratigraphy of southern Africa. General landscape-forming processes, weathering, etc. Engineering geology of South Africa and most common geotechnical constraints. Surveying techniques, including acquisition and analysis of spatial data; projections, coordinates and mapping; land surveying and 3D measurement utilising GIS, GPS and Total Station techniques.

Presented by: Earth Sciences (30%) and Civil Engineering (70%)

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Chemistry 123

59560 Engineering Informatics

244 (15) Object-Oriented Programming and Modelling (3L; 2,5T)

Basic concepts of the object-oriented programming model, algorithms and data structures for linear algebra applications and engineering models, object models of simple problems.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Computer Programming 143

314 (15) Object Modelling of Physical Problems (3L; 2,5T)

Boundary value problems and integral forms of physical problems, Galerkin finite element methods for the solution of these problems, solution of systems of linear equations, implementation of a finite element object model.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Informatics 244
P Applied Mathematics B 242

51373 Engineering Management

454 (12) Engineering Economics and Professional Practice (4L; 1T)

Engineering economics: basic concepts, time value of money; relation between present, future and serial values; cash flow. Economic analysis, comparison and decision-making among alternatives: net present value, internal rate of return, cost/benefit models, handling of risk. Life cycle costing, depreciation and replacement decision. Development financing.

Professional practice: Engineering Act, ethical code, professional registration and accountability. Practice management and business plans. Design and construction management, the role of the client. Sustainability. Tender documentation. Strategic management. Project safety. Infra-structure asset management. Building information models. Communication skills.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

38571 Engineering Mathematics

115 (15) Introductory Differential and Integral Calculus (5L; 2T)

Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics in the NSC or the IEB's school-leaving certificate or must have successfully completed the first year of a suitable extended degree programme.

Mathematical induction and the binomial theorem; functions; limits and continuity; derivatives

and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of simple functions.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

145 (15) Further Differential and Integral Calculus (5L; 2T)

Complex numbers; transcendental functions; integration techniques; improper integrals; conic sections; polar coordinates; partial derivatives; introduction to matrices and determinants.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 115

214 (15) Differential Equations and Linear Algebra (4L; 2T)

Ordinary differential equations of first order; linear differential equations of higher orders; Laplace transforms and applications. Matrices: linear independence, rank, eigenvalues.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Mathematics 115 or PP Engineering Mathematics 145
P Engineering Mathematics 145

242 (8) Series and Partial Differential Equations (2L; 1T)

Infinite series and Taylor series; Fourier series; introduction to partial differential equations; Fourier transforms.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Mathematics 145 or PP Engineering Mathematics 214
P Engineering Mathematics 214

59420 Engineering Physics

113 (8) Physics for Engineering Students (2L; 0,5P; 0,5T)

Introduction to physics and physical quantities, including: macro- and micro-descriptions of nature; molecular and atomic structure of matter; crystalline and amorphous solids; crystal structures, defects and applications; oscillatory motion; introduction to wave motion; superposition and standing waves; sound waves; Doppler effect; wave optics (diffraction, interference, polarization); introduction to nuclear physics.

Home department: Physics

Method of Assessment: Flexible Assessment

152 (6) Physics for Engineering Students (2L; 1T)

Introduction to basic relativity and basic quantum mechanics. Continued studies of waves, sound and optics based on Engineering Physics 113.

Home department: Physics

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Physics 113

59498 Engineering Statistics

243 (15) Statistics and Data Processing for Chemical Engineers (3L; 1P; 2,5T)

1 Practical per semester

Applied probability theory; applications based on discrete and continuous random variables and their probability distributions. Descriptive statistics and graphical presentations. Hypothesis testing. Simple and multiple linear regression. Analysis of variance. Experimental design. Data reconciliation. Applications to chemical engineering experiments and simulations. Technical communication of experimental results and statistical analysis.

[Presented by the Department of Process Engineering (50%) and by the Department of Statistics and Actuarial Science (50%)]

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Chemical Engineering 224
C Chemical Engineering 264

314 (15) Engineering Statistics (3L; 2,5T)

Applied probability theory; applications based on discrete and continuous random variables and their probability distributions, such as the normal, gamma, lognormal, log-Pearson type 3 (LP3), Gumbel (EV1) distributions; queuing processes; joint distributions; descriptive statistics and graphical presentations; moments, averages, median and standard deviations; moment generating functions; variation coefficient; skewness coefficient; peaking coefficient; sampling theory; point and interval estimation; hypothesis testing; chi-square and K-S goodness-of-fit testing; simple linear and non-linear regression and correlation analyses; introduction to multiple linear regression; introduction to analysis of variance and experimental design.

Home department: Statistics and Actuarial Science

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Mathematics 115
PP Engineering Mathematics 145

59501 Enterprise Design

444 (15) Enterprise Design (2L; 2T)

Systems engineering, approaches towards enterprise modelling and supply chain management. Concepts like knowledge management, innovation, and different life cycles will be applied through the complete design of an enterprise within formal information, manufacturing and organisational architectures.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
Final-year enrolment

59455 Entrepreneurship (Eng)

444 (15) Entrepreneurship (Eng) (3L; 3T)

Business strategy: business as a system; life cycles; competitiveness forecasts; entry into the market; portfolio decisions; long-term profitability; marketing management; introduction to the theory of organisation. Financial management: time-value of money, basic discounting concepts; economic analysis of investment proposals; introduction to financing and dividend decisions.

Home department: Electrical and Electronic Engineering

Method of Assessment: Project

50431 Environmental Engineering

414 (15) Environmental Engineering (3L; 2,5T)

Environmental engineering principles, including sustainable development, ethical elements of environmental management and socio-ecological factors in decision-making; environmental assessments, impacts, risks and management. Water chemistry and engineering techniques for effluent and water treatment; aspects and abatement of air pollution; solid and hazardous waste management and immobilisation.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Particle Technology 316
C Chemical Engineering 316

442 (8) Engineering and the Environment (3L; 2T)

Energy and the environment; environmental engineering principles, including sustainable development, ethical elements of environmental management and socio-ecological factors in decision-making; environmental assessments and management, including pollution control and abatement, environmental impact and risk assessments, environmental auditing, environmental

management systems and ISO 14000 standards; environmental governance and related legislation.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
Prerequisite for Engineering students: All the prescribed modules for the first two years of the relevant BEng programme
Prerequisite for AgriSciences students: All the modules for the first two years of the Wood Products Science programme

452 (8) Environmental Engineering for Civil Engineers (3L; 2,5T)

Ecology and the environment. Environmental engineering principles, ethical elements of environmental management. The water environment, including pollution, integrated environmental processes and environmental assessments and management. Environmental governance and related legislation; solid waste management; integrated development planning (IDP), including public participation. Integrated coastal management. Water quality, impacts of pollution on natural waterbodies, water quality considerations for drinking water abstraction.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
All the prescribed modules for the first two years of the relevant four-year BEng programme

13683 Final-year Project (C)

478 (32) Final-year Project in Chemical Engineering (6P)

(2P in Semester 1; 6P in Semester 2)

Each student must complete an independent project on an approved topic.

Home department: Process Engineering

Method of Assessment: Project

Required modules:
Final-year enrolment

41726 Finite Element Methods

414 (15) Finite Element Methods (Elective Module) (3L; 1P; 2T)

Revision of strength of materials concepts; principle of virtual work; truss/beam elements; plane stress/strain elements; isoparametric formulation; 3D elements; axisymmetric elements; plate and shell elements; structural symmetry; dynamic analysis; buckling analysis; use of finite element software to solve simple problems.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Strength of Materials W 334

44415 Fluid Mechanics

244 (15) First Course in Fluid Mechanics (3L; 1P; 2T)

Physical properties of liquids and gases; fluid statics and manometers, forces on and stability of buoyant bodies, pressure centre and meta-centre; fluid kinematics; fluid dynamics; integral relations for a control volume; introduction to vector analysis; differential relations; continuity, momentum and energy equations; Bernoulli and Navier-Stokes equations; similarity theory, dimensional analysis; viscous flow in pipes and closed ducts; friction charts; flow in non-round channels; flow measurement; losses in pipe systems, series and parallel pipes; basic theory of turbomachines; pumps; characteristic curves of pumps; pump systems.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Applied Mathematics B 224
P Thermodynamics A 214
P Engineering Mathematics 214

13857 Food Process Engineering

414 (15) Food Process Engineering Fundamentals (3L; 1P; 2T)

