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Faculty of **Engineering**

Dean:
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CALENDAR 2016
PART 11

Amendments, Accountability and Accuracy

In this publication, words that indicate the male gender include the female gender, unless the context of the words expressly contradicts it or indicates the opposite.

The University reserves the right to make amendments to the Calendar at any time.

The Council and the Senate of the University accept no liability for inaccuracies in the content of the Calendar, if any. Every reasonable care has, however, been taken to ensure that the relevant information at hand, as at the time of going to press, is represented in the calendar accurately and in full.

Where do I find printed versions of the parts of the Calendar?

The printed versions of the parts of the Calendar can be obtained at the Help Desk in the Admin A building.

Afrikaans (Parts 1 to 12) and English copies of the separate parts are available.

Where do I find electronic versions of the parts of the Calendar?

The electronic versions of the parts of the Calendar are available at www.sun.ac.za/calendar.

The parts of the Calendar

The Calendar is divided into 13 parts.

Parts 1, 2 and 3 of the Calendar contain general information that applies to all students. Students are requested to acquaint themselves with all the stipulations that apply to them in Part 1 of the Calendar.

Parts 4 to 13 of the Calendar are the faculties' calendar parts.

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Part 2	Bursaries and Loans
Part 3	Student Fees
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How to use this Calendar Part

Readers of the Calendar Part

The information in this Calendar Part is intended for the following groups of readers:

- **Prospective** undergraduate and postgraduate students who are looking for information about the programmes of study offered by the Faculty.
- **Registered** undergraduate and postgraduate students of Stellenbosch University who are looking for more information about the curriculums (combinations of subjects and modules) of specific programmes of study, as well as for other information related to their studies.
- **Teaching, administrative and management staff** of Stellenbosch University who are required to keep abreast of the information contained herein to be able to fulfil their various functions.

Any person who is not in one of the abovementioned groups, but who wishes to use this Calendar Part as a source of information for any reason, is of course more than welcome to do so.

How to locate information

Here follow guidelines for finding information in the different chapters in this Calendar Part. Consult the table of contents for the corresponding page numbers of the chapters referred to below.

Prospective undergraduate students

- Undergraduate Programmes chapter
  - Information on undergraduate programmes of study that are offered;
  - the minimum admission requirements for the different programmes of study; and
  - the subjects and modules that must be followed for the different programmes of study each year, with choices where applicable.
- Undergraduate Subjects, Modules and Module Contents chapter
  - An explanation of the differences between subjects and modules;
  - the language specifications of modules;
  - prerequisite pass, prerequisite and corequisite modules; and
  - an explanation of the different numbers used for the numbering of modules in the Undergraduate Programmes chapter.
- General Information chapter
  - Information about the Language Policy of the University and the Faculty;
  - information about the process of enrolment management, which entails selection for admission to programmes of study; and

- information about communication with the University, which includes an explanation of the concept "student number" and indicates applicable options for enquiries along with their contact details.

- Index
  - An index of undergraduate modules that can be followed in programmes of study of the Faculty is indicated in the end of this Calendar Part.

Prospective postgraduate students

- Postgraduate Programmes chapter
  - Information on postgraduate programmes of study that are offered;
  - the minimum admission requirements for the different programmes of study;
  - information about specific closing dates for applications, and other relevant information, for example selection.
- General Information chapter
  - Information about the Language Policy of the University and the Faculty; and
  - information about communication with the University, which includes an explanation of the concept "student number" and indicates applicable options for enquiries along with their contact details; and
  - other rules that apply to all students.

Registered undergraduate students

- Undergraduate Programmes chapter
  - The Faculty's policy on the granting of Dean's Concession Examinations to final-year students;
  - information on undergraduate programmes of study that are offered; and
  - the subjects and modules that must be followed for the different programmes of study each year, with choices where applicable.
- Undergraduate Modules chapter
  - An explanation of the differences between subjects and modules;
  - an explanation of the meaning of the numbering, teaching loads, and language specifications of the modules, as well as the meaning of prerequisite pass, prerequisite and corequisite modules;
  - each module's teaching load;
  - each module's language specification;
  - each module's prerequisite pass, prerequisite and corequisite modules, if any; and
  - each module's method of assessment, especially where continuous or flexible assessment is used.
- General Information chapter
  - Information about the Language Policy of the University and the Faculty;
  - information about communication with the University, as well as applicable options for enquiries along with contact details; and

- other rules that apply to all students.

- Index
  - An index of undergraduate modules that can be followed in programmes of study of the Faculty is available at the end of this Calendar Part.

Registered postgraduate students

- Postgraduate Programmes chapter
  - Information on postgraduate programmes of study that are offered.
- General Information chapter
  - Other rules that apply to all students.

Teaching, administrative and management staff

Most of the information in this Calendar Part may be of value in the execution of your various duties. The table of contents is the best place to begin looking for information, but regular use of the book will naturally lead to familiarity with all the information in the book, and with where it is located.

1 General Information

1.1 How to communicate with the University

1.1.1 Use of student number

Prospective, current and graduate students must please quote their student number in all correspondence with the University. The University assigns a unique student number to each applicant when he/she applies to the University for the first time. The student number serves as unique identification in order to aid communication and record keeping.

1.1.2 Contact information

Written correspondence should be sent to the following 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

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

- Dean:

  Prof JH (Hansie) Knoetze – jhk@sun.ac.za
  Tel: +27 (0)21 808 4204 / Fax: +27 (0)21 808 4206
  For appointments contact Marilie Oberholzer – marilie@sun.ac.za
  Tel: +27 (0)21 808 4203 / Fax: +27 (0)21 808 4206

- Vice-dean (Research):

  Prof WJ (Willem) Perold – wjperold@sun.ac.za
  Tel: +27 (0)21 808 4368
  For appointments contact Larry Morkel – lmorkel@sun.ac.za
  Tel: +27 (0)21 808 4478

- Vice-dean (Teaching):

  Prof AH (Anton) Basson – ahb@sun.ac.za
  Tel: +27 (0)21 808 4250 / Fax: +27 (0)866 155 206
  For appointments contact Christine Gericke – mcgericke@sun.ac.za
  Tel: +27 (0)21 808 4376 / Fax: +27 (0)866 155 206

- Departmental Chairperson Civil Engineering:

  Prof JA (Kobus) du Plessis –jadup@sun.ac.za
  Tel: +27 (0)21 808 4358 / Fax: +27 (0)21 808 4440
  For appointments contact Irene McIvor – icm@sun.ac.za
  Tel: +27 (0)21 808 4369 / Fax: +27 (0)21 808 4440

- Departmental Chairperson Electrical and Electronic Engineering:

  Prof T (Thomas) Jones – jones@sun.ac.za
  Tel: +27 (0)21 808 4319
  For appointments contact Diana Kruger – dkruger@sun.ac.za
  Tel: +27 (0)21 808 4936

- Departmental Chairperson Industrial Engineering:

  Prof CSL (Corne) Schutte – corne@sun.ac.za
  Tel: +27 (0)21 808 3617 / Fax: +27 (0)21 808 4245
  For appointments contact Karina Smith – ksmith@sun.ac.za
  Tel: +27 (0)21 808 4234 / Fax: +27 (0)21 808 4245

- Departmental Chairperson Mechanical and Mechatronic Engineering:

  Prof G (Gerhard) Venter – gventer@sun.ac.za
  Tel: +27 (0)21 808 3560 / Fax: +27 (0)866 155 206
  For appointments contact Marilie Oberholzer – marilie@sun.ac.za
  Tel: +27 (0)21 808 4374 / Fax: +27 (0)866 155 206

- Departmental Chairperson Process Engineering (Chemical Engineering):

  Prof SM (Steven) Bradshaw – smb@sun.ac.za
  Tel: +27 (0)21 808 4493 / Fax: +27 (0)21 808 2059
  For appointments contact Francis Layman – flayman@sun.ac.za
  Tel: +27 (0)21 808 4062 / Fax: +27 (0)21 808 2059

- Faculty Officer (student support):

  Mr MO (Minnaar) Pienaar – mop@sun.ac.za
  Tel: +27 (0)21 808 4205 / Fax: +27 (0)21 808 4206

- Faculty Secretary (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 4576

- Faculty Manager:

  Mr E (Enzo) D'Aguanno – vsd@sun.ac.za
  Tel: +27 (0)21 808 4986 / Fax: +27 (0)21 808 4206

Please visit the Faculty's website at www.eng.sun.ac.za, where the websites for each of the five departments are indicated.

1.2 Language policy and plan

1.2.1 University-wide

Stellenbosch University (SU) uses Afrikaans and English as languages of instruction at undergraduate level in its endeavour to promote multilingualism. The University is committed to safeguarding and developing Afrikaans further as a well-established academic language, taking into consideration this endeavour to promote multilingualism. SU also recognises English as an international academic language and a medium through which most South Africans can communicate with each other. In addition, the University provides for the development of specialist terminology and communication skills in isiXhosa, and the teaching of isiXhosa in some academic programmes for students who will need it in their careers.

Many of our modules are already presented in Afrikaans and English through parallel medium teaching and simultaneous interpretation. However, it is not possible to present the lectures of all modules fully in Afrikaans and English. The medium of teaching is therefore indicated in the relevant faculty's calendar part. More information concerning language at the University is available on the website www.sun.ac.za/language. Support for the acquisition of academic language proficiency in Afrikaans and English is provided.

The following media of teaching are used by the University:

- **Parallel medium:** A class is divided into separate Afrikaans and English streams. Students provide their preferred language of teaching at registration.
- **Interpreting:** Simultaneous interpretation into Afrikaans or English, depending on the lecturing language, can take place during class teaching.
- **Bilingual:** A combination of teaching in Afrikaans (approximately 50%) and English (approximately 50%) in the same class.
- **Afrikaans and English**: A small percentage of the modules are presented in either Afrikaans or English.

1.2.2 Faculty of Engineering

The Faculty strives to make its undergraduate programmes accessible in both Afrikaans and English. Therefore, as from 2014, all first year modules, with the exception of elective modules, are offered in both Afrikaans and English (parallel sessions), and all further undergraduate modules, with the exception of some elective modules, are offered in both Afrikaans and English by means of parallel sessions or simultaneous interpretation (that is,

Afrikaans lectures are interpreted to English and English lectures are interpreted to Afrikaans).

The planned language specifications for the undergraduate modules are indicated with the module descriptions. The final language specification for a module will be specified in the module framework at the beginning of a semester, and may differ from the entry in the Calendar according to the prevailing circumstances (for example, the availability of classrooms of sufficient size and the language proficiency of the available staff).

1.3 The Engineering Profession

1.3.1 The Role of the Professional Engineer

Professional engineers play an indispensable and creative role in society. They are responsible for the sensible application of scientific and technical knowledge to utilise materials and forces of nature in an economical manner to the advantage of humanity. They also take care of the protection and improvement of the environment by planning, designing and building the necessary facilities and equipment for an advanced society. As such, they are the senior partners in the engineering team consisting of the artisan or craftsman (trained by means of an apprenticeship), technician or technologist (trained at a technikon or university of technology) and professional engineer (trained at a university).

The Engineering Council of South Africa (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 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.

1.3.2 The Definition of an engineer

The Engineering Council of the United Kingdom has accepted the following definition of the concept "engineer":

- An engineer is someone who has and uses scientific, technical and pertinent knowledge, understanding and skills to create, enhance, operate or maintain safe, efficient systems, structures, machines, plants, processes or devices of practical and economic value.

Engineering is a profession directed towards the skilled application of a distinctive body of knowledge based on mathematics, science and technology, integrated with business and management, which is acquired through education and professional formation in a particular engineering discipline. Engineering is directed at developing and providing infrastructure, goods and services for the industry and the community.

Professional engineers are concerned primarily with the progress of technology through innovation, creativity and change. They develop and apply new technologies, promote advanced designs and design methods, introduce new and more efficient production techniques and marketing and construction concepts, and pioneer new engineering services and management methods. They are involved with the management and direction of high-risk and resource intensive projects. Professional judgment is a key feature of their role, coupled with the acceptance of responsibility for the management of important tasks, including the profitable management of industrial and commercial enterprises.

The purpose of the BEng programmes is to equip students with the knowledge they need to be able to practise as professional engineers.

1.3.3 Code of Conduct for Professional Engineers

As members of a profession, engineers are subject to a code of conduct. The Engineering Council of South Africa (ECSA) is vested with statutory powers in South Africa to lay down standards for education, and to register qualified persons as professional engineers. Registration as a professional engineer (PrEng) certifies that a person is authorised to practise as an engineer. ECSA also has the authority to take disciplinary action against engineers who are guilty of misconduct.

The objectives of the Code of Conduct for Engineers are to ensure that registered persons, 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
- do not prejudice public health and safety

1.3.4 Registration as Professional Engineer

To register as a professional engineer, and so use the title PrEng, a person must normally meet two requirements:

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

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

1.3.5 International recognition

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

1.4 The Faculty

This section gives a short overview of the Faculty as a whole, the buildings housing the Faculty and the main organisational units of the Faculty, except for the departments of the Faculty as discussed in the next section.

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.

The three original Engineering Departments of Civil, Mechanical and Electrotechnical Engineering and the Department of Applied Mathematics were later augmented by the Departments of Chemical and Metallurgical Engineering and Industrial Engineering. 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 with the addition of the Knowledge Centre in 2012. The figure below indicates an aerial photograph of the current complex.

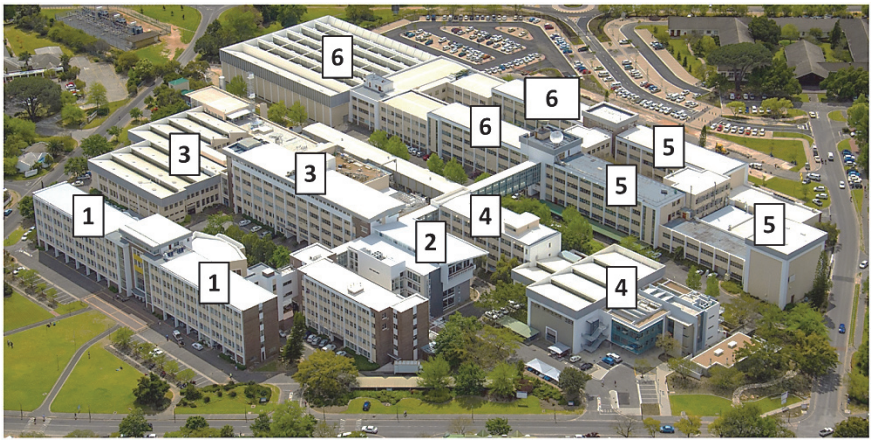

Figure 1.1: The Engineering building complex (the numbers are used in the descriptions below).