Engineering approach to problem-solving; thermodynamic properties of water and an ideal gas; conservation of mass, momentum and energy; thermodynamic processes in closed and open systems; generation, usage and reticulation of steam; pump and pipe systems; steady-state conduction, convection and radiation; air-water vapour mixtures and air conditioning processes.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Mathematics (Bio) 124
PP Food Science 214

PP Food Science 244

444 (15) Food Process Engineering Applications (3L; 2T)

Behaviour, pumping and properties of Newtonian and non-Newtonian fluids; the refrigeration cycle and refrigeration components and equipment; storage of food products by cooling and freezing; heat transfer, including the determination of heat transfer coefficients, boiling and condensation; transient heat transfer during heating, freezing and thawing; mass transfer; thermal processing of foodstuffs; evaporation and concentration; drying theory and drying equipment; mixing; process control.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Examination

Formula for Final mark: P=0,5K + 0,5E

Required modules:
P Food Process Engineering 414

39667 Geotechnique

254 (15) Geotechnical Theories (3L; 2,5T)

Geotechnical soil properties: particle size analysis, plasticity, soil classification, phase relationships, compaction. Ground water movement: permeability, seepage theory, flow nets, filter design. Effective stress: theory of effective stress, stress by own weight and seepage effects. Elastic stress theory: stresses and immediate settlement resulting from surface loading. Consolidation settlement: settlement of clay soil, rate of settlement, total and immediate settlement.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Engineering Geology 214

354 (15) Sliding Resistance, Retaining Walls, Foundations and Slopes (3L; 1,5P; 1T)

Shear strength: shear testing, shear behaviour of sand and clay, stress paths, pore pressure coefficients. Lateral earth pressure: earth pressure theory, gravity walls, embedded walls. Bearing capacity: shallow foundations, eccentric loads, settlement on sand, piles. Slope stability: parallel slips, circular slip, method of slices, safety factors.

Practical: consolidation test in the oedometer.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Strength of Materials 224
C Geotechnique 254

33928 Heat Transfer A

326 (15) Heat Transfer (3L; 1P; 2T)

1 Practical per semester

Heat conduction; steady and unsteady conduction. Convection: boundary layer equations, laminar and turbulent flow, natural convection, boiling and condensation. Heat exchangers: overall transfer coefficients, parallel, transverse and cross-flow, logarithmic mean temperature difference, effectiveness-NTU calculations, types and design principles. Radiation: absorption and emission, black bodies, emissivity, form factors, radiation heat transfer between surfaces, radiating gases. Mass transfer: diffusion processes, transport analogies, Colburn j-factors, combined mass and heat transfer.

Homework assignments in the form of self-study, tutorial problems, designs or seminars form an integral part of the module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Thermodynamics A 224
P Engineering Mathematics 214
P Chemical Engineering 254
P Chemical Engineering 264
P Engineering Mathematics 242
P Numerical Methods 262

414 (15) Heat Transfer (3L; 1P; 2T)

Heat conduction; analytical and numerical methods for steady and unsteady conduction. Convection: boundary layer equations, laminar and turbulent flow, natural convection, boiling and condensation. Heat exchangers: overall transfer coefficients, parallel, transverse and cross-flow; logarithmic mean temperature difference, effectiveness-NTU calculations, types and design principles. Radiation: absorption and emission, black bodies, emissivity, form factors, radiation heat transfer between surfaces, radiating gases. Mass transfer: diffusion processes, transport analogies, Colburn j-factors, combined mass and heat transfer.

Homework assignments in the form of self-study, tutorial problems, designs or seminars form an integral part of the module.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Fluid Mechanics 244
P Thermodynamics A 214

52124 High Frequency Technique

414 (15) High-Frequency Technique (3L; 1P; 1T)

Smith chart and applications; impedance-matching networks; amplifier design; oscillator design; high-frequency systems; electromagnetic compatibility; electro-dynamics and radiation; wire antennas; antenna design; HF metrology.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electromagnetics 344

21350 Hydraulic Engineering

424 (15) Storm Water Drainage and Hydraulic Structures (3L; 2,5T)

Storm water hydraulics: general introduction and guidelines; design floods. Storm water discharge: run-off over land, roads, parking areas, curbs and inlets, storm-water pipe systems; flood attenuation ponds; canals, culverts and bridge damming. Hydraulic structures; sharp- and broad-crested weirs and submergence; dam spillways; energy dissipaters; flow control gates; side channel spillways and outlet structures. Introduction to coastal engineering.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Hydraulics 324
P Hydraulics 354

14400 Hydraulics

324 (15) Flow Theory and Pipe Flow (3L; 2,5T)

Hydrostatics; pressure and pressure measurement; pressure forces on submerged bodies; flotation and buoyancy; principles of fluid flow; flow patterns; fundamental equations of fluid dynamics; application of the conservation laws to fluids; application of the energy and momentum equations; velocity and discharge measurement; potential flows; real and ideal fluids; behaviour of real fluids; viscous flow; stability of laminar flow and the onset of turbulence; shearing in turbulent flows; the boundary layer; implications of the boundary layer; cavitation; surface tension; flow in pipes and closed conduits; fundamentals of pipe flow; laminar flow; turbulent flow; local head loss; partially full pipes; pipeline systems and design; series, parallel and branched pipe systems; distribution systems; design of pumping mains; hydraulic machines;

classification of machines; continuous flow pumps; pump selection; turbines; cavitation in hydraulic machines; surge in pipelines; surge protection; effects of rapid valve closure; unsteady compressible flow; complex problems.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Applied Mathematics B 154
PP Engineering Mathematics 145
P Applied Mathematics B 224

354 (15) Open Channel Flow and Water Treatment (3L; 0,5P; 2T)

Open channel flow and flow classification; uniform flow; rapidly varied flow; energy conservation; hydraulic jump. Momentum principle; critical depth flow measurement; gradually varied flow; flow profile classification; backwater (transitional) curve calculation (direct and standard step methods); unsteady flow; waves in open channel flow. Basic water chemistry; basic water microbiology; water quality; treatment processes (settling, filtration, coagulation, flocculation); principles of biological treatment; aerobic processes (activated sludge and biological filters); anaerobic processes; disinfection; sewer networks and sanitation systems.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Chemistry 123
P Hydraulics 324

14397 Hydrology

424 (15) Flood and Resource Hydrology (3L; 2,5T)

A systematic overview of the different components of the hydrological cycle, variability of the South African climate, hydrological processes, sources of data and the characteristics of South African data. Storage yield analysis: philosophy and concepts, time series, gap filling, human influences on catchments, water demand, catchment models. Stochastic data. Low flow analysis: analysis of time series, regionalised data for South Africa, geohydrology, water demand management. Flood design techniques (empiric, deterministic and probabilistic); extreme floods.

From 2022 also: Probabilities, gap filling, regression and all the associated statistical analysis, exceedance and non-exceedance probabilities, all other basic statistic parameters.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Hydraulics 354
P Engineering Statistics 314

31496 Industrial Engineering

152 (6) Introduction to Industrial Engineering (3T)

Manufacturing and service systems, introductory production principles with applications, introductory optimisation, system variation, productivity measurement and analysis.

Home department: Industrial Engineering

Method of Assessment: Project

44792 Industrial Ergonomics

414 (15) Industrial Ergonomics (3L; 1,5T)

Operation analysis, work standards; reduction of setup times, training practices, remuneration, anthropometry, workstation and tool design, man/machine interfaces, work physiology and biomechanics, the work environment, cognitive work, shift work, aspects of occupational health and safety.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

53937 Industrial Management

354 (15) Industrial Management (3L; 3T)

Industry dynamics and the value chain, BPR (Business Process Re-engineering); SCM (Supply Chain Management) and logistics management, information technology and e-commerce within the framework of a formal ERP (Enterprise Resource Planning) system.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Production Management 314

10618 Industrial Practice

442 (8) Management and Organisational Behaviour (2L; 1T; 1S)

Work and people organisation, organisational culture, motivation principles, motivation methods, building groups into teams, conflict management and negotiation, managing organisational change, overview of labour legislation, guest lectures by engineers from industry.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
Final-year enrolment

47422 Industrial Programming

244 (15) Industrial Programming (2L; 3T)

Use of spreadsheets: data manipulation, numerical methods, graphs, basic financial calculations, planning and analysis of scenarios and optimising. Visual Basic for Applications for spreadsheet use. Basic computer communication. Theory and application of forecasting with emphasis on spreadsheet applications.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 145

25445 Industrial Project

498 (30) Industrial Project (1S)

Independent execution of a theoretical and/or practical investigation in the field of industrial engineering, and the submission of a comprehensive report. (The project runs for the whole final year, with 30% of the project completed in the first semester, and 70% in the second semester.)