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

1: 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
- Plakkies cafeteria

2: Engineering Knowledge Centre

- Two large lecture halls
- The Engineering and Forestry Library, a branch of the JS Gericke Library
- Two research units

3: Mechanical and Industrial Engineering Building

- Various lecture halls and tutorial rooms
- Department Industrial Engineering and its laboratories (rapid product development laboratory, reverse engineering laboratory, three laboratories with advanced computer facilities, quality control laboratory and metrology laboratory)
- Department Mechanical and Mechatronic Engineering and its laboratories (various wind tunnels, internal combustion engine testing benches, 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)

4: Process Engineering Building (Chemical Engineering)

- Various lecture halls and tutorial rooms
- Department Process Engineering and its laboratories (pilot-plant scale facilities, computer centre for process simulation and data processing, extractive metallurgy laboratories and bioprocess engineering facility)

5: Electrical and Electronic Engineering Building

- Various lecture halls and tutorial rooms
- Department Electrical and Electronic Engineering and its 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)

6: Civil Engineering Building

- Various lecture halls and tutorial rooms
- Department Civil Engineering and its laboratories (irrigation, geotechnical, transport, water, concrete, heat transfer, solar energy, strength of materials and structures laboratories, as well as the departmental computer facilities)
- Faculty of Engineering Computer User Area (FIRGA)
- School Centre

1.4.3 Faculty of Engineering Computer User Area (FIRGA)

FIRGA is 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. All the desktop computers provide access to the Internet and sophisticated software.

FIRGA provides to all engineering students, in support of their academic activities, facilities for numerical and digital modelling, computer-aided engineering, information dissemination, communication and documentation

1.4.4 School Centre

The School Centre, situated on the second floor of the Civil Engineering Building, offers a variety of outreach programmes to stimulate interest in science, mathematics and technology, and also to promote skills development. The following two units make use of the School Centre:

- TRAC is a national intervention programme, based on physical science and applied mathematics, which empowers and motivates learners from secondary schools to study in SET-directions at a tertiary level. The programme uses computer technology to reinforce scientific concepts. Learners and their teachers visit TRAC's several fixed computer laboratories on a daily basis, whilst TRAC facilitators also visit schools using mobile facilities. In Stellenbosch and the greater Western Cape area, TRAC makes use of one fixed and two mobile laboratories. The TRAC headquarters is based in

Stellenbosch in the Civil Engineering Building. Further details can be found at www.trac.sun.ac.za.

- SUNSTEP trains technology and science teachers to build electronic kits with their learners, such as a burglar alarm, cordless microphone, electronic organ and FM radio. The theory falls within the specifications of the technology curriculum, and is the ideal enrichment for science learners who learn about capacitors, reactance, magnetism and Lenz's law. All the kits are designed in conjunction with the curriculum advisers of the Western Cape Education Department (WCED). There is also very close collaboration with the education departments of the Free State, Eastern Cape, Mpumalanga and Namibia, and the schools there are also serviced. The abovementioned provinces and Namibia are visited on an annual basis for training purposes. Schools contact SUNSTEP for teacher training, as well as learner workshops, which takes place at the Engineering School Centre and also at schools. SUNSTEP successfully stimulates learners' interest in science as from Grade 7 up to Grade 12. The electronic kits are of a high quality and can be successfully assembled and soldered by learners. Working with the kits generates enthusiasm and excitement, as well as a sense of success, with the learners. Excellent feedback has been received from learners, teachers and heads of non-profit organisations, who conduct Saturday schools for township learners. SUNSTEP is also expanding its activities to Namibia.

1.5 Departments and engineering disciplines

This section briefly discusses the departments of the Faculty of Engineering, and their engineering disciplines.

1.5.1 Department of Civil of Engineering

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

Civil engineers are responsible for the development, planning, design, construction, maintenance and operation of large-scale projects pertaining to especially the country's infrastructure. They can therefore achieve great job satisfaction through their involvement in the erection of large, permanent works such as irrigation systems, bridges, dams, harbours, canals, roads and streets, pipelines, sewerage systems, railways, structures of all kinds and structure foundations, storm water systems, tunnels, towers, water supply systems, and all 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.

1.5.2 Department of Electrical and Electronic Engineering

The degree programmes in e*lectrical engineering and electronic engineering* are hosted by this department.

Electrical and electronic engineers are responsible for the control of electronic and mechanical robotic systems; the generation, transmission and conversion of electrical

energy; the collection, processing and dissemination of information by electronic systems; and the design of computers and large programming systems. Electrical and electronic engineers are concerned with electrical energy applications (including renewable energy sources) in industries such as electricity supply, factories, chemical plants, mines, municipalities, railways, and harbours. They design computers and computer software, particularly embedded system, as well as computer and communication networks such as cell phone networks, Wi-Fi and mobile data networks. These fields offer many opportunities for entrepreneurs to create new, small high-technology businesses.

1.5.3 Department of Industrial Engineering

The degree programmes in *industrial engineering* and *engineering management* are hosted by this department.

The *industrial engineer* essentially creates better manufacturing and service systems. Industrial engineering is therefore an interdisciplinary field of study in which training in several applied sciences, for instance mechanical and mechatronic and 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.

The industrial engineer's daily task involves a great variety of creative activities, especially in modern manufacturing and service industries. This work covers a wide spectrum, starting at the design stage and moving on to the manufacturing or delivering stages, where attention is particularly focussed on planning, efficiency and productivity, and concludes with marketing.

The industrial engineer is also particularly trained in the use of computers in decision-making for enterprise management and the automatic control of machines and equipment.

The main branches of industrial engineering are manufacturing technology and operational systems design. This includes important facets such as quality assurance, robotics, engineering economics, operations research, industrial ergonomics and information technology that are extremely important in the modern industrial and service environments.

Engineering management is a specialised form of management that applies engineering principles to business practices. It is thus used in the management of technology or technical processes in enterprises. In order to achieve this, multi-disciplinary coordination of inputs and contributions from several engineering disciplines and other specialist areas such as project management, risk management, quality management, performance management and feasibility studies, are often required. Emphasis is also placed on the contribution of technology in order to realise the company's strategy.

1.5.4 Department of Mechanical and Mechatronic Engineering

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

Mechanical engineering is characterised by the motion and transfer of energy. This involves the design and development of, for example, machines and machine elements, vehicles, aeroplanes, vessels, missiles, cooling systems, cooling towers and engines. Heat transfer, fluid mechanics, strength of materials, dynamics and mechanical design are the most important disciplines in these fields. Training is therefore multi-faceted and leads to various professional careers in, for example, air conditioning and cooling, power generation systems, vehicle engineering, aeronautics and conservation of energy.

Mechatronic engineering is a combination of precision mechanical engineering, electronics and computer systems. A typical mechatronic system is characterised by close integration of the mechanical components, electronic sensors, mechanical and electrical actuators and computer controllers. Examples of mechatronic systems include electronic engine control systems, robots, automated assembly lines and artificial hearts.

1.5.5 Department of Process Engineering

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

Chemical engineering involves the large-scale operation of processes by which a material's properties are altered. These processes range from simple physical separations by means of distillation, evaporation, drying or filtration, to complex chemical synthesis.

The practice of chemical engineering comprises the development, design, construction and operation of such processes on an economical basis. It requires thorough knowledge of the fundamental sciences of mathematics, physics and chemistry as well as thermodynamics, transfer phenomena, reactor design, separation processes, control systems and the design of chemical plants.

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.

1.6 Rules of the Faculty

This section outlines faculty-specific rules that apply to undergraduate and postgraduate students. Rules that apply to undergraduate and postgraduate programmes can be found in the chapters in this part of the Calendar that deals with undergraduate and postgraduate programmes, and university-wide rules can be found in Part 1 of the Calendar. Please also refer to the Faculty's Assessment Rules and the Faculty's General Stipulations for Undergraduate Modules. The latter two documents are available to students on the SunLearn pages of all modules offered by the Faculty of Engineering, and are available to personnel on the document archive (SharePoint).

1.6.1 Examination and promotion provisions

No marks are awarded in a module for which a student is not registered.

Each item that a student submits for assessment (and which may contribute to a class mark or final mark), must be his/her own work. No part thereof may have been completed by another person, unless the relevant lecturer gave written consent that students may use the work of their team members for the item in question.

The timetable for examinations and main assessments of modules offered to students of the Faculty of Engineering are published centrally. It is the sole responsibility of all students to ensure that, *before* registration at the beginning of the academic year, there are no clashes on any of the abovementioned timetables regarding the modules for which they have registered.

All written test and examination scripts must be done in ink.

1.6.2 Excuse from assessments

A student who, as a result of sickness or any other certifiable reason, is unable to write a test or submit an assessment, must produce a declaration (for example a medical certificate) in this regard (indicating an acceptable reason and period of absence), to be submitted to the relevant lecturer within seven class, test-week or examination days (according to the University's Almanac) from the date of the test or assessment.

1.6.3 Representations regarding test and class marks

Students who wish to dispute a test or class mark may approach their lecturers or departmental chairperson in this regard. In all cases, a deadline of 7 calendar days applies after a test or class mark has been disclosed. No representations will be considered after this deadline.

1.6.4 Work during vacations

It may be expected of postgraduate and final-year undergraduate students to work, over and above the time allocated for this purpose in the timetable, during the University vacation on their projects in the laboratories of the relevant department.

1.6.5 IT-infrastructure

The Faculty’s information technology infrastructure is mainly based in the Faculty of Engineering Computer User Area (FIRGA).

All engineering students, with the exception of a few postgraduate students who do not study on campus and who are specifically exempted from this obligation, pay an annual levy for access to the IT infrastructure.

Only hardware that has been approved by the University’s Information Technology Division may be connected to the network.

The misuse of the IT infrastructure is strictly forbidden. Misuse includes:

- Unauthorised access to computers or servers.
- Unauthorised use of software programs and the use of illegal software.

- Unauthorised copying of computer programs or the violation of copyright.
- Unauthorised access to and/or copying or changing of system files, including configuration, user and password files.
- Harassment of others by displaying indecent material or sending unwelcome messages.
- Interception of network traffic and wrongful reading of e-mail.
- Any form of fraud via the network, including the use of another person's password.
- Playing computer games on the network.
- Any action resulting in the system being overloaded with information, such as chain letter messages and spam.

Good e-mail and network etiquette includes:

- Provide a descriptive title for each email.
- Keep the automatic message received function active; confirmation of receipt is of great use to the sender, thereby creating an expectation of receiving a reaction/answer.
- Read your e-mail regularly and answer all e-mails which are not intended for general distribution.
- Use good 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. Rather make use of the Campus News or the University's Daily Bulletin.

Good etiquette for communal computer user areas includes:

- 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 run long programs unmanned, with messages that the computer must be left alone.
- Make positive suggestions that will improve the functionality of the system.

1.7 Awards and prizes

The most important awards and prizes that are unique to the Faculty of Engineering are described in this section. Please refer to Part 2 of the Calendar for details regarding other prizes and bursaries for which engineering students may be eligible.

1.7.1 Faculty-wide

Appendix A lists the recipients of faculty-wide awards.

1.7.1.1 The Dean's Award for Outstanding Achievement

The Dean's Award for Outstanding Achievement may be awarded to a student whose undergraduate, as well as postgraduate, performance has been outstanding. The period of study is usually limited to eight consecutive years of study. To qualify for this award, the candidate must also have excelled as a researcher, in addition to obtaining an excellent academic record. What will typically be required is the acceptance for publication of at least one journal article, of which the candidate must be the author, by a reputable international journal, as well as contributions to the published proceedings of one or more international conferences.

The award, which will not necessarily be awarded on an annual basis, includes a silver medal and a cash prize. Candidates are nominated by the departments, and the Faculty Committee decides on the recipient of the award.

1.7.1.2 The ECSA Medal of Merit

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

1.7.1.3 The Jac van der Merwe Prize for Innovation

The Jac van der Merwe Prize for Innovation to the value of R30 000 is sponsored by MultiChoice and awarded to a final-year student whose project or thesis affords the greatest evidence of ingenuity or originality of thought.

1.7.1.4 Academic Colours

Academic colours are awarded by the Students' Representative Council for outstanding academic achievement.

1.7.1.5 Lecturer of the Year

This award, in the form of a medal, goes to a lecturer who has made his/her mark in the Faculty.

The award is made in recognition of good teaching, a formative influence on the Faculty's students, and a contribution to the development of the Faculty's programmes and/or laboratories.

Candidates are nominated by the departments on an annual basis. The Faculty Committee makes the award on the grounds of the motivations provided by the departments.

1.7.1.6 Upcoming Researcher of the Year

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

1.7.1.7 Honorary Member of the Faculty

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

Candidates are nominated by the departments. 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. The certificates are handed over at an Advisory Board meeting or other suitable occasion.

1.7.2 Civil Engineering

- The Bergstan South Africa Prize of R1 250 for the best first-year student in Civil Engineering.
- The Bergstan South Africa Prize of R1 800 for the best second-year student in Civil Engineering.
- The Bergstan South Africa Prize of R2 500 for the best third-year student in Civil Engineering.
- The Western Cape Branch of SAICE Prize of R3 000 for the student who has contributed most to the advancement of Civil Engineering.
- The SA Institute of Steel Construction Prize of R1 500 for the most deserving student in Steel Construction.
- The Concrete Society of Southern Africa Prize of R1 000, plus one year's membership fees to the Association, for the best thesis, or the most deserving student in Concrete Technology.
- The AURECON Prize of R2 000 for the best final-year project.
- The WSP Africa Coastal Engineers (Pty) Ltd Prize of R1 000 for the most deserving final-year student in Hydraulic Engineering.
- The AURECON Prize of R1 500 for the most deserving student in Transport Science.
- The GLS Prize of R2 000 for the best thesis/dissertation on Water Engineering.
- The AURECON Prize of R1 500 for the most deserving student in Environmental Engineering.
- The Marius Louw Medal and the AURECON Prize of R3 500 for the best final-year student in Civil Engineering.
- The SANRAL Prize of R1 500 for the best final-year project in Pavement Engineering.

- The Pretoria Portland Cement Prize of R2 500 for the most deserving work in the field of Concrete Engineering.
- The HL Reitz Medal and the AECOM Prize of R5 000 for the best postgraduate student in Civil Engineering.
- The Murray & Roberts Construction (Pty) Ltd Prize of R1 750 for the best second-year student in the module Informatics in Civil Engineering.
- The Murray & Roberts Construction (Pty) Ltd Prize of R1 750 for the best third-year student in the module Informatics for Civil Engineers.
- The Murray & Roberts Construction (Pty) Ltd Prize of R1 750 for the best postgraduate student in the module Informatics for Civil Engineers.
- The Melis & Du Plessis Prize of R4 000 for the most deserving undergraduate or postgraduate student in Geotechnics.
- The Manfred Kloos Prize of R1 500 for the most deserving postgraduate student in Port and Coastal Engineering.
- The UWP Consulting (Pty) Ltd Prize of R1 500 for the best final-year student in Transportation Engineering.
- The ITS Prize of R3 000 for the best final-year project in Road Safety.
- The Institute for Water and Environmental Engineering Prize of R2 500 for the most deserving final-year student in Advanced Design (Hydraulics).
- The Element Consulting Engineers (Pty) Ltd prize of R2 500 for the most deserving student in Advanced Design (Structural Engineering).
- The GIBB Engineering and Science prize of R2 500 for the most deserving student in Advanced Design (Transportation, Geotechniques or Engineering Management).
- The Haw & Inglis Civil Engineering (Pty) Ltd Prize of R3 000 for the best master's student in Civil 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 SAIIE Floating Trophy and SENROB Prize for the best achievement in manufacturing subjects and assignment.
- The Lecturers' Prize for professional excellence in Industrial Engineering at undergraduate level.
- The Lecturers' Prize for professional excellence in Industrial Engineering at postgraduate level and for excellence as an industrial engineer.
- The Lecturers' Prize for excellence at undergraduate level.
- The Departmental Prize for the runner up in Industrial Project.