Home department: Industrial Engineering

Method of Assessment: Project

Required modules:
Final-year enrolment

48062 Information Systems

414 (15) Information Systems (2L; 1,2P; 2T)

Techniques and resources required for the design, development and implementation of information systems; system development life cycle; entity-relationship models; data flow models; normalisation; design of input and output interfaces; quality assurance of the information system; system implementation; design, development and implementation of an Internet-based information system in group projects.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Industrial Programming 244

13363 Internship (Eng)

392 (0) Industrial Experience (0T)

Students experience, or observe first hand, typical engineering work in an appropriate industry. The work must be performed under the direct supervision of an engineer from an appropriate discipline. Students are required to, within their discipline: apply fundamental engineering principles to solve practical problems in an industrial context; develop an enhanced understanding of the nature, processes and challenges of industrial practice; and develop their technical and interpersonal skills.

The student's home department's prior approval of the scope and nature of the work is required. The scope of the student's work in this module should be at least 1700 hours Students are required to submit three reports: (a) shortly after commencing the internship, a report on the agreement between the student and employer, detailing the scope and nature of the work; (b) a progress report halfway through their training; and (c) a final report at the end of their training. The latter two reports must explain the nature and scope of the work conducted, as well as the technical details of work that they experienced or observed. References by students' industrial supervisors on their conduct must be submitted with these reports.

Students are normally not allowed to register for any other undergraduate module(s) in the year that a student is registered for this module.

Home department: Engineering (Admin)

Method of Assessment: Attendance

Required modules:
PP: All modules of the first two years of a 4-year BEng
Departmental approval

393 (0) Industrial Experience and International Exchange (0T)

This module can be offered either in one or in both semesters. If it is offered in both semesters, it comprises Parts 1 and 2 as described below. If it is offered in only one semester, it comprises only Part 2.

Part 1: Students experience, or observe first hand, typical engineering work or research in an appropriate industry or research institution for least 600 hours. The work must be performed under the direct supervision of an engineer from an appropriate discipline. Students are required to, within their engineering discipline, apply fundamental engineering principles to solve practical problems in an industrial context and develop their technical and interpersonal skills. The home department's prior approval of the scope and nature of the work is required. Students are required to submit at least two reports: (a) shortly after commencing the internship, a report on the agreement between the student and host, detailing the scope and nature of the work; (b) a final report at the end of their training. The latter report must explain the nature and scope of the work conducted, as well as the technical details of work that they experienced or observed. References by students' supervisors on their conduct must be submitted with these reports.

Part 2: Students also undertake an exchange to an engineering faculty outside South Africa for at least 600 hours of participation in projects and/or modules. The host faculty, as well as the

combination of the projects and modules, are subject to the prior approval of the student's home department at Stellenbosch University.

Students are normally not allowed to register for any other undergraduate module(s) at Stellenbosch University in the semester(s) that a student undertakes Internship 393, unless the modules are part of an exchange agreement between the Engineering Faculty and the host faculty.

Home department: Engineering (Admin)

Method of Assessment: Attendance

Required modules:
PP: All modules of the first two years of a 4-year BEng
Departmental approval

39705 Introductory Machine Design

244 (15) Design Process, Machine Parts and Machine Drawing (1L; 3P; 2T)

Conceptual design process, human factors in design. Design for assembly. Machine parts: seals, couplings, keys, retaining rings and bearings. Freehand sketches, part models, 2D detail drawings of parts and part lists, 3D modelling and interference checking. Drawing standards: measurement instrumentation for manufacturing, surface roughness, tolerancing, geometric tolerancing, shrink fits, welding symbols. Design of belt and chain drives. Working drawings and design projects in which the theory is applied.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Drawings 123
P Strength of Materials 143

254 (15) Mechanics of Machines and Machine Drawing (2L; 3P; 1T)

Modelling of mechanical systems: kinematics of planar mechanisms, velocity and acceleration diagrams, balancing. Machine parts: seals, couplings, keys, retaining rings and bearings. Drawing standards: measurement instrumentation for manufacturing, surface roughness, tolerancing, geometric tolerancing, shrink fits, welding symbols. Working drawings.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Drawings 123
P Applied Mathematics B 224

16020 Machine Design A

314 (15) Fatigue, Fracture Mechanics and Machine Components (2L; 2P; 2T)

Design for 3D static and dynamic loads, static failure, fatigue, fracture mechanics, deflection and stiffness, buckling. Design for machining, metal casting, welding, forging and plastic injection moulding. Design projects where the theory is applied up to and including complete working drawings.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Introductory Machine Design 244
P Strength of Materials W 244

16039 Machine Design B

344 (15) Design of Machine Subsystems (2L; 2P; 2T)

Design of lead screws, bolt connections, fasteners, springs, clutches, brakes. Cam analysis and design. Kinematics of gear systems and forces. Gear design. Shaft connections. Design projects where theory is applied up to complete manufacturing drawings. CNC programming.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Machine Design A 314

11745 Maintenance Management

414 (15) Maintenance Management (3L; 0,5P; 2,5T)

Strategic maintenance planning, plant acquisition policy, business interface, structuring of maintenance objectives, reliability statistics, Reliability Centred Maintenance, plant maintenance life planning and scheduling, preventive maintenance, top-down/bottom-up approach, managing maintenance resources, maintenance organisation, human factors, maintenance team work, Total Productive Maintenance, maintenance systems, maintenance budgeting, maintenance control, short-term work planning, management of shutdowns, network analysis technique for management of shutdowns, other shutdown methodologies, spare-part management, maintenance management information systems.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Mechatronics 424

34134 Manufacturing Processes

244 (15) Manufacturing Processes (2L; 1,5P; 1T)

Mechanical properties of materials; casting processes; shaping of plastics; powder metallurgy; metal forming; bulk deformation of material; sheet metal working; principles of metal machining; machining operations and equipment; cutting tools for machining; economic considerations for machining; welding processes; mechanical assembly; non-traditional machining; additive manufacturing (3D printing). Factory visits and process design projects.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Material Science A 244

45381 Manufacturing Systems

314 (15) Manufacturing Systems (2L; 2T)

Introduction to manufacturing systems, design for sustainable manufacturing, computer-aided design (CAD) systems and geometric modelling, reverse engineering; concurrent engineering; rapid prototyping and additive manufacturing; computer-aided process planning (CAPP); CNC technology; network automation of manufacturing systems; part inspection on automated coordinate measuring machines (CMM); quality control; material handling; group technology and manufacturing cells; flexible and reconfigurable manufacturing; computer integrated manufacturing (CIM).

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Manufacturing Processes 244

30325 Material Science A

244 (15) Materials Science A (3L; 3P)

Metals: physical testing; dislocations and strengthening mechanisms; cold work; phase diagrams; micro-structure; iron iron-carbide system; cooling curves; thermal processing; properties of ferrous and non-ferrous alloys; fracture analysis. Ceramics: introduction to ceramics; mechanical properties; types and application; advanced engineering ceramics; fire proof materials; manufacturing processes; future use of advanced ceramics. Polymers: classification; polymerisation; molecular structure; crystalinity; glass transition; melting point; elasticity; flow viscosity; creeping; yielding; morphologic changes during loading; reinforcing mechanisms;

types; advanced fibre-reinforced polymers. Corrosion: types; corrosion processes and rate for metals; corrosion control and protection; corrosion-related phenomena; degradation of polymers; material protection. Thermal properties of materials. Materials selection for engineering applications (project).

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Strength of Materials 143

22853 Mathematical Statistics

214 (16) Distribution Theory and Introduction to Statistical Inference (4L, 2P)

Continuous stochastic variables; expected value and variance of a continuous stochastic variable; important continuous distributions; uniform, normal, exponential, gamma, beta. Moments and moment-generating functions for discrete and continuous distributions. Bivariate probability distributions; marginal and conditional distributions; the multinomial and bivariate normal distribution; determining the distribution of functions of variables. The central limit theorem (without proof). Samples and sampling distributions: the standard parametric cases. Interval estimation and hypothesis testing: applying these principles in the standard cases of parametric inference. Data representation and description, calculating and interpreting sample measures.