- The John Thompson Prize for the best postgraduate student in Industrial Engineering.
- The IBi Prize for the best third-year student in Industrial Engineering.
- The SASOL Prize for the best postgraduate study in Industrial Engineering that is of relevance to Sasol.
- The SASOL Prize for the best final-year project in systems improvement.
- The Decision-making and Analysis Prize for the best student in Mathematical and Operations Research subjects in all four years.
- The Qmuzik Prize for the best final-year student, as nominated by other students.
- The Qmuzik Prize for the best student in Information Systems and Programming.
- The Fraunhofer IWU-GCC Cooperative Laboratory Prize for the best final year project within the Fraunhofer IWU-GCC cooperative laboratory for joint research.
- The Altech ISIS Prize for the best postgraduate student with the most valuable addition to Information Technology and Systems Design.
- The LTS Prize for the best second-year student in Industrial Engineering.
- The LTS Prize for the best student in Industrial Engineering over the full period of study of four years.
- The Pragma Prize for the best final-year project in Industrial Engineering.
- The Pragma Prize for the best postgraduate project in "Physical Asset Management" (PAM).
- The AFSA Prize for the best final-year project making use of aluminium.
- The SAIIE Shield, Medal and one-year subscription for the best student over four years.
- Competitive Dynamics International Holdings (Pty) Ltd (CDI) Prize for the final year project with the best system-level solution for a sustainable competitive benefit.
- The PPS Prize for the highest average mark in the final year.
- The Optimisation Prize for the best system optimisation project.

1.7.5 Mechanical and Mechatronic Engineering

- The AeSSA Prize for the best Mechanical final-year project in Aeronautics.
- 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 CAE Book Prize for the best final-year project in Automotive Engineering.
- The Kröger Book Prize for the best final-year project in the field of Thermodynamics or Heat Transfer.
- 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 SASOL Prize for the best second-year student in Mechanical Engineering.

- The SASOL Prize for the best third-year student in Mechanical Engineering.
- The SASOL Prize for the best final-year student in Mechanical Engineering.
- The SASOL Prize for the best third-year Mechanical Engineering student in Design.
- The SASOL Prize for the best postgraduate student in Mechanical Engineering.
- The Aluminium Federation of South Africa's Prize for the best final-year project with aluminium.
- 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 ITM Prize for the best final-year student in Mechatronic Engineering.
- The ITM Prize for the best postgraduate student in Mechatronic Engineering.
- The ITM Prize for the best poster presentation in a final-year project in Mechanical or Mechatronic Engineering.
- The Arthur Child Award for an exceptional postgraduate student in Aeronautics.
- 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 AAT Composites Prize for the best final-year project in Composite Materials.
- The Autodesk/Educad Prize for the best use of CAD (Inventor) in a final-year project in Mechanical or Mechatronic Engineering.
- 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 John Thompson Prize for Exceptional Performance in Mechanical Engineering.
- The John Thompson Prize for the best final-year project in Thermal Energy Systems
- 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 Nico Laubscher Prize for the best final-year project written in Afrikaans
- The Heever Technologies Prize for the best final-year project in Biomedical Engineering
- The Gradwealth Prize for Innovation
- 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

1.7.6 Process Engineering (Chemical Engineering and Mineral Processing)

- The SAIChE Silver Medal for the best final-year student in the Department of Process Engineering.
- The SAIMM Prestige Prize for the best final-year student in the Department of Process Engineering with final-year project in Mineral Processing.
- The SAIMM Prize for the best third-year student in Mineral Processing.
- The SASOL Prize for the best third-year student in Thermodynamics (CE 317).
- The SASOL Prize for the best student in Process Design (CE 414).
- The SASOL Prize for the best final-year student in Process Control (CE 426).
- Element Six / DST / NRF Medals in support of Material Science for the best third-year student and the best performance in Material Science – final year.
- The Chairperson's Prize for a final-year student who has made a noteworthy contribution to the Department of Process Engineering.
- The Minerals Education Trust Fund Prize for the best final-year project in the Department of Process Engineering.
- The Jac van der Merwe Nomination Prize for the most innovative final-year project in the Department of Process Engineering.
- The AJ Burger Prize for the best graduating MEng student in the Department of Process Engineering.
- The Centre for Process Engineering Prize for the best final-year project poster.
- The Centre for Process Engineering Prize for the best final-year student in Design.
- The GE Intelligent Platforms Prize for the best graduating PhD student.
- The Department of Process Engineering Prize for the student with the highest average over four years.

2 Undergraduate Programmes

2.1 Qualifications and fields of study

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, and provides a broad education.

The BEng degree may be awarded in of the following fields of study: Chemical Engineering; Chemical Engineering – Mineral Processing option; Civil Engineering; Electrical and Electronic Engineering; Industrial Engineering; Mechanical Engineering and Mechatronic Engineering.

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

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

All off the Faculty's four-year and extended BEng programmes are accredited by ECSA for registration as professional engineer.

The extended degree programme for Engineering was introduced to assist students with an inadequate school background to master a BEng programme, and each programme comprises a transition year followed by the curriculum of a BEng (4yr). A BEng (EDP) therefore provides alternative access routes to the BEng programmes in the Faculty of Engineering.

2.2 ECSA Accreditation

The BEng programmes of the Faculty are formulated to meet the requirements of the Engineering Council of South Africa (ECSA) for accredited BEng programmes. This means that each of the programmes includes at least the required number of credits per ECSA knowledge area, and also develops and assesses all the ECSA exit level outcomes. Each student who has completed a BEng programme, irrespective of the electives they have chosen, meets the ECSA requirements.

2.3 Undergraduate enrolment management

In order to reach the Council's targets with regard to the *size* (the total number of students) and *shape* (fields of study and diversity profile) of the student body of Stellenbosch University (SU), it is necessary to manage the undergraduate enrolments at SU. SU's total number of enrolments is managed to be within the available capacity.

The following points of departure apply:

- The expansion of academic excellence by maintaining high academic standards.
- The maintenance and improvement of high success rates.
- The fulfilment of SU's commitment to correction, to social responsibility and to contributing towards the training of future role models from all population groups.
- The expansion of access to higher education, especially for students from educationally disadvantaged and economically needy backgrounds who possess the academic potential to study successfully at SU.

2.4 Admission to BEng programmes for new students

New students are students who have not previously studied at a university. Students who have already studied at a university may also apply for admission on the same basis as new students.

2.4.1 Procedure to be considered for admission

To be considered for admission to a BEng programme, a new student must:

- Submit a complete application by the closing date for applications (30 June);
- write the National Benchmarking Test (NBT; for particulars: www.nbt.ac.za) in Mathematics, Academic Literacy and Quantitative Literacy;
- meet the admission requirements for the relevant degree programme; and
- be selected for the particular degree programme (selection for one BEng programme is not transferable to another BEng programme).

The admission to a BEng programme of prospective students who have already passed Grade 12, may be regarded as final. Prospective students who are in Grade 12 at the time of applying, may be admitted provisionally to a specific BEng programme on the grounds of their Grade 11 results. Their final admission, however, shall be subject to, firstly, the submission of written proof of an obtained National Senior Certificate, or equivalent, that meets the admission requirements of the particular degree programme and, secondly, that their admission scores, based on their Grade 12 final examination marks, meet the particular programme's threshold score (described below).

New students cannot apply for admission to a BEng (EDP), but students who have applied for admission to a BEng (4yr), but who do not meet the admission requirements or are not selected for the particular programme, will be considered for admission to a BEng (EDP).

Prospective students who submit complete applications after the closing date for applications will be considered if there are places available in the particular programme.

Prospective students who applied for admission before the closing date for applications, but were not admitted based on their Grade 11 marks, may submit their Grade 12 results to be reconsidered for admission. Their admission will be subject to the availability of places in the particular programme.

If prospective students do not register during the year in which they were admitted, their admission will lapse and they would once again be subject to selection if they apply for admission for a later year.

2.4.2 Admission requirements for BEng (4yr)

To be considered for admission to any BEng (4yr), a new student must meet all of the following requirements:

- Received a National Senior Certificate with admission to bachelor's studies, or an exemption certificate issued by the Matriculation Board;
- achieved an average (using the six best matric subjects, excluding Life Orientation and Mathematical Literacy) of at least 70% in the applicable school final examination;
- passed Mathematics with a minimum of 70% and Physical Sciences with a minimum of 60% in the applicable school final examination (Mathematical Literacy is not accepted); or in the Senior Certificate Examination before or in 2007, passed Mathematics HG with at least a B and Natural Sciences HG with at least a C; and
- in the applicable school final examination, achieved at least one of the following in language subjects:
    - English Home Language: 40%;
    - English First Additional Language: 60%; or
    - English First Additional Language: 50%, together with Afrikaans Home Language: 40%, or Afrikaans Second Additional Language: 60%.

Admission of prospective students who meet the above admission requirements is also subject to selection.

2.4.3 Admission requirements for BEng (EDP)

To be considered for admission to a BEng (EDP), a new student must meet all of the following requirements:

- Received a National Senior Certificate with admission to bachelor's studies, or an exemption certificate issued by the Matriculation Board;
- achieved an average (using the six best matric subjects, excluding Life Orientation and Mathematical Literacy) of at least 60% in the applicable school final examination;
- passed Mathematics with a minimum of 60% and Physical Sciences with a minimum of 50% in the applicable school final examination (Mathematical Literacy is not accepted); and
- in the applicable school final examination, achieved at least one of the following in language subjects:
    - English Home Language: 40%;
    - English First Additional Language: 60%; or
    - English First Additional Language: 50%, together with Afrikaans Home Language: 40%, or Afrikaans Second Additional Language: 60%.

Admission of prospective students who meet the above admission requirements is also subject to selection.

2.4.4 Selection process for BEng (4yr)

The most important measure used by the Faculty for selection for BEng programmes, is a selection score that is calculated as follows:

- Selection score = Mathematics mark + Physical Science mark + 6 x Matric average.

The percentages obtained in Mathematics and Physical Science, as well as the average percentage of the six best matric subjects (excluding Life Orientation), are used for calculating the selection score. The score therefore takes a broad group of matric subjects into account, and Mathematics and Physical Science usually each contribute twice. The maximum score is 800.

Other measures that are used for selection are the National Benchmark Tests (NBTs), the school results and other relevant information. Personal interviews may in exceptional circumstances form part of the selection measures.

The Dean, in consultation with the Faculty Management Committee, sets a threshold score and a minimum score for each BEng programme after all of the complete applications, which were received before the closing date, have been processed. The threshold score is determined 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. The minimum selection score is the selection score that students must at least have to have a reasonable likelihood to complete the particular programme.

Prospective students are selected if they meet the admission requirements and if their selection scores are equal to, or larger than, the threshold score for the particular degree programme. Students below the threshold score, but above the minimum selection score for the particular programme, are placed on a waiting list and may still be admitted to the particular programme if there are places available. Alternatively, such a student can be admitted directly to another programme if he/she meets the threshold score for the particular programme.

2.4.5 Selection process for BEng (EDP)

A limited number of students who have not been selected for a BEng (4yr), but who do meet the admission requirements for a BEng (EDP), are selected for the BEng (EDP). Preference is given to students from educationally disadvantaged environments.

2.5 Admission to BEng programmes from other programmes, other universities or other prior learning

2.5.1 Procedure for recognition of modules

Applicants, who have already completed applicable modules before enrolling in the BEng programmes of the Faculty of Engineering, may apply for recognition of modules that they have completed, in the place of modules in the BEng programme.

These applications must:

- Be submitted to the Faculty Secretary before 3 January of the students' first year of study in a BEng programme at Stellenbosch University;
- include the students complete academic record; and
- include the content and outcomes of the modules that they are asking recognition for.

The applications will be considered by a committee for Assessment and Recognition of Prior Learning (ARPL committee; refer to the Faculty's ARPL Rules for details) of the particular BEng programme's home department. The Faculty Secretary will give written feedback to the applicant.

Recognition will be granted on a module-by-module basis. Modules will be recognised where the curriculum, outcomes and credits of the module largely meet the requirements of the module within the relevant engineering programme, or where the completed module includes work, in addition to that which is required by the intended programme.

In accordance with the University's ARPL policy, at least 50% of the credits of a programme must be done at the University and normally only credits completed in the preceding 5 years will be considered for transfer.

2.5.2 Applicants from other programmes at Stellenbosch University

To be admitted to a BEng programme, a student must:

- Submit a written application to the Faculty Secretary after all the final marks have been made available, but before 13 December, in the year before the intended start of their studies in engineering;
- meet the requirements indicated below; and
- meet the admission requirements regarding language for new students.

Applications will be considered by the Faculty Secretary and the Departmental Chairperson of the particular programme's home department (or delegate). The latter will, if the student is admitted to a BEng (4yr), also decide which of the modules that the student has already completed, can be recognised instead of modules in the BEng programme. The Faculty Secretary will give written feedback to the applicant.

The requirements that applicants for admission to the second year of a BEng (EDP) must meet, are:

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

The requirements that applicants for admission to a BEng (4yr) must meet, are:

- Applicants must meet the relevant admission requirements for new students with regard to mathematics and physical sciences, unless they have already, during their studies at Stellenbosch University, passed mathematics, chemistry and physics at first-year level;
- applicants must meet the relevant admission requirements for new students with regard to languages;
- applicants must have passed Mathematics 114 and 144, or Engineering Mathematics 115 and 145; and
- applicants must
    - either have passed all modules within an appropriate BSc programme (where Mathematics 114 and 144, or Engineering Mathematics 115 and 145, are included) in their first year of study;
    - or have been selected by the home department of the particular BEng programme;

Students who have completed a BSc programme, but who took longer than four years to complete the BSc programme, or who performed poorly in general, are normally not admitted to a BEng (4yr).

Students who have completed a BSc programme will generally only be admitted to the first year of a BEng (4yr), but students can apply for the recognition of certain subjects they have passed already in the BSc programme.

2.5.3 Applicants from other universities in South Africa

Students who have commenced their studies in a BEng or BScEng programme at another university, and who wish to continue their studies in engineering at Stellenbosch University, are strongly advised to complete only their first year of study at the other university and then to apply for admission to a BEng (4yr) at Stellenbosch University from the second year of study.