Home department: Statistics and Actuarial Science

Method of Assessment: Flexible Assessment (EMS rules)

Required modules:
PP (Mathematics 114 and Mathematics 144) or (Engineering Mathematics 115 and Engineering Mathematics 145)
PP Probability Theory and Statistics 114 or Probability Theory and Statistics 144

245 (8) Statistical Inference and Sampling Theory (2L, 1P)

Introduction to statistical inference. Principles of point estimation: efficiency, minimum variance unbiased estimators, consistency. Method-of-moments estimators. Maximum likelihood estimators. The Neyman-Pearson lemma: proof and applications. Likelihood ratio tests. Sampling theory: sampling techniques in finite and infinite populations, surveys and sequential analysis.

Home department: Statistics and Actuarial Science

Method of assessment: Flexible Assessment (EMS rules)

Required modules:
PP Mathematical Statistics 214

246 (8) Linear Models in Statistics (2L, 1P)

Matrix algebra. Stochastic vectors and matrices. The multivariate normal distribution. Distributions of quadratic forms. The simple linear regression model. The method of least squares. Inference in the simple linear regression model. Introduction to R software.

Home department: Statistics and Actuarial Science

Method of assessment: Flexible Assessment (EMS rules).

Required modules:
PP Mathematical Statistics 214

312 (16) Statistical Inference and Probability Theory (3L, 1P)

Advanced distribution theory, sequences of random variables, limit theory for sequences, generating functions, sampling distributions. Different approaches to inference. Parametric estimation theory and hypothesis testing, goodness-of-fit tests, non-parametric inference. Bayes inference. Decision theory.

Home department: Statistics and Actuarial Science

Method of assessment: Flexible Assessment (EMS rules)

Required modules:
PP Mathematical Statistics 244 or Mathematical Statistics 245
P Mathematical Statistics 246
P (Mathematics 214 and Mathematics 244) or (Engineering Mathematics 214 and Engineering Mathematics 242)

316 (16) Regression and Analysis of Variance (3L, 1P)

Fitting regression models by means of matrices. The multiple linear regression model. Inference in the multiple linear regression model. Residual analysis. Analysis of variance models. The use of R software to fit models in practice.

Home department: Statistics and Actuarial Science

Method of assessment: Flexible Assessment (EMS rules)

Required modules:
PP Mathematical Statistics 244 or Mathematical Statistics 246
P Mathematical Statistics 245
P (Mathematics 214 and Mathematics 214) or (Engineering Mathematics 214, Engineering Mathematics 242 and Applied Mathematics B 242)

344 (16) Stochastic Processes (3L, 1P)

Introduction to stochastic processes. Markov chains, Markov processes and their applications. Markov jump processes. Elementary martingale theorem and applications. Brownian movements. Renewal theory.

Home department: Statistics and Actuarial Science

Method of assessment: Flexible Assessment (EMS rules)

Required modules:
P Mathematical Statistics 312 or Mathematical Statistics 318
P Mathematical Statistics 316 or Mathematical Statistics 318

21539 Mathematics

186 (32) Introductory Mathematics (3L; 3T)

For BSc (Extended Degree Programme) and BEng (Extended Degree Programme) students.

Any student who wishes to take this module must have achieved a mark of at least 5 (or 60%) for Mathematics in the NSC or the IEB's school-leaving certificate. An introduction to calculus, linear algebra and mathematical reasoning: different presentations of functions in terms of formulas, graphs, tables and stories; inverse of a function; exponential and logarithmic functions; trigonometric functions and their inverse functions; modelling with functions. Gradual progression from average to instantaneous rate of change; limits; basic integration. Systems of equations; analytic geometry; mathematical induction; binomial theorem.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

21466 Mechanical Design

444 (15) Principles of Systems Engineering (3L; 3P)

Principles of systems engineering; legal aspects of engineering practice and safety; product lifecycle management. Design of systems that integrate heat transfer, fluid mechanics, fluid machines and control systems (design projects are done in teams).

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Heat Transfer A 414
P Modelling 334

39292 Mechanical Engineering

152 (6) An introduction to mechanical engineering (3T)

Mechanical machines and components; freehand drawings; modelling of machines and components; conceptual design process; layout and assembly of a mechanical system; basic experimental investigation.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

414 (15) Specialist Topics in Mechanical Engineering (3L; 1P; 2T)

Topics from specialist areas in mechanical engineering, such as air-conditioning and refrigeration, aeronautical engineering, marine engineering, vehicle engineering and machine design. The exact content of the module is determined annually as dictated by the availability of specialist lecturers and the requirements of students.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

Required modules:
Final-year enrolment

39179 Mechanical Project

478 (45) Capstone Project for Mechanical Engineering Students (2L; 3P)

Professional communication: written and oral project presentations, reports. Independent execution of theoretical and/or practical design and/or investigation in the field of mechanical engineering with formal oral presentations and the submission of a final comprehensive report.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

Required modules:
Final-year enrolment

10886 Mechatronic Engineering

152 (6) An introduction to mechatronic engineering (3T)

Mechanical machines and components; freehand drawings; modelling of machines and components; conceptual design process; layout and assembly of a mechatronic system; basic experimental investigation.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

56790 Mechatronic Project

478 (45) Capstone Project for Mechatronic Engineering Students (2L; 3P)

Professional communication: written and oral project presentations, reports. Independent execution of theoretical and/or practical design and/or investigation in the field of mechatronic engineering with formal oral presentations and the submission of a final comprehensive report.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Project

Required modules:
Final-year enrolment

488 (45) Capstone Project for Mechatronic Engineering Students (2L; 3P)

Professional communication: written and oral project presentations, reports. Independent execution of theoretical and/or practical design and/or investigation in the field of mechatronic engineering with formal oral presentations and the submission of a final comprehensive report.

Home department: Electrical and Electronic Engineering

Method of Assessment: Project

Required modules:
Final-year enrolment

50458 Mechatronics

424 (18 until 2021, thereafter 15) Mechatronic Design (3L; 3P)

Sensors, measurement accuracy and uncertainty, actuators; digital and analogue interfaces; sequential control with relay logic, PLCs and PCs. One or more projects in which mechanics, electronics, computer use and control are integrated.

Until 2021: The statistics of measurement and reliability (this section is presented as a block course before the start of the semester).

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Electrical Drive Systems 324
P Electronics 245 or P Electronics 344

47988 Mineral Processing

345 (15) Mineral Processing (3L; 1P; 2T)

Mineral growths and principles of liberation; solid state analysis; population balances; mineral liberation and liberation distributions; classification with sieves and hydrocyclones; empirical models; comminution; density-based separation equipment; surface chemistry and flotation; hydrometallurgical principles and unit operations; Pourbaix diagrams; introductory mass balance reconciliation.

[Presented by Dept Process Engineering, 80% of module.]

Introduction to mineralogy. Characterisation of materials in the solid state: scanning electron microscopy with energy dispersive spectroscopy (SEM-EDS) and wave length dispersion spectroscopy; X-ray fluorescence (XRF) and X-ray diffraction techniques (XRD); reflectance and transmittance microscopic techniques and image analysis; microscopic techniques based on polarised light and etched materials, sample preparation for solid state characterisation and

spectroscopic techniques. Laser ablation, glow discharge and spark discharge optical emission spectra.

[Presented by Dept Earth Sciences, 20% of module.]

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 254
P Particle Technology 316

415 (15) Materials Extraction and Selection (3L; 2T)

Processing of natural raw materials and secondary materials: applied phase and reaction equilibrium thermodynamics relevant to solid and liquid solutions, molten alloys, slag and matte melts. Processing methods in high and low temperature reactors from raw or secondary materials to metals, alloys and solutions containing metallic species with consideration of kinetic as well as thermodynamic factors. Extraction of metals with regard to the selection, specification and characterisation of pyrometallurgical reactors, including refractory materials at both high and low temperatures. Materials in chemical engineering: macro and micro properties of metals, ceramics, composites and polymers. Selection of materials for chemical engineering applications with consideration of prediction, limitation and prevention of failure, corrosion and degradation. Homework tasks in the form of self-study, tutorial problems, designs or seminars form an integral part of the module.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 317

56804 Modelling

334 (18) Modelling and Simulation of Mechanical Systems (4L; 1P; 2T)

Formulation of differential equations, solutions using Laplace transforms, block diagrams and transfer functions; state space formulation, eigenvalues and stability. Simulation of mechanical systems: numerical solutions of ordinary first order differential equations; programming of mathematical models in Matlab and Simulink; interpretation of results; experimental identification of model parameters. Transient and stationary behaviour; frequency response analysis; Bode and polar plot diagrams. Design of a laboratory experiment.

Up to 2020: Modelling of mechanical systems: kinematics of planar mechanisms, velocity and acceleration diagrams, balancing.

From 2021: The statistics of measurement and reliability, expected values, distributions and probability density functions; operations and transformation of random variables; programming with R.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Applied Mathematics B 224 (until 2020)
P Engineering Mathematics 214
P Engineering Mathematics 242

53678 Numerical Fluid Dynamics

414 (15) Numerical Fluid Dynamics (3L; 1P; 2T)

Modelling of flow: elements of numerical flow software, conservation laws and differential equations for mass, momentum and energy, boundary conditions, equation of state, grid types and generation, linearisation, discretisation, false diffusion, SIMPLE pressure correction algorithm, stability, relaxation factors, source term linearisation, error calculations, convergence, use of commercial codes; course project.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Thermofluid Dynamics 344

36323 Numerical Methods

262 (8) Numerical Methods (2L; 1T)

Introduction to MATLAB; zeros of functions; solving of systems of linear equations; numerical differentiation and integration; interpolation and curve-fitting; numerical methods for solving ordinary and partial differential equations.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214

59528 Operations Research (Eng)

345 (15) Operations Research (Deterministic Models) (3L; 3T)

The systems approach to problem-solving; problems leading to linear programming, network, integer and non-linear programming models; algorithms for solving such models; tasks, including exercises with computer packages.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214

415 (15) Operations Research (Stochastic Models) (3L; 3T)

Analysis of problems leading to deterministic and stochastic dynamic programming models; Markov chains and waiting-line models; techniques for solving such models; decisions under uncertainty; Bayes' theorem; multi-criteria decision-making; local-search and population-based metaheuristics.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Statistics 314

14020 Optimisation (Eng)

414 (15) Non-linear Optimisation (3L; 1,5P; 1,5T)

Classical methods: gradient-based approaches, the simplex method, BFGS, Nelder-Mead, trust regions, quadratic programming, Monte Carlo methods and random walks. Metaheuristic methods: evolutionary algorithms, simulated annealing, swarm-based optimisation algorithms and estimation of distribution algorithms. A wide range of optimisation algorithms; theory of non-linear problems, conditions for optima, convergence rate, sensitivity analysis.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Operations Research 345
P Computer Science E 214

47902 Particle Technology

316 (15) Particle Technology (3L; 1P; 2T)

1 Practical per semester

Characteristics and mathematical description of particles and their size distributions; determination of the particular characteristics of single particles and powders; the mechanical

behaviour and flow patterns of particle systems; mixing and segregation of particle systems; particle size reduction and particle size classification; sedimentation and thickener design; flow through packed beds; fluidisation and fluidised bed behaviour of particles; hydraulic and pneumatic transport of particles; filtration: principles, process analysis and design; centrifugal separation; crystallisation. Surface characterisation of powders (BET), suspension and stirring of slurries.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 254
P Chemical Engineering 264

65609 Philosophy and Ethics

314 (4) Philosophy and Ethics (2L)

Applied ethics; the code of conduct for professional persons of the Engineering Council of SA (ECSA); case studies of typical situations from engineering practice, including the social, workplace and physical environments.

Offered in the first term of the semester.

The quality assurance of Philosophy and Ethics is handled jointly by the Department of Philosophy and the Faculty of Engineering.

Home department: Philosophy

Method of Assessment: Flexible Assessment

414 (4) Philosophy and Ethics (2L)

Applied ethics; the code of conduct for professional persons of the Engineering Council of SA (ECSA); case studies of typical situations from engineering practice, including the social, workplace and physical environments.

Offered in the first term of the semester.

The quality assurance of Philosophy and Ethics is handled jointly by the Department of Philosophy and the Faculty of Engineering.

Home department: Philosophy

Method of Assessment: Flexible Assessment

12998 Physics

176 (32) Preparatory Physics (3L; 3P)

Students follow this module in the BSc Extended Degree Programmes in AgriSciences and Science and for the BEng. The module focuses on the nature of physics with the following themes as content: mechanics, electromagnetism, modern physics.

Home department: Physics

Method of Assessment: Flexible Assessment

40142 Practical Workshop Training

211 (0) Practical Workshop Training

After their first year of study, students receive training in workshop practice at a workshop appointed by the University. Students may complete such training at other institutions that have suitable facilities and staff, provided that prior written permission is obtained from the relevant departmental chair. Such permission must be obtained prior to the commencement of the module.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Attendance

241 (0) Practical Workshop Training

Students receive, after their first study year, training in workshop practice in a workshop appointed by the University. Students may complete such training at other organisations which have the necessary facilities and personnel, provided that written permission is obtained from the relevant departmental chair. Such permission must be obtained prior to the commencement of the module.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Attendance

12201 Preparatory Technical Drawings

146 (16) Preparatory Technical Drawings (3L; 3P)

Principles of first- and third-angle projection. Linework and lettering. Isometric projections and drawings. Drawing layouts. Full section views. Geometric constructions and tangency. True lengths and auxiliary views. Introduction to descriptive geometry: points and lines in space; new projection planes. Introduction to parametric geometric modelling in computer-aided design (CAD).

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

56820 Probability Theory and Statistics

114 (16) Probability Theory and Statistics (3L, 3T)

Combinatorial analysis; the basic counting principles; permutations and combinations. Random phenomena; sample spaces and events; the probability axioms; the probability of an event; random selection; probability rules; conditional probability; the rule of Bayes; stochastic independence. Discrete and continuous stochastic variables; expected value and variance of a stochastic variable; important discrete distributions: binomial, Poisson, geometric, hyper-geometric, negative binomial; important continuous distributions, uniform, exponential, normal.

Please note: This module is identical to Probability Theory and Statistics 144(16), which is offered in the second semester by the Department of Statistics and Actuarial Science for BCom students.

Home department: Statistics and Actuarial Science

Method of Assessment: Flexible Assessment (EMS rules)

23256 Production Management

212 (8) Production and Operational Management (2L; 2T)

Introduction to operations management; strategy and sustainability; process analysis and manufacturing processes; lean supply chains; sales and operations planning; materials requirements planning (dependent inventory).

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

314 (15) Operations Facilities and Management (3L; 1P; 2T)

Facility design from a strategic, process and schedule context; flow and space relationships; personnel requirements; materials handling; layout models and algorithms; operational aspects of a warehouse; operational aspects of a distribution centre; manufacturing process design; supply chain management; classic inventory control; material requirements planning (MRP); Theory of Constraints (TOC).

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Production Management 212
C Engineering Statistics 314

444 (12) Financial and Production Management (3L; 2T)

Introduction to operations management, productivity and competitiveness; the funds flow cycle and the accounting equation; process flow analysis; cost accounting; quality management and statistical process control; budgets and capital expenditure including discounted cash flow

techniques; inflation and tax; just-in-time management (JIT), theory of constraints scheduling (TOC); inventory control and MRP; supply chain management (SCM).

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

59447 Professional Communication

113 (8) Professional Communication (2L; 2T)

Effective communication with various target audiences with specific objectives in mind; particular focus on the planning and writing of a technical report; other document types in the professional environment such as proposals and correspondence; text skills, such as coherence, appropriate style and text structure; appropriate referencing methods; written communication in teams. Introduction to the engineering profession.

Home department: Engineering (Admin)

Method of Assessment: Project

30279 Project (Civil Engineering)

418 (30) Project (Civil) (1L; 20P)

Each student must complete an approved design or research project during the final year, after which a comprehensive report on the project is submitted. The project must be of an investigative nature and the ability of the student to work independently will be assessed. Each student will deliver an oral and poster presentation on the project. This module may be done only instead of Project (Civil) 458 in the semester that the students can complete their programme.

Home department: Civil Engineering

Method of Assessment: Project

Required modules:
Departmental approval

458 (30) Project (Civil) (1L; 20P)

Each student must complete an approved design or research project during their final year, after which a comprehensive report on the project is submitted. The project must be of an investigative nature and the ability of the student to work independently will be assessed. Each student will deliver an oral and poster presentation on the project.