To be admitted to a BEng (4yr), applicants must:

- Submit a written application to the Faculty Secretary before 30 June of the year preceding the planned start of their BEng studies at Stellenbosch University;
- include their full academic record, together with the curriculum/module outcomes for the modules for which they require recognition, with their application;

- meet the requirements to continue with their studies in engineering at the university where they have studied before, or where they are studying at the time of their application;
- meet the relevant admission requirements for new students with regard to languages; and
- meet one of the following requirements:
    - meet the applicable admission requirements of the Faculty of Engineering at Stellenbosch University; or
    - show that they have passed mathematics (equivalent to Engineering Mathematics 115 and 145), chemistry and physics on first year level.

Applications will be considered by the Faculty Secretary and the Departmental Chairperson of the particular programme's home department (or delegate). The latter will, if the student is admitted to a BEng programme, also decide which of the modules that the student has already completed, can be recognised instead of modules in the BEng programme. The Faculty Secretary will give written feedback to the applicant.

2.5.4 Enrolling from a technikon or university of technology

Candidates who have obtained the applicable National Diploma, Higher National Diploma or BTech degree, and who have performed well academically, can be admitted to the second or third year of BEng (4yr), subject to the following conditions:

- Applicants must meet the applicable admission requirements with respect to language;
- applicants must pass the main assessments in the modules indicated below, during the examination periods;
- applicants must pass all the normal main assessments of the relevant modules in, at most, two consecutive assessment opportunities; and
- applicants must be selected.

The procedure to apply, and be admitted, is as follows:

- Applicants must apply by 1 April of the preceding year at the Faculty Secretary. Applicants must include in their applications their full study record, together with the curriculum/module outcomes for all modules which they have passed.
- The departmental ARPL committees consider the applications and decide which assessments must be completed (which may be at the end of the first semester).
- The Faculty Secretary provides feedback to the applicant regarding the assessments that need to be completed. The departments provide to the applicant, for each module, only the syllabus, module content, class notes (if applicable) and the name of the prescribed text book.
- The Faculty Secretary will make the outcome of the assessments known to the applicant as only a pass or a fail, and the results will not be included in the candidate's study record.

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

- Engineering Mathematics 145;
- Applied Mathematics B 154; and
- at most two further modules, as specified by the relevant department after taking the candidate's study record at the technikon, or university of technology, into consideration in order to ensure that the candidate has the necessary background for further successful study.

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

- Chemical Engineering and Mineral Processing (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 branches
  - At most three further modules, as specified by the relevant department after taking the candidate's study record at the technikon, or university of technology, into consideration in order to ensure that the candidate has the necessary background for successful further study.

2.5.5 Applicants from universities outside South Africa

Students who desire recognition for qualifications from and/or modules passed at universities outside South Africa, must apply before 30 June of the year that precedes their intended study at Stellenbosch University. Applicants must include with their application their full study record, together with the curriculum/module outcomes for the modules for which they require recognition. The Postgraduate and International Office/HSRC's assessment of foreign qualifications will be used as the guideline. In the event of qualifications or institutions where the standards are regarded as being on the same level as South African universities, the applications will be handled in a similar manner to those students who apply for admission from a university within South Africa. In other cases, no recognition will be given for individual modules, but applicants will be given the same opportunity as students from a technikon or university of technology, to write supplementary examinations.

All applicants must meet the applicable admission requirements with respect to language.

The Faculty Secretary will give written feedback to applicants.

2.5.6 Other applicants

In the case of all other applicants, who wish to apply for admission of recognition of modules based on prior learning not covered by other sections in the Calendar, the following applies:

- All such applications must be submitted by 1 April of the preceding year.
- Applicants must include with their applications full details of prior learning, including 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. Should any of this information be omitted, the application cannot be processed.

Experience in itself is not recognised; it must be learning which is assessed in a recognised manner.

Departmental ARPL committees consider the application by comparing the education with relevant module contents, outcomes and credits. They can refuse the application with

relevant reasons, give recognition for certain module(s), recommend that the assessments be completed for certain modules (as for applicants from a university of technology), 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 written feedback to applicants.

2.6 Change in degree programme

Applications of enrolled undergraduate engineering students to change their field of study to another degree programme within the Faculty of Engineering must be submitted in writing to the Faculty Secretary before 13 December of the preceding year. Changing from one degree programme to another degree programme within the Engineering Faculty is subject to being selected for the new degree programme.

As a result of the common first year, students can change their undergraduate engineering programme at the end of the first year of study of a BEng (4yr), subject to being selected for the new programme, without having to follow any additional modules. Changing from one degree programme to another from the second year onwards, implies that over time an increasing number of additional modules will need to be followed in order to catch up.

Normally a student will have to obtain at least 0,75 HEMIS credits at the end of the first year of a BEng (4yr) (which means that they must pass 75% of the module credits in the first-year programme) to stand a good chance of being permitted to change their degree programme. Students in a BEng (4yr) who have passed all modules of the first year in their first academic year, will automatically qualify to change their degree programme, and similarly for students in the second year of a BEng (EDP).

It is the responsibility of the student involved to determine whether changing from one programme to another meets the conditions imposed by his/her bursary providers.

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

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

2.7 Renewal of registration for undergraduate students

2.7.1 HEMIS credits

Students in undergraduate programmes must acquire at least a prescribed number of HEMIS credits, and meet other requirements, to register in the following year. One HEMIS credit is equivalent to the total required number of module credits that are prescribed in a specific year of a BEng (4yr).

If, for instance, a student passes the module Control Systems 314 (which comprises 15 credits) in the programme in Electrical and Electronic Engineering, with a total of 150

credits for the year, the student acquires 0,1 HEMIS credits. The same module gives 0.102 HEMIS credits in the third year of the programme in Industrial Engineering, since 147 credits are prescribed for the third year of that programme.

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

2.7.2 After one year of study in a BEng (4yr)

Students will normally only be permitted to continue as a student in the relevant BEng programme if they:

- In the particular year acquired at least 0,6 HEMIS credits in prescribed modules of the first year of the relevant BEng programme;
- of which at least 0,2 HEMIS credits were from the modules Applied Mathematics B 124, Applied Mathematics B 154, Engineering Mathematics 115 and Engineering Mathematics 145.

2.7.3 After two or more years of study in a BEng (4yr)

Students in a BEng (4yr) must have obtained the following HEMIS credits, after the number of years of study mentioned below, to be permitted to continue in the engineering programmes at this University:

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

In addition to the HEMIS credits, the following conditions apply for renewal of registration:

- After two years of full-time study, students will normally not be permitted to continue their studies in the programme if they have not passed all the prescribed modules for the first year of study.
- After four years of full-time study, students will normally only be permitted to continue with the programme if they have passed all the prescribed modules of the first and second years of study.
- Students who have not successfully completed a BEng (4yr) after six years of full-time study, normally will not be permitted to continue with the programme.
- Irrespective of any other stipulations, students will normally only be permitted to study further if they have obtained at least 0,4 HEMIS credits in the preceding year.

2.7.4 After one year of study in a BEng (EDP)

Students in a BEng (EDP) will only be admitted to the second year of the programme if they have passed all the modules of the first year, with a performance level as determined by the Faculty and communicated to the students at the beginning of the academic year.

2.7.5 After two or more years of study in a BEng (EDP)

Students in a BEng (EDP) must have obtained the following HEMIS credits (the information below considers the first year of a BEng (EDP) to be 1 HEMIS credit), after the number of years of study mentioned below, to be permitted to continue in the engineering programmes at this University:

- After 2 years at least HEMIS 1.60 credits
- After 3 years at least HEMIS 2.40 credits
- After 4 years at least HEMIS 3.20 credits
- After 5 years at least HEMIS 4.00 credits
- After 6 years at least HEMIS 4.60 credits
- After 7 years at least HEMIS 5.20 credits

The corresponding further requirements that apply after two years of study in a BEng (4yr), also apply here. For example, requirements that apply after two years in a BEng (4yr), apply after three years in a BEng (EDP), and students in a BEng (EDP) will normally not be permitted to enrol further if they did not complete the programme in seven years of full-time study.

2.7.6 After interruption of studies

Students who interrupt their study in engineering at Stellenbosch University, for whatever reason, must apply anew for admission to the degree programme and will once again be subject to selection.

2.7.7 Application for readmission

Students who do not meet the conditions to continue their studies in BEng programmes at this University may submit written applications for readmission to the particular BEng programme. Such applications will be considered by the Readmission Committee of the University, for recommendation to the Executive Committee (Senate), only if the applications reach the Registrar before 10 January of the year in which students want to continue their studies.

A full statement of reasons why the student should be readmitted, with supporting documentation where applicable, must be provided with each application.

If their application for readmission is successful, students who have interrupted their studies for a period of three years or longer, must apply in writing to the Registrar, before the start of the academic year, for recognition of the modules passed during the initial period of study.

2.8 Admission to study modules of a next year of study

The following rules apply to students in a BEng (4yr) or BEng (EDP) who wish to register in one year for modules from more than one of a particular programme's years of study:

- The requirements regarding normal, co- and pass prerequisites must be met.
- There may be no clashes in class, test, assessment or examination timetables.
- Students are permitted to register for at most 100% of the normal academic load per semester (except for the exceptions discussed below).
- Students are not permitted to simultaneously follow modules chosen from more than two consecutive years of the degree programme (for example a third-year module may not be done simultaneously with a first-year module).
- Students may, in any given semester, only follow modules from more than one year of study of the relevant programme if they have already passed, or are also following, all the modules of the more junior years (for example a module of the first semester of the third year of study may only be followed if all the modules of the first two years of study have either already been passed, or are also being followed in that semester).

The following exceptions apply to the rules above, in addition to the stipulation in the section "Provisions Relating to Examination and Promotion" in Part 1 of the Calendar, regarding repeating a module:

- When clashes occur for lectures, tutorials or practicals, the chairperson of the clashing module's home department may permit students to follow such a module.
- Students who meet the requirements to register for the complete normal semester of one year of study of a degree programme, except that they still have to complete one module in that semester of an earlier year of study, and who have performed satisfactorily otherwise, may be permitted on merit by the chairperson of the programme's home department, in consultation with the Dean, to register for the additional module.

2.9 Further rules

2.9.1 Electronic pocket calculators

Every engineering student must, as from the first year, own an approved electronic pocket calculator (as specified in the Faculty's General Stipulations for Undergraduate Modules). Only the prescribed type of pocket calculator may be used in tests, main assessments and examinations in the first and second years of study of a BEng (4yr), as well as when required by lecturers on other years of study.

2.9.2 Residency requirement

Students who are already in possession of appropriate degree qualifications, must pass at least the final two academic years of an approved BEng programme at this University in order to obtain a BEng degree.

2.9.3 Dean's Concession Examinations

The Faculty's rules regarding Dean's Concession Examinations are given in the Faculty's Assessment Rules.

Students should submit applications for Dean's Concession Examinations by email to the Faculty Secretary as soon as all their final marks are known. The Faculty Secretary will inform the students, by email to their university email addresses, whether their applications were successful.

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

2.9.4 Improvement of a final mark

In the case of modules for which only satisfactory attendance is required, students may improve their final marks until the end of January, subject to the approval of the departmental chairperson of the module's home department.

In the case of modules that make use of project evaluation in the final year of the BEng programmes, the departmental chairperson may offer final-year students, who did not pass the relevant module, the opportunity to improve their final mark at *any time after the normal round of examinations in November*, by completing satisfactorily such work as is prescribed by the relevant department for the improvement of the final marks. The examiners may submit the improved final mark *any time after the normal round of examinations* for interim approval by the Executive Committee, provided that this concession is limited to no more than two modules per student.

In the case of similar modules in the Faculty of Engineering of a non-final year student, or of students not in their final year, the improvement of the final mark must take place in the framework of the specific submission dates for final marks for the June or November examinations, if the normal round of examination is, respectively, in June or November.

2.10 Symbols used in the tables for the Bachelor's programmes

The credit values and lecture load for each module are provided in the tables below. The symbols have the following meaning:

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
h Planned total workload hours per week for the student (contact time and own time)
c Credit value (SAQA credits: Total notional hours required by the student to complete the module, divided by 10)

Lecture, seminar and single tutorial periods (normally in the morning) are 50 minutes in duration. 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 tutorials or practicals in the afternoon means that students start at 14:00 and finish at 16:15. A load of 2,5 consecutive tutorials or practicals in the afternoon means that students start at 14:00 and finish at 16:30.
- A load of 0,75 typically means that, every second week, the students 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 time table is prepared, a room is allocated for the required number of periods, for example 3 periods for 2,25 consecutive tutorials.

2.11 Curriculum of first year of study of BEng (4yr)

The curriculum is the same for all fields of study:

First Semester

	l	***p***	***t***	***s***	***h***	***c***
Applied Mathematics B 124	4.00	0.00	2.00	0.00	12.00	15
Engineering Chemistry 123	4.00	0.00	2.00	0.00	12.00	15
Engineering Drawings 123	1.00	3.00	3.00	0.00	12.00	15
Engineering Mathematics 115	5.00	0.00	2.00	0.00	12.00	15
Engineering Physics 113	2.00	0.50	0.50	0.00	6.00	8
Professional Communication 113	2.00	0.00	1.00	0.00	6.00	8
TOTALS	18.00	3.50	10.50	0.00	60.00	76

Second Semester

	l	***p***	***t***	***s***	***h***	***c***
Applied Mathematics B 154	4.00	0.00	2.00	0.00	12.00	15
Computer Programming 143	3.00	2.00	0.00	0.00	9.00	12
Electrotechnique 143	3.50	1.50	1.50	0.00	12.00	15
Engineering Mathematics 145	5.00	0.00	2.00	0.00	12.00	15
Strength of Materials 143	3.00	0.00	2.00	0.00	10.00	12
Choose one of the following elective modules (see note below):						
Chemistry C 152	0.00	0.00	3.00	0.00	5.00	6
Electronic Engineering 152	0.00	0.00	3.00	0.00	5.00	6
Engineering Physics 152	0.00	0.00	3.00	0.00	5.00	6
Industrial Engineering 152	0.00	0.00	3.00	0.00	5.00	6
Mechanical Engineering 152	0.00	0.00	3.00	0.00	5.00	6
Mechatronic Engineering 152	0.00	0.00	3.00	0.00	5.00	6
TOTALS	18.50	3.50	10.50	0.00	60.00	75

Note: Students are advised to choose the elective module that corresponds to their study programme, but students' choices will not restrict their

eligibility to change to another programme at the end of the first year.