Home department: Civil Engineering

Method of Assessment: Project

Required modules:
Departmental approval

46795 Project (E)

448 (45) Project (E) (20P)

Thesis project: Each student must do an independent project on an approved topic and submit a full report. An oral examination is required where the professional communication skills of each student is assessed.

Home department: Electrical and Electronic Engineering

Method of Assessment: Project

Required modules:
Final-year Enrolment

51993 Project Management

412 (12) Project Management (3L; 1T)

Project management framework: integration, scope, time, cost, human resources, communication, risk, safety and procurement. Project management processes: initiating, planning, execution, control and commissioning. Principles of business management and leadership. Multidisciplinary team work and project management.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

46167 Quality Assurance

344 (15) Quality Assurance (2L; 3T)

Definition of quality, methods and techniques of quality assurance, statistical process design, sampling. Principles of robust design. Formulation of measures of system performance and quality. Identification of quality noise factors. Formulation and implementation of techniques to reduce effects of noise. Synthesis and selection of design concepts for robustness.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Statistics 314

59471 Quality Management

444 (15) Quality Management (3L; 3T)

Definition of reliability and maintainability; reliability management; methods and techniques for reliability modelling, allocation, prediction and maintainability assurance; fault tree analysis; failure mode analysis; quality management; history and background; ISO 9000; total quality

management; leadership, 6-sigma; cost considerations; quality audits; experimental design with Statistica.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Statistics 314

64866 Scientific Communication Skills

116 (12) Scientific Communication Skills (3L; 3T)

For BSc (Extended Degree Programme) students. This module focuses on the development of speaking, listening, and reading skills in the academic environment in general and specifically in the natural sciences. Aspects such as engaging with and understanding relevant academic and natural science texts, understanding text components, the use of fluent, correct and proper language, and the interpretation of graphic data, will be addressed.

Home department: Language Centre

Method of Assessment: Flexible Assessment

146 (6) Scientific Communication Skills (3L)

For BSc (Extended Degree Programme) students. This module focuses on the development of writing skills in the academic environment in general and specifically in the natural sciences. Aspects such as engaging with and understanding relevant academic and natural science texts, understanding text components, presenting data in an edited and coherent text, the use of correct and proper language, the employment of accurate language, correct referencing technique and using graphics to clarify data will be addressed.

Home department: Language Centre

Method of Assessment: Flexible Assessment

53945 Simulation

442 (12) Simulation (3L; 1P; 2T)

Principles of discrete-event simulation of stochastic processes; generation of random numbers and values for random variables; Monte-Carlo principle; simulation methodology; concept models; theory, techniques and resources required for the analysis of input- and output data of simulation models; applications with a software package.

Home department: Industrial Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Statistics 314

19712 Strength of Materials

143 (12) Introduction: Mechanics of Deformable Bodies (3L; 2T)

Introduction to mechanics, internal forces and stresses, deformations and strain, material response: material law, axially loaded elements, torsion elements with circular cross section, symmetrical bending of beams, thin walled pressure vessels.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Engineering Mathematics 115
C Applied Mathematics B 124

224 (15) Stress Analysis (3L; 2,5T)

Stress and strain analysis; relation between stress and strain for materials; transformation of stress and strain, principal stress and principal strain; elastic and plastic material behaviour for axially loaded members, stability of axially loaded members (Euler theory), torsion, bending and skew bending elements with solid and thin-walled sections; shear stress in bending; composite stress – axial, torsion, shear and bending; stress concentrations, failure theories and fatigue; elastic design of members.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Strength of Materials 143

254 (15) Structural Analysis (3L; 2,5T)

Determining equilibrium, reactions, section forces, material law, controlling differential equations, strains and displacements of structural elements. Axial members and trusses, torsion members, bending members and plane frames. Representation of loadings and reactions with discontinuity functions. Theory and application of classic structural analysis techniques. Macaulay, moment-area, slope displacement, stiffness (displacement), flexibility (force) methods, energy methods and virtual work.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Strength of Materials 224

19739 Strength of Materials W

244 (15) Displacements, Failure Criteria, Stress and Strain Transformations (3L; 1P; 2T)

Displacements and deflection of beams. Energy methods. Stress and strain transformations. Mohr circles. Von Mises, Tresca and Mohr-Coulomb failure theories. The relationship between stress and strain and the application to thick-walled cylinders, curved beams, press and shrink fits, rotating discs and rings, etc. Experimental stress analysis using strain gauges.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214
P Strength of Materials 224

334 (15) Strength of Materials (3L; 1P; 2T)

Complex strains and stresses; generalised Hook's law, anisotropic materials (composites); failure criterions; introduction to plasticity; fracture mechanics (stress singularities); time dependent failure (material creep); non-destructive testing (NDT) and failure analysis.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214
P Engineering Mathematics 242
P Strength of Materials W 244

36307 Structural Design

354 (15) Concrete Construction (3L; 2,5T)

Conceptual understanding of reinforced concrete structures: limit states approach and loads according to the relevant design codes of practice (gravitational loads). Material behaviour of concrete (shrinkage, creep and applications according to the relevant codes of practice). Short column analysis: stresses, areas of steel and concrete, basic detailing. Slender columns (uni-axial and bi-axial bending). Beam analysis: bending, redistribution of moments, shear forces, basic detailing, displacement control (L/d ratio according to design codes of practice). Slab design: beam and slab with application of tables in codes of practice, flat slab design and punching shear, basic detailing. Simplified frames as allowed by codes of practice (application of commercial frame analysis software packages). Introduction to pre-stressed concrete (statically determinate beams): choice of tendon force and tendon profile, losses, details (anchor zone). Anchorage of reinforcement: laps and bond of reinforced concrete. Furthermore, continuously as part of the above: quality control during design and construction, specifications, representation of a physical structure by theoretical modelling.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Building Materials 254
P Strength of Materials 254

424 (15) Steel Construction (3L; 2,5T)

Description of the basis of design. Determination of structural loading according to the relevant code of practice: review of general prescriptions, focus on wind loading as applied to steel structures. Conceptual design of steel structures. Determination of the response of steel structures in terms of function, stability and load effects (element forces and deflections). Determination of the function, response and capacity of structural steel elements, tension elements, compression elements, beams, beam-columns, connections and foot plates in terms of the relevant code of practice. Design of basic steel structure.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Strength of Materials 254
C Structural Design 354

46779 Systems and Signals

214 (15) Introduction to Systems and Signals (3L; 1P; 2T)

Sinusoidal steady-state analysis; phasors; sinusoidal power and energy concepts; transient and phasor analysis of second-order RLC circuits; instantaneous and average power; ideal operational amplifiers; two-port parameters.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electrotechnique 143

244 (15) Frequency Domain Techniques (3L; 1,5P; 1,5T)

The Laplace transform and its application to dynamic circuits; impulse and step response; convolution; transfer functions; Bode plots; basic passive filters; basic active filters; Fourier series and its application to circuits; Fourier transform and its applications to circuits; filters.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Electrotechnique 143
C Engineering Mathematics 214
C Engineering Mathematics 242

315 (15) Signal Theory and Analogue Modulation (3L; 1,5P; 1,5T)

Time/frequency transformations as underlying principle; the Fourier transform and the discrete Fourier transform (DFT); LTI systems; modulation as building block for telecommunication systems; application of transforms in AM, SSB, FM, FDM and TDM; (de)modulation circuits with theoretical verification.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Systems and Signals 214
C Systems and Signals 244

344 (15) Stochastic Signals (3L; 1P; 2T)

One- and multi-dimensional random variables; expected values, moments, distribution functions and probability density functions; operations on and transformations of random variables; random signals, auto- and cross-correlation, stationary and spectral characteristics; behaviour with linear systems.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Systems and Signals 315

414 (15) Digital Signal Processing (3L; 1P; 1T)

Sampling and time/frequency duality; Fourier transforms and series of discrete-time signals, the discrete Fourier transform (DFT), the fast Fourier transform (FFT), convolution by means of the FFT; describing and characterising discrete-time systems using the z-transform, impulse responses, frequency responses; difference equations; elementary filters, FIR and IIR filter design; using auto-correlations and cross-correlations.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Systems and Signals 344

20419 Telecommunication

414 (15) Introduction to Telecommunications (3L; 1P; 1T)

Channel capacity; baseband data transmission: intersymbol interference and error probabilities; signal-to-noise ratios; probability of error for digital modulation schemes (ASK, PSK, FSK); digital transmission of analogue signals (PCM) and quantisation noise; forward error correction codes.

Home department: Electrical and Electronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
C Systems and Signals 344

19984 Theory of Structures

354 (15) Finite Element Methods (3L; 2,5T)

Theory of structural components, membranes, thin plates and frames. Finite element theory and computer implementation of elements for the components stated. Modelling and interpretation of results for the different cases.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Strength of Materials 254
P Engineering Informatics 314

33863 Thermodynamics A

214 (15) Applied Thermodynamics A (3L; 1P; 2T)

Specific heat, C_p and C_v; vapours; gas-vapour mixtures, saturation; use of steam tables, phase diagrams; ideal and non-ideal gases; compressibility charts, improvements to the state equation; mass balances (steady and unsteady); energy, mechanical work, first law of thermodynamics; applications to closed and open systems: processes and cycles; method of problem solving; state changes for ideal gases; isochoric, isobaric, isothermic, adiabatic and polytropic changes; enthalpy and technical work; entropy and the second law; temperature-entropy diagram; maximum available energy. Applications of thermodynamics; technical cycle processes; power generation; cooling cycles.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 145
C Applied Mathematics B 154
P Engineering Chemistry 123

224 (15) Applied Chemical Thermodynamics A (3L; 1P; 2,5T)

1 Practical per semester

Specific heat, C_p and C_v; vapours; gas-vapour mixtures, saturation; use of steam tables and phase diagrams; ideal and non-ideal gases; compressibility charts; inter-molecular forces and potential functions; basic equations of state; energy, mechanical work and first law of thermodynamics; applications to closed and open systems; state changes for ideal gases; isochoric, isobaric, isothermic, adiabatic and polytropic changes; enthalpy and technical work; entropy and the second law; temperature entropy diagram; maximum available energy; irreversible processes; basic cycles and refrigeration.

Home department: Process Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 145
C Applied Mathematics B 154
P Engineering Chemistry 123

59544 Thermofluid Dynamics

214 (15) Introductory Thermofluid Dynamics (3L; 3P)

Engineering approach to problem solving; thermodynamic properties of water and an ideal gas; conservation of mass, momentum and energy; entropy; thermodynamic processes in closed and open systems; generation, use and distribution of steam; pump and pipe systems; fans; ducts; steady conduction, convection and radiation heat transfer; air-vapour mixtures and air-conditioning processes.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Chemistry 123

344 (15) Thermodynamics and Fluid Dynamics (3L; 1P; 2T)

External flow: introduction to fluid flow over bodies; Reynolds number and geometric effects; momentum-integral approach; boundary layer equations: flat plate with and without pressure gradients; lift and drag forces. Compressible flow: compressibility and the Mach number; stagnation conditions; isentropic flow; flow with heat addition and with friction; shock wave phenomena; the application of compressible flow; the effect of area change. Introduction to turbomachinery, pumps, axial fans; compressible flow through fluid machinery, dimensional analysis; rothalpy; centrifugal and axial compressors; gas turbines; steam turbines. Introduction to Numerical Fluid Dynamics (NFD).

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Thermodynamics A 214
P Fluid Mechanics 244

21040 Transport Science

324 (15) Transportation Engineering (3L; 1P; 1,5T)

Traffic flow theory: travel patterns, traffic flow variables and their relationships (speed, volume, travel time, delay). Urban transport networks: network development, classification and universal accessibility. Traffic engineering: speed studies, parking, capacity and level of service, intersection control. Transportation planning: stakeholders, travel demand forecasting. Traffic impact assessments. Public transport: modes and intermodal transport, operational planning. Transport economics: evaluation of projects, user pricing and payment.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

364 (15) Transportation Engineering (3L; 1P; 1,5T)

Urban transport travel demand management. Road geometric design: human factors and vehicle movements, movement equations, vertical and horizontal alignment design, route determination, intersection design, international standards. Transport safety: human factors, causes and severity of crashes, non-motorised traffic, public transport and safety, road safety audits, safety standards, forgiving road, systems approach. ITS Infrastructure: ITS applications, infrastructure, communications, trends. Non-motorised transport: NMT facilities, human walking behaviour. Rail and Freight: rail system in SA, freight supply chain.

From 2021 also: Traffic analysis using floating car data, data visualisation.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Engineering Statistics 324 (from 2021)
P Transport Science 324
PP Applied Mathematics B 154

434 (15) Pavement Design (3L; 1P; 1,5T)

Overview of pavements; elastic layer theory; stresses and strain development, behaviour of granular, asphaltic and cementitious materials; behaviour and transfer functions; alternative pavement design methods, including CBR design, mechanistic design and low-volume road design; flexible and rigid pavements; influence of climate; construction; rehabilitation and maintenance; present worth of costs for roads.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Transport Science 324

64007 University Practice in the Natural Sciences

176 (8) University Practice in the Natural Sciences (3L)

Study load: 78 lectures in total, presented as 5L per week in the first semester and 1L per week in the second semester.

For students in the BSc (Extended Degree Programme). It is followed up during the second semester in the different subject-specific modules of Mathematics 176, Physics 146, Chemistry 176 and Biology 146. Basic terminology and concepts are addressed. Study and life skills receive attention. The natural sciences and specifically the subjects taken by the students serve as a context.

Home department: Mathematical Sciences

Method of Assessment: Flexible Assessment

40150 Vacation Training

241 (0) Vacation Training (Civil)

A block of a minimum of four weeks' vacation training must be completed. A report, complying with the Department's requirements, must be submitted as examination script. The student must make his/her own arrangements for vacation training. The Department is willing to assist with the arrangements. Students that do not succeed in arranging vacation work must, before the particular holiday, formulate a project of equivalent scope and submit it to the Chair of the Department for approval. Vacation Training 241 may be completed at any time after the commencement of the second academic year.

Home department: Civil Engineering

Method of Assessment: Attendance

341 (0) Vacation Training (Mechanical and Mechatronic)

Students must complete at least four uninterrupted weeks, or six weeks with no more than one interruption of up to four weeks, of vacation training on which a report that complies with the Department's requirements is submitted as examination script. Students must make their own arrangements for vacation training. The Department is prepared to assist them in this regard. In cases where employment cannot be found, students must formulate a project of equivalent scope and submit it to the Chair of the Department for approval. Vacation Training 341 may be completed at any time after commencement of the second year of study.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Attendance

342 (0) Vacation Training (Civil)

A block of a minimum of four weeks' vacation training must be completed. A report, complying with the Department's requirements, must be submitted as examination script. The student must make his/her own arrangements for vacation training. The Department is willing to assist with the arrangements. Students that do not succeed in arranging vacation work must, before the particular holiday, formulate a project of equivalent scope and submit it to the Chair of the Department for approval. Vacation Training 342 may be completed at any time after the commencement of the second academic year.

Home department: Civil Engineering

Method of Assessment: Attendance

351 (0) Vacation Training (Industrial)

A period of at least three weeks of vacation training must be completed, supported by a report in accordance with departmental requirements. The report will be subject to examination. While students are expected to arrange their own vacation employment, the Department is prepared to provide assistance in this regard. In cases where employment cannot be found, students are required to complete a project or task as agreed upon with the Chair of the Department. Vacation training (Industrial) 351 may be completed at any time after the start of the second academic year of study. Students may also apply for permission to do a single session of vacation training. This session must be of at least six weeks duration (uninterrupted), and a single report is required which must cover the complete session. This alternative allows the student to complete Vacation Training 351 (Industrial) as well as Vacation Training 451 (Industrial) simultaneously, and may be completed at any time after the start of the third academic year.

Home department: Industrial Engineering

Method of Assessment: Attendance

361 (0) Vacation Training (Chemical)

At least six weeks' vacation training should be done in total, of which at least three weeks must be uninterrupted. Preferably the students should do work in the chemical and mineral process industries and gain exposure to the large-scale equipment used in industry which is not available at the University. The work should be of engineering or scientific nature, and preferably be done under the guidance of a graduate chemical or metallurgical engineer.

Home department: Process Engineering

Method of Assessment: Attendance

441 (0) Vacation Training (Mechanical and Mechatronic)

The same particulars as Vacation Training 341, except that Vacation Training 441 can be completed any time after the start of the third academic year.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Attendance

451 (0) Vacation Training (Industrial)

Refer to Vacation Training (Industrial) 351 for details. Vacation Training (Industrial) 451 may be completed at any time after the start of the third academic year of study.