2.12 Curriculum of four-year BEng Chemical Engineering (including Mineral Processing)

Home department: Process Engineering

Year 1

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

Year 2

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 224	3.00	0.00	3.00	0.00	12.00	15
Chemical Engineering 224	3.00	0.00	3.00	0.00	12.00	15
Chemistry C 224	4.00	2.00	0.00	0.00	12.00	15
Engineering Mathematics 214	4.00	0.00	2.00	0.00	12.00	15
Practical Workshop Training 211	1.00	0.00	0.00	0.00	0.00	0
Thermodynamics A 214	3.00	0.00	3.00	0.00	12.00	15
TOTALS	18.00	2.00	11.00	0.00	60.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Chemical Engineering 254	3.00	0.00	3.00	0.00	12.00	15
Chemical Engineering 264	3.00	0.00	3.00	0.00	12.00	15
Chemical Engineering D 244	3.00	2.00	1.00	0.00	12.00	15
Chemistry C 254	4.00	2.00	0.00	0.00	12.00	15
Engineering Mathematics 242	2.00	0.00	1.00	0.00	6.00	8
Numerical Methods 262	2.00	0.00	1.00	0.00	6.00	8
TOTALS	17.00	4.00	9.00	0.00	60.00	76

Year 3

Both Semesters

	l	*p*	*t*	*s*	*h*	*c*
Internship (Eng) 392*	0.00	0.00	0.00	0.00	0.00	0

* *Optional module that allows selected students to interrupt their credit-bearing studies for one year, in the year preceding their final year of study, and to complete an internship at an approved organisation; refer to the module contents in Section 4.3 for further details.*

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Chemical Engineering 316	3.00	1.00	2.00	0.00	12.00	15
Chemical Engineering 317	3.00	1.00	2.00	0.00	12.00	15
Chemical Engineering 324	3.00	1.00	2.00	0.00	12.00	15
Heat Transfer A 326	3.00	1.00	2.00	0.00	12.00	15
Particle Technology 316	3.00	1.00	2.00	0.00	12.00	15
TOTALS	15.00	5.00	10.00	0.00	60.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Chemical Engineering 344	3.00	0.00	2.00	0.00	12.00	15
Chemical Engineering 354	3.00	0.00	2.00	0.00	12.00	15
Chemical Engineering 367	3.00	0.00	2.00	0.00	12.00	15
Chemical Engineering D 356	1.00	6.00	0.00	0.00	12.00	15
Mineral Processing 345	3.00	1.00	2.00	0.00	12.00	15
Vacation Training 361	0.00	1.00	0.00	0.00	0.00	0
TOTALS	13.00	8.00	8.00	0.00	60.00	75

Year 4

Both Semesters

	l	*p*	*t*	*s*	*h*	*c*
Choose one of the following elective modules (see note below):						
Chemical Engineering 478	0.00	6.00	0.00	0.00	12.00*	30*
Mineral Processing 478	0.00	6.00	0.00	0.00	12.00*	30*
TOTALS	0.00	6.00	0.00	0.00	12.00*	30*

Note: Students with bursaries from mining houses follow Mineral Processing 478 and not Chemical Engineering 478. All other students' choice between Mineral Processing 478 and Chemical Engineering 478 is determined by their project topics.

* *3 hours per week (4 credits) in the first semester and 20 hours per week (26 credits) in the second semester*

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Chemical Engineering 412	2.00	0.00	2.00	0.00	6.00	8
Chemical Engineering 414	3.00	0.00	2.00	0.00	12.00	15
Chemical Engineering 426	3.00	1.00	2.00	0.00	12.00	15
Complementary Studies (Eng) 311	0.00	0.00	3.00	0.00	3.00	4
Mineral Processing 415	3.00	0.00	2.00	0.00	12.00	15
Philosophy and Ethics 314	3.00	0.00	1.00	0.00	6.00	8
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
TOTALS	17.00	4.00	10.00	0.00	60.00	77

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Design Project 488	1.00	3.00	0.00	0.00	24.00	30
Environmental Engineering 454	3.00	0.00	2.50	0.00	12.00	15
TOTALS	4.00	3.00	2.50	0.00	36.00	45

2.13 Curriculum of four-year BEng Civil Engineering

Home department: Civil Engineering

Year 1

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

Year 2

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 224	3.00	0.00	3.00	0.00	12.00	15
Civil Engineering 224	3.00	0.00	2.50	0.00	12.00	15
Engineering Geology 214	3.00	3.00	0.00	0.00	12.00	15
Engineering Mathematics 214	4.00	0.00	2.00	0.00	12.00	15
Strength of Materials 224	3.00	0.00	2.50	0.00	12.00	15
TOTALS	16.00	3.00	10.00	0.00	60.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 242	2.00	0.00	1.50	0.00	6.00	8
Applied Mathematics B 252	2.00	0.00	1.00	0.00	6.00	8
Building Materials 254	3.00	2.00	1.00	0.00	12.00	15
Engineering Informatics 244	3.00	0.00	2.50	0.00	12.00	15
Geotechnique 254	3.00	0.00	2.50	0.00	12.00	15
Strength of Materials 254	3.00	0.00	2.50	0.00	12.00	15
Vacation Training 241	0.00	1.00	0.00	0.00	0.00	0
TOTALS	16.00	3.00	11.00	0.00	60.00	76

Year 3

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Engineering Informatics 314	3.00	0.00	2.50	0.00	12.00	15
Engineering Statistics 314	3.00	0.00	2.50	0.00	12.00	15
Geotechnique 324*	3.00	1.00	1.50	0.00	12.00	15
Hydraulics 324	3.00	1.00	2.00	0.00	12.00	15
Transport Science 324**	3.00	0.00	2.50	0.00	12.00	15
Water Treatment 324	3.00	0.00	2.50	0.00	12.00	15
TOTALS	15.00	2.00	11.00	0.00	60.00	75

* *Last offered in 2016*

** *First offered in 2017*

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Geotechnique 354	3.00	1.50	1.00	0.00	12.00	15
Hydraulics 354	3.00	0.50	2.00	0.00	12.00	15
Structural Design 354	3.00	0.00	2.50	0.00	0.00	15
Theory of Structures 354	3.00	0.00	2.50	0.00	12.00	15
Transport Science 354	3.00	1.00	1.50	0.00	12.00	15
Vacation Training 342	0.00	1.00	0.00	0.00	0.00	0
TOTALS	15.00	4.00	9.50	0.00	48.00	75

Year 4

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Hydrology 424	3.00	0.00	2.50	0.00	12.00	15
Philosophy and Ethics 414	3.00	0.00	1.00	0.00	6.00	8
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
Structural Design 424	3.00	0.00	2.50	0.00	12.00	15
Transport Science 434	3.00	1.00	1.50	0.00	12.00	15
Hydraulic Engineering 424	3.00	0.00	2.50	0.00	12.00	15
TOTALS	18.00	1.00	11.00	0.00	63.00	80

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Advanced Design (Civil) 446	2.00	6.00	0.00	0.00	12.00	15
Complementary Studies (Eng) 441	0.00	0.00	3.00	0.00	3.00	4
Engineering Management 454	4.00	0.00	2.00	0.00	12.00	15
Environmental Engineering 454	3.00	0.00	2.50	0.00	12.00	15
Project (Civil Engineering) 458	1.00	20.00	0.00	0.00	22.00	30
TOTALS	10.00	26.00	7.50	0.00	61.00	79

2.14 Curriculum of four-year BEng Electrical and Electronic Engineering

Home department: Electrical and Electronic Engineering

The first, second and half of the third year of this programme comprises general techniques that are applicable to all electrical and electronic engineers, particularly the techniques to model and systematically design systems. In the second semester of the third year, students choose one of the following four specialist directions: Telecommunication, Informatics, Energy and Robotics. These directions offer students the opportunity to partially focus their degree programmes in their direction of choice as preparation for modern industry and/or postgraduate study.

Year 1

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

Year 2

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 224	3.00	0.00	3.00	0.00	12.00	15
Computer Systems 214	3.00	3.00	0.00	0.00	12.00	15
Computer Science E 214	3.00	3.00	0.00	0.00	12.00	15
Engineering Mathematics 214	4.00	0.00	2.00	0.00	12.00	15
Systems and Signals 214	3.00	1.50	1.50	0.00	12.00	15
TOTALS	16.00	7.50	6.50	0.00	60.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 242	2.00	0.00	1.50	0.00	6.00	8
Computer Systems 245	3.00	3.00	0.00	0.00	12.00	15
Electronics 245	3.00	1.50	1.50	0.00	12.00	15
Energy Systems 244	3.00	1.50	1.50	0.00	12.00	15
Engineering Mathematics 242	2.00	0.00	1.00	0.00	6.00	8
Systems and Signals 244	3.00	1.50	1.50	0.00	12.00	15
TOTALS	16.00	7.50	7.00	0.00	60.00	76

Year 3

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Control Systems 314	3.00	1.50	1.50	0.00	12.00	15
Design (E) 314	1.00	3.00	0.00	0.00	12.00	15
Electromagnetics 314	3.00	1.50	1.50	0.00	12.00	15
Electronics 315	3.00	1.50	1.50	0.00	12.00	15
Systems and Signals 315	3.00	1.50	1.50	0.00	12.00	15
TOTALS	13.00	9.00	6.00	0.00	60.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Control Systems 344	3.00	1.50	1.50	0.00	12.00	15
Design (E) 344	1.00	3.00	0.00	0.00	12.00	15
Electronics 365	3.00	1.50	1.50	0.00	12.00	15
Systems and Signals 344	3.00	1.50	1.50	0.00	12.00	15
Choose one of the following elective modules (see note below):						
Electromagnetics 344	3.00	1.50	1.50	0.00	12.00	15
Energy Systems 344	3.00	1.50	1.50	0.00	12.00	15
TOTALS	13.00	9.00	6.00	0.00	60.00	75

Note: Electromagnetics 344 is a prerequisite for the Telecommunication specialty in Year 4 and Energy Systems 344 is a prerequisite for the Energy specialty in Year 4. For the other two specialist directions, either of the elective modules may be chosen.

Year 4

First Semester: Telecommunication

	l	*p*	*t*	*s*	*h*	*c*
Philosophy and Ethics 414	3.00	0.00	1.00	0.00	6.00	8
High Frequency Technique 414	3.00	1.00	1.00	0.00	12.00	15
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
Systems and Signals 414	3.00	1.00	1.00	0.00	12.00	15
Telecommunication 414	3.00	1.00	1.00	0.00	12.00	15
Choose one of the following elective modules:						
Computer Science 315	3.00	0.00	3.00	0.00	12.00	16
Electronics 414	3.00	1.00	1.00	0.00	12.00	15
TOTALS	18.00	3.00/ 4.00	6.00/ 8.00	0.00	63.00	80/ 81

First Semester: Informatics

	l	***p***	***t***	***s***	***h***	***c***
Philosophy and Ethics 414	3.00	0.00	1.00	0.00	6.00	8
Computer Science 315	3.00	0.00	3.00	0.00	12.00	16
Computer Science 334	3.00	3.00	0.00	0.00	12.00	16
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
Systems and Signals 414	3.00	1.00	1.00	0.00	12.00	15
Choose one of the following elective modules:						
Computer Systems 414	3.00	1.00	1.00	0.00	12.00	15
Telecommunication 414	3.00	1.00	1.00	0.00	12.00	15
TOTALS	18.00	5.00	7.00	0.00	63.00	82

First Semester: Energy

	l	***p***	***t***	***s***	***h***	***c***
Electronics 414	3.00	1.00	1.00	0.00	12.00	15
Energy Systems 414	3.00	1.00	1.00	0.00	12.00	15
Energy Systems 424	3.00	1.00	1.00	0.00	12.00	15
Philosophy and Ethics 414	3.00	0.00	1.00	0.00	6.00	8
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
Choose one of the following elective modules:						
Computer Systems 414	3.00	1.00	1.00	0.00	12.00	15
Control Systems 414	3.00	1.00	1.00	0.00	12.00	15
TOTALS	18.00	5.00	7.00	0.00	63.00	80

First Semester: Robotics

	l	***p***	***t***	***s***	***h***	***c***
Philosophy and Ethics 414	3.00	0.00	1.00	0.00	6.00	8
Computer Systems 414	3.00	1.00	1.00	0.00	12.00	15
Control Systems 414	3.00	1.00	1.00	0.00	12.00	15
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
Systems and Signals 414	3.00	1.00	1.00	0.00	12.00	15
Choose one of the following elective modules:						
Computer Science 315	3.00	0.00	3.00	0.00	12.00	16
Electronics 414	3.00	1.00	1.00	0.00	12.00	15
TOTALS	18.00	4.00	9.00	0.00	63.00	80/81

Second Semester: all specialities

	l	*p*	*t*	*s*	*h*	*c*
Complementary Studies (Eng) 441	0.00	0.00	3.00	0.00	3.00	4
Entrepreneurship (Eng) 444	3.00	0.00	3.00	0.00	12.00	15
Environmental Engineering 442 *	3.00	0.00	2.00	0.00	6.00	8
Project (E) 448	0.00	20.00	0.00	0.00	35.00	45
TOTALS	6.00	20.00	8.00	0.00	56.00	72

** Presented during the first 7 weeks of the semester.*

2.15 Curriculum of four-year BEng Industrial Engineering

Home department: Industrial Engineering

Year 1

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

Year 2

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 224	3.00	0.00	3.00	0.00	12.00	15
Electrotechnique 214	3.00	1.50	1.50	0.00	12.00	15
Engineering Economics 212	2.00	0.00	2.00	0.00	6.00	8
Engineering Mathematics 214	4.00	0.00	2.00	0.00	12.00	15
Practical Workshop Training 211	1.00	0.00	0.00	0.00	0.00	0
Production Management 212	2.00	0.00	2.00	0.00	6.00	8
Thermofluid Dynamics 214	3.00	1.00	2.00	0.00	12.00	15
TOTALS	18.00	2.50	12.50	0.00	60.00	76

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Industrial Programming 244	2.00	0.00	3.00	0.00	12.00	15
Introductory Machine Design 244	1.00	3.00	2.00	0.00	12.00	15
Engineering Mathematics 242	2.00	0.00	1.00	0.00	6.00	8
Manufacturing Processes 244	2.00	1.50	1.00	0.00	12.00	15
Material Science A 244	3.00	3.00	0.00	0.00	12.00	15
Numerical Methods 262	2.00	0.00	1.00	0.00	6.00	8
TOTALS	12.00	7.50	8.00	0.00	60.00	76

Year 3

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Complementary Studies (Eng) 311	0.00	0.00	3.00	0.00	3.00	4
Control Systems 314	3.00	1.50	1.50	0.00	12.00	15
Electrical Drive Systems 324	3.00	1.00	2.00	0.00	12.00	15
Engineering Statistics 314	3.00	0.00	2.50	0.00	12.00	15
Philosophy and Ethics 314	3.00	0.00	1.00	0.00	6.00	8
Production Management 314	3.00	1.00	2.00	0.00	12.00	15
TOTALS	15.00	3.50	12.00	0.00	57.00	72

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Electronics 344	3.00	1.50	1.50	0.00	12.00	15
Engineering Economics 354	2.00	0.00	3.00	1.00	12.00	15
Industrial Management 354	3.00	0.00	2.00	0.00	12.00	15
Operations Research (Eng) 345	3.00	0.00	3.00	0.00	12.00	15
Quality Assurance 344	3.00	0.00	3.00	0.00	12.00	15
Vacation Training 351	0.00	1.00	0.00	0.00	0.00	0
TOTALS	14.00	2.50	12.50	1.00	60.00	75

Year 4

Both Semesters

	l	*p*	*t*	*s*	*h*	*c*
Industrial Project 498	0.00	0.00	0.00	1.00	0.00	30
TOTALS	0.00	0.00	0.00	1.00	0.00	30