Home department: Industrial Engineering

Method of Assessment: Attendance

23477 Vibration and Noise

354 (12) Vibration and Noise of Mechanical Systems (3L; 1P; 1T)

Vibration of systems with a single degree of freedom: formulation of mathematical models, free and forced vibration of undamped and damped systems. Systems with two and more degrees of freedom: natural frequencies and modes of undamped systems, free and forced vibrations, and frequency response functions. Vibration of continuous systems. Control of vibration: balancing, isolation, absorbers, and vibration measurement. Vibration monitoring for maintenance purposes. Fundamentals of sound and noise; measuring and standards of industrial noise; influence of noise on the environment. The control of noise by damping and shielding.

Home department: Mechanical and Mechatronic Engineering

Method of Assessment: Flexible Assessment

Required modules:
P Applied Mathematics B 224
P Modelling 334

13184 Water Treatment

324 (15) Fundamentals of wastewater treatment (3L; 2,5T)

Objectives of wastewater treatment; wastewater laboratory testing methods; physical characterisation, settleable, non-settleable and dissolved constituents; primary sedimentation; unit operations, biodegradable and unbiodegradable organics, biological growth and death behaviour; biological process kinetic equations; the steady state activated sludge model; oxygen demand and sludge production.

Home department: Civil Engineering

Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Chemistry 123
P Engineering Mathematics 115
C Hydraulics 324

Appendix A: Faculty-wide Awards

A.1 Chancellor's Medal

1965	JH Gouws	BScBEng	Electrical and Electronic
1977	JB Neethling	BEngHons	Civil
1986	AF Conradie	MEng, BEng	Mechanical and Mechatronic, Industrial
1987	WD Rencken	BEng	Electrical and Electronic
1988	P Meyer	MEng	Electrical and Electronic
1992	TJ van der Walt	PhD	Process/Chemical
2001	CAW Vale	PhD	Electrical and Electronic
2003	M Schoeman	MScEng, BEng	Electrical and Electronic
2006	C Barnardo	PhD	Civil
2007	DIL de Villiers	PhD	Electrical and Electronic
2010	L Auret	PhD	Process/Chemical
2016	RM Swanepoel	BEng	Process/Chemical
2017	J Kazmaier	BEng	Industrial

A.2 Dean's Award for Outstanding Achievement

1996	DW Moolman	PhD	Process/Chemical
2004	M du Rand	PhD	Process/Chemical

A.3 ECSA Merit Medal

1982	PJ de Bruyn	Mechanical and Mechatronic, Industrial
1984	AF Conradie	Mechanical and Mechatronic
1985	GJJ van Zyl	Electrical and Electronic
1986	P Meyer	Electrical and Electronic
1987	WD Rencken	Electrical and Electronic
1988	K van der Westhuizen	Mechanical and Mechatronic
1989	IP Theron	Electrical and Electronic
1990	R de Villiers	Electrical and Electronic
1991	TR Niesler	Electrical and Electronic
1992	JC van Rooyen	Electrical and Electronic
1993	A van Zyl	Electrical and Electronic
1994	SWJ Esterhuyse	Mechanical and Mechatronic
1995	LC Schwardt	Electrical and Electronic

1996	P Poolman	Civil
1997	MO Vermeulen	Mechanical and Mechatronic
1998	CAW Vale	Electrical and Electronic
1999	PleR Herselman	Electrical and Electronic
2000	T Stehmann	Electrical and Electronic
2001	C Barnardo	Civil
2002	T Sickel	Electrical and Electronic
2003	P Joubert	Electrical and Electronic
2004	DIL de Villiers	Electrical and Electronic
2005	C Dorfling	Process/Chemical
2006	G Hardie	Electrical and Electronic
2007	L Loots	Electrical and Electronic
2008	R le Roux, P van der Spuy	Civil
2009	H Kamper	Electrical and Electronic
2010	MH Volkmann	Electrical and Electronic
2011	HJ Gadinger	Electrical and Electronic
2012	W Burger	Process/Chemical
2013	RP Theart	Electrical and Electronic
2014	CB Roelofse	Civil
2015	GT Hawkridge	Mechanical and Mechatronic
2016	RM Swanepoel	Process/Chemical
2017	M Louw	Industrial

A.4 Engineering – Lecturer of the Year

1992	JB Uys	Applied Mathematics
1993	J Rossouw	Civil
1994	G Geldenhuys	Applied Mathematics
1995	A Rooseboom	Civil
1996	JJ du Plessis	Electrical and Electronic
1996	DG Kröger	Mechanical and Mechatronic
1997	AH Basson	Mechanical and Mechatronic
1998	E Terblanche	Mechanical and Mechatronic
1999	L Lorenzen	Process/Chemical
2000	JB de Swardt	Electrical and Electronic
2001	A Schoonwinkel	Electrical and Electronic
2002	PJ Bakkes	Electrical and Electronic
2003	JL van Niekerk	Mechanical and Mechatronic
2004	PE Dunaiski JH Knoetze	Civil Process/Chemical
2005	TW von Backström	Mechanical and Mechatronic

2006	J Bekker	Industrial
2007	WJ Perold	Electrical and Electronic
2008	MJ Kamper	Electrical and Electronic
2009	CJ Bester	Civil
2011	KD Palmer	Electrical and Electronic
2012	GPAG van Zijl	Civil
2013	MM Blanckenberg	Electrical and Electronic
2014	HC Reader	Electrical and Electronic
2015	AJ Burger K Jenkins	Process/Chemical Civil
2016	SM Bradshaw	Process/Chemical
2017	CSL Schutte	Industrial
2018	WH Steyn G Venter	Electrical and Electronic Mechanical and Mechatronic

A.5 Engineering – Researcher of the Year

1987	DG Kröger	Mechanical and Mechatronic
1988	JH Cloete	Electrical and Electronic
1989	HJ Viljoen	Process/Chemical
1990	JSJ van Deventer	Process/Chemical
1991	JP du Plessis	Applied Mathematics
1992	TW von Backström	Mechanical and Mechatronic
1993	JHR Enslin	Electrical and Electronic
1994	A Rooseboom	Civil
1995	C Aldrich	Process/Chemical
1995	DB Davidson	Electrical and Electronic
1996	L Lorenzen	Process/Chemical
1997	WJ Perold	Electrical and Electronic
1998	DG Kröger	Mechanical and Mechatronic

A.6 Engineering – Upcoming Researcher of the Year

1999	I Nieuwoudt	Process/Chemical
1999	P Meyer	Electrical and Electronic
2000	MJ Kamper	Electrical and Electronic
2001	C van Niekerk	Electrical and Electronic
2002	JA van Vuuren	Applied Mathematics
2003	JJ Eksteen	Process/Chemical
2004	CJ Fourie	Electrical and Electronic

2005	C Scheffer	Mechanical and Mechatronic
2006	JF Görgens	Process/Chemical
2006	GPAG van Zijl	Civil
2007	M Botha	Electrical and Electronic
2008	MJ Kamper	Electrical and Electronic
2009	Y Kim	Mechanical and Mechatronic
2011	C Schwarz	Process/Chemical
2012	D de Villiers	Electrical and Electronic
2013	C Dorfling	Process/Chemical
2014	WP Boshoff	Civil
2015	MJ Booysen C Coetzee	Electrical and Electronic Mechanical and Mechatronic
2016	SJ van der Spuy	Mechanical and Mechatronic
2017	NJ Goossen RS Walls	Process/Chemical Civil
2018	TM Louw WG Bam	Process/Chemical Industrial

A.7 Engineering - Teaching Excellence Award

2017	MM Bruwer JC Bekker	Civil Electrical and Electronic
2018	DC Blaine L Auret	Mechanical and Mechatronic Process/Chemical

A.8 Honorary Members of the Faculty

1998	SA Grobbelaar
1998	HB van der Walt
1998	AJO van der Westhuizen
1999	AC Britten
1999	MP Cilliers
1999	A Dippenaar
2001	WJ Barnard
2001	G Pretorius
2001	J Rall
2001	I Smit
2001	C van der Merwe
2001	D Wright
2004	R de Villiers
2004	J Gosling

2004	R Reinecke
2004	PW van der Walt
2004	HC Viljoen F Hugo P Uys W Barnard

Index of Undergraduate Subjects and Modules

Please refer to Section 4.1 for an explanation of module names.