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Industrial Ergonomics 414	3.00	0.00	1.50	0.00	12.00	15
Information Systems 414	2.00	1.20	2.00	0.00	12.00	15
Manufacturing Systems 414	2.00	0.00	2.00	0.00	12.00	15
Operations Research (Eng) 415	3.00	0.00	3.00	0.00	12.00	15
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
TOTALS	13.00	1.20	9.50	0.00	57.00	72

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Industrial Practice 442	2.00	0.00	1.00	1.00	6.00	8
Quality Management 444	2.00	0.00	3.00	0.00	12.00	15
Environmental Engineering 442 *	3.00	0.00	2.00	0.00	6.00	8
Enterprise Design 444	2.00	0.00	2.00	0.00	12.00	15
Simulation 442	2.00	0.50	1.00	0.00	6.00	8
Vacation Training 451	0.00	1.00	0.00	0.00	0.00	0
TOTALS	11.00	1.50	9.00	1.00	42.00	54

** Presented during the first 7 weeks of the semester.*

2.16 Curriculum of four-year BEng Mechanical Engineering

Home department: Mechanical and Mechatronic Engineering

Year 1

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

Year 2

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Applied Mathematics B 224	3.00	0.00	3.00	0.00	12.00	15
Electrotechnique 214	3.00	1.50	1.50	0.00	12.00	15
Engineering Mathematics 214	4.00	0.00	2.00	0.00	12.00	15
Strength of Materials 224	3.00	0.00	2.50	0.00	12.00	15
Thermodynamics A 214	3.00	0.00	3.00	0.00	12.00	15
Choose the following elective module, or the corresponding elective module in the second semester:						
Practical Workshop Training 211	1.00	0.00	0.00	0.00	0.00	0
TOTALS	17.00	1.50	12.00	0.00	60.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Engineering Mathematics 242	2.00	0.00	1.00	0.00	6.00	8
Fluid Mechanics 244	3.00	1.00	2.00	0.00	12.00	15
Introductory Machine Design 244	1.00	3.00	2.00	0.00	12.00	15
Material Science A 244	3.00	3.00	0.00	0.00	12.00	15
Numerical Methods 262	2.00	0.00	1.00	0.00	6.00	8
Strength of Materials W 244	3.00	1.00	2.00	0.00	12.00	15
Choose the following elective module or the corresponding elective module in the first semester:						
Practical Workshop Training 241	1.00	0.00	0.00	0.00	0.00	0
TOTALS	15.00	8.00	8.00	0.00	60.00	76

Year 3

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Complementary Studies (Eng) 311	0.00	0.00	3.00	0.00	3.00	4
Electrical Drive Systems 324	3.00	1.00	2.00	0.00	12.00	15
Philosophy and Ethics 314	3.00	0.00	1.00	0.00	6.00	8
Machine Design A 314	2.00	2.00	2.00	0.00	12.00	15
Modelling 334	4.00	0.00	3.00	0.00	14.00	18
Strength of Materials W 334	3.00	1.00	2.00	0.00	12.00	15
TOTALS	15.00	4.00	13.00	0.00	59.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Control Systems 354	4.00	1.00	2.00	0.00	14.00	18
Electronics 344	3.00	1.50	1.50	0.00	12.00	15
Machine Design B 344	2.00	2.00	2.00	0.00	12.00	15
Thermofluid Dynamics 344	3.00	1.00	2.00	0.00	12.00	15
Vacation Training 341	0.00	1.00	0.00	0.00	0.00	0
Vibration and Noise 354	3.00	1.00	1.00	0.00	10.00	12
TOTALS	15.00	7.50	8.50	0.00	60.00	75

Year 4

Both Semesters

	l	*p*	*t*	*s*	*h*	*c*
Mechanical Project 478	2.00	3.00	0.00	0.00	18.00*	45*
TOTALS	2.00	3.00	0.00	0.00	18.00*	45*

* *6 hours per week (8 credits) in the first semester and 30 hours per week (37 credits) in the second semester.*

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Energy Systems M 434	3.00	1.00	2.00	0.00	12.00	15
Heat Transfer A 414	3.00	1.00	2.00	0.00	12.00	15
Mechatronics 424 *	3.00	3.00	0.00	0.00	15.00	18
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
Choose one of the following elective modules:						
Finite Element Methods 414	3.00	1.00	2.00	0.00	12.00	15
Maintenance Management 414	3.00	1.00	2.00	0.00	12.00	15
Mechanical Engineering 414	3.00	1.00	2.00	0.00	12.00	15
Numerical Fluid Dynamics 414	3.00	1.00	2.00	0.00	12.00	15
TOTALS	15.00	6.00	7.00	0.00	60.00	75

* *A part of this module is presented before the normal start of the semester.*

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Mechanical Design 444	3.00	3.00	0.00	0.00	12.00	15
Environmental Engineering 442 *	3.00	0.00	2.00	0.00	6.00	8
Production Management 444	3.00	0.00	2.00	0.00	10.00	12
Vacation Training 441	0.00	1.00	0.00	0.00	0.00	0
TOTALS	9.00	4.00	4.00	0.00	28.00	35

** Presented during the first 7 weeks of the semester.*

2.17 Curriculum of four-year BEng Mechatronic Engineering

Home department: Mechanical and Mechatronic Engineering

Year 1

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

Year 2

The same as BEng Mechanical Engineering.

Year 3

First Semester

	l	***p***	***t***	***s***	***h***	***c***
Complementary Studies (Eng) 311	0.00	0.00	3.00	0.00	3.00	4
Electrical Drive Systems 324	3.00	1.00	2.00	0.00	12.00	15
Philosophy and Ethics 314	3.00	0.00	1.00	0.00	6.00	8
Machine Design A 314	2.00	2.00	2.00	0.00	12.00	15
Modelling 334	4.00	0.00	3.00	0.00	14.00	18
Computer Systems 214	3.00	3.00	0.00	0.00	12.00	15
TOTALS	15.00	6.00	11.00	0.00	59.00	75

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Control Systems 354	4.00	1.00	2.00	0.00	14.00	18
Electronics 245	3.00	1.50	1.50	0.00	12.00	15
Machine Design B 344	2.00	2.00	2.00	0.00	12.00	15
Computer Systems 245	3.00	3.00	0.00	0.00	12.00	15
Vacation Training 341	0.00	1.00	0.00	0.00	0.00	0
Vibration and Noise 354	3.00	1.00	1.00	0.00	10.00	12
TOTALS	15.00	9.50	6.50	0.00	60.00	75

Year 4

Both Semesters

	l	***p***	***t***	***s***	***h***	***c***
Choose one of the following elective modules:						
Mechatronic Project 478	2.00	3.00	0.00	0.00	18.00*	45*
Mechatronic Project 488	2.00	3.00	0.00	0.00	18.00*	45*
TOTALS	2.00	3.00	0.00	0.00	18.00*	45*

* *6 hours per week (8 credits) in the first semester and 30 hours per week (37 credits) in the second semester.*

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Design (E) 314	1.00	3.00	0.00	0.00	12.00	15
Electronics 315	3.00	1.50	1.50	0.00	12.00	15
Heat Transfer A 414	3.00	1.00	2.00	0.00	12.00	15
Mechatronics 424 *	3.00	3.00	0.00	0.00	15.00	18
Project Management 412	3.00	0.00	1.00	0.00	9.00	12
TOTALS	13.00	8.50	4.50	0.00	60.00	75

* *A part of this module is presented before the normal start of the semester.*

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Mechanical Design 444	3.00	3.00	0.00	0.00	12.00	15
Environmental Engineering 442 *	3.00	0.00	2.00	0.00	6.00	8
Production Management 444	3.00	0.00	2.00	0.00	10.00	12
Vacation Training 441	0.00	1.00	0.00	0.00	0.00	0
TOTALS	9.00	4.00	4.00	0.00	28.00	35

** Presented during the first 7 weeks of the semester.*

2.18 Curriculum of BEng (EDP)

The first year of the BEng (EDP) (all fields of study) is coordinated by the Science Faculty. The second and later years of these programmes are the same as the first and later years of a corresponding BEng (4yr), and are coordinated by the departments mentioned in the previous section.

Year 1

The first-year of the BEng (EDP) in all fields of study has the following curriculum:

Both Semesters

	l	*p*	*t*	*s*	*h*	*c*
Chemistry 176	3.00	3.00	0.00	0.00	12.00	32
Computer Skills 176	1.00	0.00	4.00	0.00	5.00	8
Mathematics 186	3.00	0.00	3.00	0.00	12.00	32
Physics 176	3.00	3.00	0.00	0.00	12.00	32
University Practice in the Natural Sciences 176*	3.00	0.00	0.00	0.00	3.00	8
TOTALS	13.00	6.00	7.00	0.00	44.00	112

* *5l in the first semester; 1l in the second semester.*

First Semester

	l	*p*	*t*	*s*	*h*	*c*
Scientific Communication Skills 116	3.00	0.00	3.00	0.00	10.00	12
TOTALS	3.00	0.00	3.00	0.00	10.00	12

Second Semester

	l	*p*	*t*	*s*	*h*	*c*
Preparatory Technical Drawings 146	3.00	3.00	0.00	0.00	12.00	16
Scientific Communication Skills 146	3.00	0.00	0.00	0.00	5.00	6
TOTALS	6.00	3.00	0.00	0.00	17.00	22

Year 2 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).

2.19 Transitional measures

As a result of the programme changes, transitional measures have been implemented to accommodate the new modules being phased in.

Industrial Engineering

Module previously in programme	Last year offered	Transitional measure
Electronics 245	n/a	Repeaters follow Electronics 344
Philosophy and Ethics 314 (12 credits)	2015	Philosophy and Ethics 314 (8 credits) and Complementary Studies (Eng) 311

Chemical Engineering including Mineral Processing

Module previously in programme	Last year offered	Transitional measure
Philosophy and Ethics 314 (12 credits)	2015	Philosophy and Ethics 314 (8 credits) and Complementary Studies (Eng) 311

Civil Engineering

Module previously in programme	Last year offered	Transitional measure
Applied Mathematics B 264	2015	Repeaters follow Applied Mathematics B 252 and Transport Science 324 from 2017
Geotechnique 324	2016	Repeaters follow Geotechnique 254
Engineering Mathematics 252	2015	Repeaters follow Transport Science 324 from 2017
Philosophy and Ethics 474 (12 credits)	2015	Philosophy and Ethics 414 and Complementary Studies (Eng) 441
Theory of Structures 324	2015	Repeaters follow Water Treatement 324

Electrical and Electronic Engineering

Module previously in programme	Last year offered	Transitional measure
Philosophy and Ethics 474 (12 credits)	2015	Philosophy and Ethics 414 and Complementary Studies (Eng) 441

Industrial Engineering

Module previously in programme	Last year offered	Transitional measure
Electronics 245	n/a	Repeaters follow Electronics 344
Philosophy and Ethics 314 (12 credits)	2015	Philosophy and Ethics 314 (8 credits) and Complementary Studies (Eng) 311

Mechanical Engineering

Module previously in programme	Last year offered	Transitional measure
Electronics 245	n/a	Repeaters follow Electronics 344
Philosophy and Ethics 314 (12 credits)	2015	Philosophy and Ethics 314 (8 credits) and Complementary Studies (Eng) 311

Mechatronic Engineering

Module previously in programme	Last year offered	Transitional measure
Philosophy and Ethics 314 (12 credits)	2015	Philosophy and Ethics 314 (8 credits) and Complementary Studies (Eng) 311

3 Postgraduate Programmes

Faculty-wide rules, which are applicable to postgraduate study in engineering at this University, are given below. Further details are available upon request from the respective departmental chairpersons.

3.1 Qualifications and fields of study

The Faculty awards the following postgraduate qualifications (illustrated in Figure 3.1 below; 1 credit corresponds to 10 hours of work):

- PGDip (Engineering): Postgraduate Diploma in Engineering

  The one-year postgraduate diploma (120 credits) 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.

- MScEng: Master of Science in Engineering

  This programme has been phased out as from 2011. The last first registrations for this programme were in February 2011.

- MEng: Master of Engineering

  Two Master of Engineering qualifications are offered by the Faculty:

  - The MEng (Structured) is a coursework-based master's programme in which the emphasis is placed on the advanced application of engineering sciences in design.
  - The MEng (Research) consists of a research project. A satisfactory thesis on the research project is required.

- PhD: Doctor of Philosophy

  The PhD degree programme comprises a research project. The degree may only be awarded if the candidate has generated new knowledge through research.

- DEng: Doctor of Engineering

  The DEng may be awarded to candidates whose research makes a substantial contribution towards humanity's knowledge in the field of engineering.

All the postgraduate qualifications can be awarded in the following fields of study: Chemical Engineering, Chemical Engineering – Mineral Processing, Civil Engineering, Electrical Engineering, Electronic Engineering, Industrial Engineering, Mechanical Engineering and Mechatronic Engineering. The PGDip (Eng) and MEng can also be awarded in the field of Engineering Management.

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

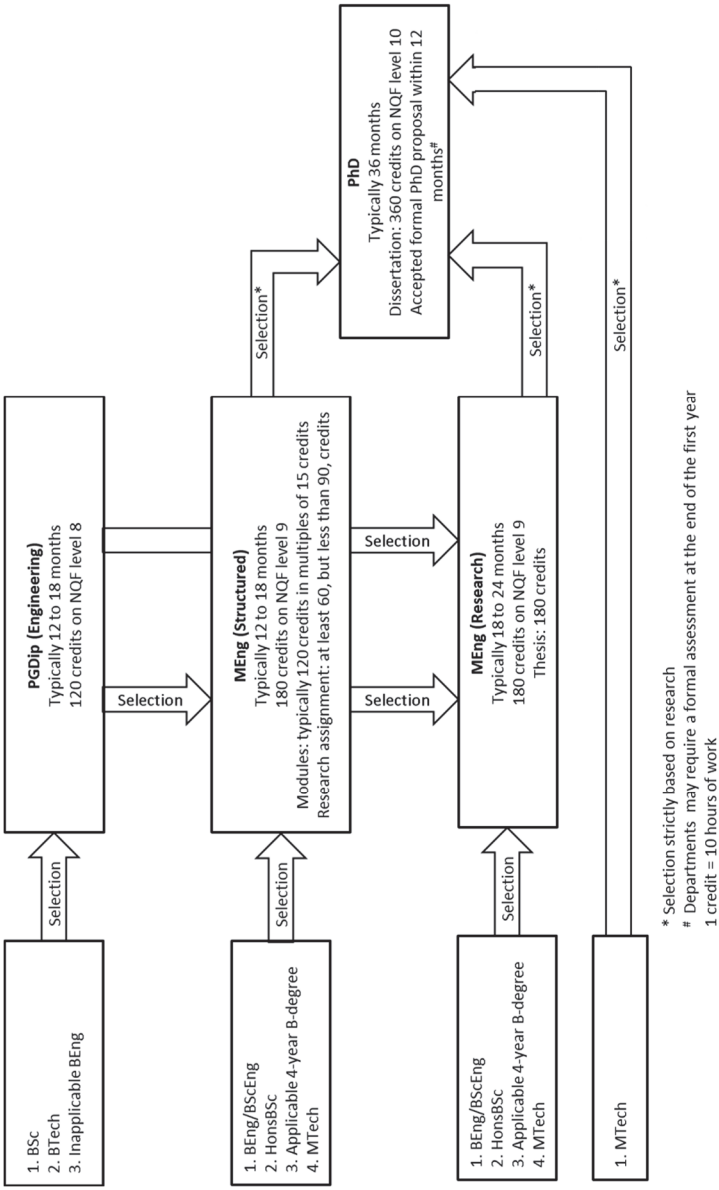

Figure 3.1: Postgraduate Admission Model

3.2 The Postgraduate Diploma in the Engineering (PGDip (Eng))

3.2.1 Admission and residence requirements

Also refer to Figure 3.1.

To be considered for admission to the Postgraduate Diploma in Engineering, PGDip (Eng), students must satisfy the following requirements:

- Hold at least an approved bachelor's degree in engineering or science 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, after recommendation by the relevant department's chairperson.

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

Students must be registered for at least one year at the University in the particular programme to be awarded the diploma. The maximum residence period is shown in Table 3.1 at the end of this chapter.

3.2.2 Application

Prospective students must submit to the Registrar a written application for admission to the PGDip (Eng) at least three months before the start of the first or second semester, depending on when they would like to start the programme. Official application forms will then be sent to them. The following additional information must be supplied when submitting these application forms to the University:

- Details of qualifications already obtained and appropriate experience gained.
- Certified copies of the relevant certificates.
- The prospective field of study of the PGDip (Eng) that the student wishes to follow.

3.2.3 Composition and presentation

The programme can be presented in semester, self-study or block courses that, depending on the composition of the programme, may be followed on a full-time or part-time basis. The programme must include at least 120 credits on NQF level 8. Each department retains the right to require students to undertake preparatory and/or supplementary study.

In certain cases, candidates may commence study in the second semester if presentation is done by means of block courses or self-study.

3.2.4 Requirements to pass

A final mark of at least 50% must be obtained in each of the prescribed modules.

3.3 Master's degrees

3.3.1 Admission and residence requirements

Also refer to Figure 3.1.

To be considered for admission to the MEng (Structured) and MEng (Research), students must satisfy the following requirements:

- Hold at least a Bachelor in the Engineering, the degree Bachelor of Science with Honours, another relevant four-year bachelor's degree, a master's degree from a South African university of technology, or the Postgraduate Diploma in Engineering; or
- hold other academic degree qualifications and appropriate experience that have been approved by the Faculty Board, after recommendation by the relevant department's chairperson.

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

Students must be registered in the relevant programme at the University for at least one year to be awarded the degree. The maximum residence period is shown in Table 3.1 at the end of this chapter.

3.3.2 Application

Students must submit a written application to the Registrar for admission as a master's student. The following information must be supplied:

- Details of qualifications already obtained.
- Certified copies of the relevant certificates.
- The proposed field of study or subject of the thesis.

3.3.3 Presentation: all master's degrees

Depending on their content, the programmes may be presented full-time and without interruption, or by means of block courses that may be followed on a full-time or part-time basis. In certain cases, where the presentation is by means of block courses, the candidates may start their study in the second semester.

3.3.4 Composition and presentation: MScEng and MEng (Research)

The MEng (Research) programme requires a thesis with a minimum credit value of 180 on NQF level 9. Certain MScEng and MEng (Research) programmes can include modules that may be used together with a research project to determine the final mark.

In some MScEng and MEng (Research) programmes, candidates will not be expected to follow further modules if they already have an honours degree in science, a relevant four-year bachelor's degree, or a bachelor's degree in engineering, or an equivalent qualification in the subject matter of the thesis, while other MScEng and MEng (Research) programmes

include compulsory modules. The candidate must pass all the prescribed modules of the specific degree programme before the degree can be awarded.

An approved research project must be completed satisfactorily and a thesis submitted. It must be evident from this thesis that the student is capable of independent scientific and technical investigation and interpretation of the results. The thesis must be accompanied by a declaration that it has not been submitted at another university for a degree and that it is the student's own work. The complete thesis must be written by the student himself/herself. The body of the thesis must form a coherent whole, which 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.

Students who wish to study on a part-time basis, and/or do the research work mentioned above at another approved institution, must obtain written approval from the Senate.

3.3.5 Composition and presentation: MEng (Structured)

The MEng (Structured) programme is coursework-based programme of 180 credits on NQF level 9 that comprises a number of prescribed modules (maximum 120 credits) and an approved research assignment (minimum of 60 credits, but less than 90 credits). In the research assignment, the emphasis is placed on the practical application of theory and on assessing the value of the impact of this application.

3.3.6 Examination and requirements to pass

The examination is arranged in accordance with the procedures given in the Faculty's *Minimum Standards – Postgraduate Examination*.

Formal class attendance and the completion of prescribed modules, supplementary independent study, assignments and so forth, as prescribed for a specific candidate by the chairperson of the relevant department for being awarded a given master's degree, must be completed. Modules are prescribed to candidates on the basis of:

- The requirements of the specific field of study.
- The specific objectives of the candidates' studies, their academic background and experience.
- The availability of lecturing personnel who can handle the specific fields of study and modules.

Written and/or oral examinations covering the prescribed study must be completed to the satisfaction of the University. A minimum final mark of 50 (out of 100) must be obtained in such an examination.

MScEng and MEng (Research) candidates, who wish to graduate at the December graduation ceremony, must submit their theses for final examination on or before 1 October. The corresponding submission date for the March graduation ceremony is usually 1 December.

Each MScEng and MEng (Research) student must submit a copy of a journal article on his/her research, which has been approved by the supervisor(s), at the oral examination. It is the prerogative of the supervisor(s) to decide whether or not the article will be submitted to a journal or a conference. Should the thesis be classified as confidential or secret, the article must still be submitted at the oral examination.

3.4 The PhD degree

3.4.1 Admission and residence requirements

Also refer to Figure 3.1 near the beginning of this chapter.

To be considered for admission to the PhD-programme students must satisfy the following requirements:

- Hold at least a degree Master of Science in Engineering, Master of Science, Master of Engineering (with a research component) or a master's degree (with a research component) from a South African university of technology; or
- have reached (in another manner) a standard of competence in their field of study which is deemed sufficient for this purpose by the Senate.

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

The minimum residence requirements are that students must be registered at the University for the degree Doctor of Philosophy:

- For at least two years after they have been awarded a master's degree; or
- for at least three years after they have been awarded a bachelor's degree in engineering.

The maximum residence period is shown in Table 3.1 at the end of this chapter.

3.4.2 Application and continued admission

Also refer to Figure 3.1 near the beginning of this chapter.

At the time of application for registration, the student must provide the following:

- The customary contact information;
- qualifications already completed (accompanied by certified copies of these qualifications if they were not obtained from Stellenbosch University);
- the intended commencement date; and
- the name of a supervisor and, if applicable, the names of one or more co-supervisors.

To be permitted to continue registering for PhD studies after the first year of study, the student must have:

- Completed a formal assessment of a research proposal to the satisfaction of the Faculty Board (please refer to the Faculty's "Minimum Standards w.r.t. PhD Registration"); and

- after completion of aforementioned assessment, receive the Faculty Board's approval of the dissertation topic and the supervisor(s).

3.4.3 Composition

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

3.4.4 Examination and requirements to pass

The examination is arranged according to the procedures given in the Faculty's *Minimum Standards – Postgraduate Examination*.

Candidates, who wish to graduate at the December graduation ceremony, must submit their dissertations for final examination on or before 1 September. The corresponding submission date for the March graduation ceremony is 1 November.

A PhD candidate may not submit his/her dissertation for examination before written permission has been obtained by the supervisor(s).

PhD dissertations can be submitted 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 of the dissertation that must be submitted, as well as further requirements that must be met before the degree may be awarded, are set out in the chapter "Postgraduate Qualifications" in Part 1 of the Calendar.

Dissertations that contain research in the form of published and/or unpublished articles:

- Should at least contain an introductory overview, as well as 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; and
- may only present research if the research work and the originality of the research, are substantially the PhD candidate's own work. The dissertation must, in terms of each article, include a declaration in which the contribution of the candidate is indicated, in the format prescribed in the relevant section of the chapter "Postgraduate Qualifications" in Part 1 of the Calendar.

The University can award the degree Doctor of Philosophy in the Faculty of Engineering to students who:

- Did original research in the field of engineering sciences under the supervision of a supervisor for a period of at least two academic years at the University, or at another institution approved by the University, to the satisfaction of the University;
- submitted a dissertation that, in the view of the Senate, satisfactorily presents a specific contribution that exhibits independent critical judgement, was made by the student to the enrichment of knowledge in the particular subject area. The dissertation must be accompanied by a declaration that it had not already been submitted at another university for the purpose of obtaining a degree, and that it is the student's own work;

- completed an oral examination to the satisfaction of the University, except that in special circumstances, subject to the approval of the Senate, exemption from the oral examination may be granted; and
- submitted proof at his/her oral examination that a journal article, reporting the research of his/her dissertation, has already been submitted to a journal of acceptable standard or, if the dissertation has been classified as confidential or secret, submitted such a journal article to the examination committee at the oral examination.

3.5 The DEng degree

3.5.1 Requirements to pass

The University may award the degree Doctor of Engineering in the Faculty of Engineering to students who:

- Were registered for at least one year as a student for the degree Doctor of Engineering at the University, and if
    - a period of at least two years elapsed after the degree Doctor of Philosophy (Engineering) had been awarded to them, or after reaching, in another manner, a standard of competence in their field of study which is deemed sufficient for this purpose by the Senate; or
    - a period of at least five years elapsed after the degree of Master of Science, Master of Science in Engineering or Master of Engineering had been awarded to them, or after reaching in another manner a standard of competence in their field of study which is deemed sufficient for this purpose by the Senate; or
    - a period of at least nine years elapsed after the degree Bachelor in Engineering had been awarded to them, or after reaching in another manner a standard of competence in their field of study which is deemed sufficient for this purpose by the Senate;
- after completion of the specified periods of study, were working full-time in their field to the satisfaction of the Senate;
- performed advanced original research and/or creative work to the satisfaction of the University in the field of engineering sciences; and
- submitted original and previously published works which, according to the judgment of the Senate, indicates that they have made a significant and outstanding contribution to the enrichment of knowledge of the engineering sciences.

3.5.2 Examination

A DEng candidate may not submit his/her dissertation for examination before written permission has been given by the supervisor(s).

The requirements relating to the submission date, the number of copies that must be submitted, as well as the additional requirements that must be met before the degree can be awarded, are set out in the chapter “Postgraduate Qualifications” in Part 1 of the Calendar.

Candidates are not subject to an oral examination.

3.6 Converting between postgraduate programmes

3.6.1 From PGDip (Eng) to MEng

In deserving cases, the Faculty Board may recommend that registration for a PGDip (Eng) may be converted to registration for a MEng. The conversion may be done when the candidate has progressed above the expected standards in his/her studies and wishes to continue studying at a master's level.

3.6.2 From MEng to MScEng

Since the MScEng programme is being phased out, conversion to it is no longer permitted.

3.6.3 From MScEng and MEng (Research) to PhD

In deserving cases, the Faculty Board may recommend that registration for a master's degree in Engineering, only MScEng and MEng (Research), be converted to registration for a doctorate degree. Applications are handled in accordance with the rules in Part 1 of the Calendar, and the procedure described in the Faculty's *Procedure for Upgrading to PhD*.

3.7 Further rules for postgraduate students

3.7.1 Postgraduate model for the Faculty of Engineering

The postgraduate programme structure, as illustrated in Figure 3.1 near the beginning of this chapter, is applicable to all postgraduate students who were admitted from 2005 onwards. The admission to the postgraduate programmes of students who do not meet the qualifications requirements, shown in the model, is subject to the approval of the Faculty Board.

3.7.2 Recognition of prior learning

Sections 2.5.1 and 2.5.6 also apply here, except for the following:

- Modules that have already been used to obtain a qualification will not be recognised again as part of a postgraduate programme.
- Where applicants hold the required qualification for admission, but the performance did not meet the required standard (for example not 60% in the final year in the case of a prospective master's student), the ARPL committees may recognise supplementary learning and work experience (for example advanced projects completed successfully) to grant an applicant admission, if the learning and experience show that the applicant now has the potential to complete the relevant programme successfully.
- Work experience and projects, of an appropriate scope and advanced nature, that have been completed by the applicant can be considered by ARPL committees for recognition of module credits, but not for research work.

3.7.3 Maximum period of enrolment

Table 3.1 below shows the maximum period of enrolment for the respective postgraduate programmes, as approved by the Faculty Board in 2004. After the maximum enrolment period, a postgraduate student may only re-register if:

- The particular student annually submits an application for continuation of studies by 15 January to the chairperson of the relevant department;
- the particular departmental chairperson recommends approving the application; and
- for students in a PGDip (Eng), MEng or MScEng programme, permission is granted by the Faculty Committee; or
- for students in a PhD programme, permission is granted by the Senate, upon recommendation by the Faculty Board.

Extending a student's permitted maximum period of enrolment will normally only be granted or recommended once by the Faculty Board.

3.7.4 Continued enrolment during the maximum period of enrolment

The Faculty Board may, on recommendation by the relevant departmental chairperson, prevent a student from continuing his/her postgraduate studies on the grounds of insufficient progress made by the student. Considerations that the Faculty Board can use in this context include:

- Whether it is reasonable to expect the student to complete the program within the relevant maximum period of enrolment, taking into account the student’s progress to date; and
- in the case of assignments, theses and dissertations, to what extent the student has to date exhibited the ability to work independently.

Table 3.1: Maximum period of enrolment for postgraduate programmes

PGDip (Eng) [120 SAQA credits]

Year of Enrolment	***1***	***2***	***3***	***4***
Full-time Enrolment			***X***	
Part-time Enrolment				***X***

MEng (Structured) [180 SAQA credits]

Year of Enrolment	***1***	***2***	***3***	***4***	***5***
Full-time Enrolment			***X***		
Part-time Enrolment					***X***

MEng (Research) [180 SAQA credits]

Year of Enrolment	***1***	***2***	***3***	***4***	***5***	***6***
Full-time Enrolment				***X***		
Part-time Enrolment						***X***

MScEng [240 SAQA credits]

Year of Enrolment	***1***	***2***	***3***	***4***	***5***	***6***
Full-time Enrolment				***X***		
Part-time Enrolment						***X***

PhD [360 SAQA credits]

Year of Enrolment	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
Full-time Enrolment					***X***			
Part-time Enrolment								***X***

Key:

	Normal duration of programme
	Final year of concessional registration
X	*Must apply for readmission to degree*
	Not Applicable

4 Undergraduate Subjects, Modules and Module Contents

4.1 Abbreviations and numbering system

The format of Section 4.3 can be explained by means of the following example. The entry for the module normally referred to as **Engineering Mathematics 145**, is as follows:

> **38571 ENGINEERING MATHEMATICS**
>
> **145 Further Differential and Integral Calculus (15)**
> *A & E (5.00 l, 0.00 p, 2.00 t, 0.00 s per week)*
> 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*

The **subject code** is **38571** and it is associated with the **subject name Engineering Mathematics**, whilst **145** is the **module code** of the module, in the sequence **Y S H**:

- **Y** indicates the year of study within which the module is usually presented. In the case of modules for honours degree programmes and postgraduate diplomas Y=7, for master's degree programmes Y=8, and for doctoral degree programmes Y=9. In the example, Engineering Mathematics 145, with J=1, is presented in the first year of study.
- **S** indicates the semester: S=1, 2 or 3 indicates a first-semester module, S=4, 5 or 6 indicates a second-semester module, and S=7, 8 or 9 indicates a year module. Engineering Mathematics 145, with S=4, is presented in the second semester.
- **H** is merely an auxiliary digit that distinguishes between different modules. In Engineering Mathematics 145, H=5.

Further Differential and Integral Calculus indicates the **module topic**.

The number that follows the module description in brackets, **(15)**, indicates the **credit value** of the module. In the example, a student can obtain 15 **credits** by passing Engineering Mathematics 145. The **credit value** (SAQA definition) is one tenth of the number of hours of work that would typically be required by a student to complete the module (which includes tests, examinations and contact sessions, such as lectures). A module with a credit value of 15 will therefore require approximately 150 hours of work.

A & E indicates the **language specification** of Engineering Mathematics 145. The respective language specifications are stipulated here: http://www.sun.ac.za/language.

The meaning of the **lecture load** *(5 l, 0 p, 2 t, 0 s per week)* is explained in Section 2.10.

The **method of assessment** is normally indicated after the content description of each module. If a method of assessment is not indicated with a module, then the default method applies, that is Examination with P=0,4K+0,6E. In some modules, however, Flexible Assessment is used, even though not indicated as such, since the Faculty is participating in trial applications of Flexible Assessment.

Please refer to the following section for details on how final marks are determined. The symbols in the **formula for final mark,** which are indicated with some modules, have the following meaning:

- P = final mark
- K = class mark
- E = examination mark

The **required modules** indicate the requirements that must be met by students before registering for a particular module. There are three types of requirement categories, as indicated below by the letters *PP, P* and *C:*

- PP: Prerequisite Pass module

  A module which a candidate needs to pass before being permitted to proceed with the module, or modules, for which this module is prescribed.

- P: Prerequisite Module

  A module for which a class mark of at least 40 needs to be obtained, if the examination system is used for the module, or a final mark of at least 40, if other assessment methods are used, before being are permitted to proceed with the module for which it is a prerequisite module.

- C: Corequisite Module

  A module that must be followed before or in the same semester as the module for which it is a prerequisite module. A pass in such a corequisite module is required before the relevant degree or diploma can be conferred.

For certain modules, departmental approval (for example admission to the final year) is also required before a student may register for a module.

4.2 Determining final marks

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

In the Faculty of Engineering the class mark, as determined by tests, assignments, designs and project reports, may also be the final mark in certain modules. This method of determining the final mark is known as project assessment.

There are also modules in which satisfactory attendance is the only requirement. No final mark is awarded. All assignments must be executed satisfactorily before a student is credited with the module.

In some modules there are outcomes that have to be achieved to pass the module, but that are not represented in the final mark formula. Subminima on certain assessments (or parts of assessments) are then used to assess the achievement of the outcomes. If a student has not achieved such an outcome (in other words, has not satisfied the corresponding subminimum), the student's final mark will not be allowed to exceed 45 for that module. If, during or after the completion of the semester's classes, a student can no longer pass the module due to such subminima, he/she will normally not be admitted to further assessment opportunities for the particular module. This can lead to limiting the student's class mark to 35 or less in examination modules.

4.3 Module contents

36315 ADVANCED DESIGN (CIVIL)

446 Design Project (15)
A & E (2.00 l, 6.00 p, 0.00 t, 0.00 s per week)
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 Statics (15)
A & E (4.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Dynamics (15)

A & E (4.00 l, 0.00 p, 2.00 t, 0.00 s per week)

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 Dynamics of Rigid Bodies (15)

A & E (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)

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 Vector Analysis (8)

A & E (2.00 l, 0.00 p, 1.50 t, 0.00 s per week)

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 Applied Mathematics for Civil Engineers (8)

A+i (2.00 l, 0.00 p, 1.00 t, 0.00 s per week)
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

Required modules:
P Applied Mathematics B 154

39020 BUILDING MATERIALS

254 Basic Building Materials Practice (15)

A+i (3.00 l, 2.00 p, 1.00 t, 0.00 s per week)
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 Principles and Processes of Chemical Engineering (15)

E+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 214

254 Mass and Energy Balances (15)

E+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Fluid Mechanics for Chemical Engineers (15)

E+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Physical properties of liquids and gases; fluid statics; fluid kinematics; fluid dynamics; continuity, momentum and energy equations; 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; 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 214
P Engineering Mathematics 214

271 Supplementary Studies (15)

A (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
The module content is arranged according to the requirements of individual students.

Home department: Process Engineering

316 Reaction Engineering I (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week), 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 and complex reactions; influence of temperature and pressure; non-ideal flow; biochemical reactors. 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 Thermodynamics (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week), 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, cooling. 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 214
PP Chemical Engineering 254
PP Chemical Engineering 264
Any two of the above three modules are required.
P Thermodynamics A 214
P Chemical Engineering 254
P Chemical Engineering 264
P Engineering Mathematics 214
P Engineering Mathematics 242

324 Bioprocess Engineering (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
Chemical composition of cells; cell structure of prokaryotic and eukaryotic cells; microbial counting techniques; cell growth and inhibition of growth; biochemical macromolecules and their functions; sources, transport and storage of cellular energy; basic cellular metabolism, transcription and translation; basic recombinant DNA technology. Process design equations for batch, continuous and fed-batch biological processes; endogenous respiration and energy of maintenance concepts; measurement and prediction of oxygen transfer rate in bioreactors; bioreactor scale-up; thermal death and degradation kinetics; batch and continuous sterilisation; downstream processing.
[Presented by the Department of Microbiology (40%) and the Department of Process Engineering (60%)]

Home department: Process Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Chemical Engineering 254
C Chemical Engineering 316

344 Modelling and Optimisation (15)

E+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
Steady and unsteady state mass, energy and momentum balances. Modelling and simulation of integrated process units. Process integration.

Home department: Process Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 214
P Engineering Mathematics 242
P Numerical Methods 262
P Chemical Engineering 254
C Chemical Engineering 316

354 Reaction Engineering II (15)

A+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)

Energy balances in reactor design; non-steady conditions; design of 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 Mass Transfer Operations (15)

E+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)

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 Supplementary Studies (15)

A & E (1.00 l, 0.00 p, 0.00 t, 0.00 s per week)

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

Home department: Process Engineering

412 Materials Engineering for Chemical Engineers (8)

E+i (2.00 l, 0.00 p, 2.00 t, 0.00 s per week)

Materials selection for chemical engineering; corrosion engineering.

Home department: Process Engineering
Method of Assessment: Flexible Assessment

Required modules:
PP All the prescribed modules of the first 2 years of the relevant BEng programme.

414 Process Design (15)

A+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)

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

426 Process Control (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week), 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

478 Final-year Project (30)

A & E (0.00 l, 6.00 p, 0.00 t, 0.00 s per week)
(0.00 l, 2.00 p, 0.00 t, 0.00 s per week in Semester 1), (0.00 l, 6.00 p, 0.00 t, 0.00 s per week 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

41696 CHEMICAL ENGINEERING D

244 Experimental Design (15)

E+i (3.00 l, 2.00 p, 1.00 t, 0.00 s per week)
8 Practicals per semester
Variability of measurements; tabulation, presentation and description of observations; discrete and continuous variables and their probability models; binomial, negative binomial; Poisson, exponential and normal distributions; reliability theory; simulation and application of probability models; sampling distributions and estimation of parameters; confidence intervals; the measurement of relationships; simple linear regression and correlation

analysis; estimation with the method of least squares; fundamentals of quality control. Statistical design of experiments. Statistical analysis of experimental data. Carrying out Chemical Engineering experiments on pilot scale; report writing and computer simulations.

Home department: Process Engineering
Method of Assessment: Project

Required modules:
C Chemical Engineering 224
C Chemical Engineering 264

356 Pilot Plant Laboratory III (15)

E+i (1.00 l, 6.00 p, 0.00 t, 0.00 s per week)
6 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 (2 *l*).
[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

11479 CHEMISTRY

176 Introduction to Chemistry (32)

A & E (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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; acid and bases; the periodic table. 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 Chemistry Laboratory Practicals (6)

E+i (0.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Development of laboratory skills by performing introductory chemistry experiments.

Home department: Chemistry and Polymer Science
Method of Assessment: Project

Required modules:
PP Engineering Chemistry 123

224 Industrial Chemistry I (15)

E+i (4.00 l, 2.00 p, 0.00 t, 0.00 s per week)
8 Practicals per semester
Bonding models; solid-state chemistry; chemistry in solution; introduction to coordination chemistry. Thermochemistry, chemical and phase equilibrium, ideal and electrolyte solutions, electrochemistry, colligative properties, elementary chemical kinetics.

Home department: Chemistry and Polymer Science
Method of Assessment: Flexible Assessment

Required modules:
PP Engineering Chemistry 123

254 Industrial Chemistry II (15)

E+i (4.00 l, 2.00 p, 0.00 t, 0.00 s per week)
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 C224

18481 CIVIL ENGINEERING

224 Measurement, Problem-solving and Communication skills (15)

E+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
Problem solving theory and practice; outcome prediction and assessment; risk evaluation and mitigation; complexity and uncertainty; utilisation of data; acquisition and analysis of spatial data; projections, coordinates and mapping; land surveying and 3D measurement; effective written and oral communication; development of sound argument; synthesis and interpretation; paraphrasing, quoting and referencing.

Home department: Civil Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Engineering Mathematics 115

13362 COMPLEMENTARY STUDIES (ENG)

311 Community Interaction and Leadership Development (4)

A+i (0.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Participation in specific community projects or leadership development related to community projects.

Home department: Engineering (Admin)
Method of Assessment: Project

441 Community Interaction and Leadership Development (4)

A+i (0.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Participation in specific community projects or leadership development related to community projects.

Home department: Engineering (Admin)
Method of Assessment: Project

30317 COMPUTER PROGRAMMING

143 Computer Programming (12)

A & E (3.00 l, 2.00 p, 0.00 t, 0.00 s per week)
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

315 Machine Learning (16)

T (2.00 l, 4.00 p, 0.00 t, 0.00 s per week)
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: Continuous Assessment

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

334 Databases and Web Centric Programming (16)

E+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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: Continuous 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 Object-Oriented Programming (15)

E+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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: Continuous Assessment

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

50040 COMPUTER SKILLS

176 Computer Skills (8)

A & E (2.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Introduction to Computer Systems (15)

A+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
Boolean algebra; combinational and sequential circuit analysis and design; state machines; hardware description languages; programmable logic.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Computer Programming 143

245 Microprocessors (15)

A+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
Assembler language programming; basic microprocessor architecture; bus, memory and input-output systems.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Computer Systems 214

414 Computer Systems (15)

A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)
Hardware/software co-design; embedded systems; computer networks.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Computer Systems 245

23965 CONTROL SYSTEMS

314 Control Systems (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Engineering Mathematics 214

344 Control Systems (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Control Systems 314

354 Design of Control Systems for Mechanical and Mechatronic Systems (18)

E+i (4.00 l, 1.00 p, 2.00 t, 0.00 s per week)
Design of control systems: PID controllers; root locus design; 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; discrete root locus; practical considerations: A/D and D/A converters and filters.

Home department: Mechanical and Mechatronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Modelling 334

414 Control Systems (15)

A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)
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 servotrackers. Optimal LR and Kalman observer analysis and synthesis.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Control Systems 344

46833 DESIGN (E)

314 Digital Design (15)

A+i (1.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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:
P Computer Systems 245

344 Electronic Design (15)

A+i (1.00 l, 3.00 p, 0.00 t, 0.00 s per week)

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:
P Electronics 315
P Computer Science E 214

47929 DESIGN PROJECT

488 Design (30)

A & E (1.00 l, 3.00 p, 0.00 t, 0.00 s per week)

Choice of the best process from several available processes for a specific plant design, and factors and criteria involved. The design of a process plant (or sub-process) with consideration of process thermodynamics, kinetics and transport phenomena. The focus is on basic process design, safety, control, plant layout, process flow sheets and plant material and energy balances, piping and instrumentation diagrams, cost estimation, environmental impact, and profitability.

Home department: Process Engineering
Method of Assessment: Project

Required modules:
Final-year Enrolment

11949 ELECTRICAL DRIVE SYSTEMS

324 Principles of Electrical Machines and Power Electronics (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)

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 motors and stepper motors.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Electrotechnique 214

51357 ELECTROMAGNETICS

314 Electromagnetics (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Applied Mathematics B 224
P Applied Mathematics B 242

344 Electromagnetics (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
Maxwell's equations; electromagnetic waves; transmission lines; antennas.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Electromagnetics 314

39802 ELECTRONIC ENGINEERING

152 Introduction to Electronic Design (6)

A+i (0.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Basic structured electronic design and synthesis.

Home department: Electrical and Electronic Engineering
Method of Assessment: Project

12491 ELECTRONICS

245 Electronics (15)

A & E (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Systems and Signals 214 or P Electrotechnique 214

315 Electronics (15)
A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Electronics 245

344 Introduction to Electronics (15)
A+i (3.00 l, 1,50 p, 1.50 t, 0.0 s per week)
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 Electronics (15)
A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Electronics 315

414 Electronics (15)
A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)
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, full-bridge and three-phase 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:
P Electronics 365
P Control Systems 314

12599 ELECTROTECHNIQUE

143 Introduction to Circuit Theory and Electrical Machines (15)
A & E (3.50 l, 1.50 p, 1.50 t, 0.00 s per week)
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 Electro-Techniques (15)

A & E (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
Sinusoidal sources; phasors; instantaneous, average and RMS power; real and reactive power; passive circuit elements in the frequency domain; balanced three-phase circuits; first- and second-order transfer functions; Bode plots; cascade circuits; resonance; ideal filters; ideal operational amplifiers.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Electrotechnique 143

43915 ENERGY SYSTEMS

244 Electrical Energy Systems (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
Introduction to power systems; single and three-phase alternating current theory; power transformers; per-unit system; symmetrical components; modelling of transmission lines; steady-state operation of transmission lines.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Systems and Signals 214

344 Energy Conversion (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)
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:
P Energy Systems 244

414 Renewable Energy Systems (15)

E+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)

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:
P Energy Systems 344
C Electronics 414

424 Electrical Energy Systems (15)

A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)

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.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Energy Systems 244
P Energy Systems 344

51365 ENERGY SYSTEMS M

434 Mechanical Energy Systems (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)

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 Thermofluid Dynamics 344

49484 ENGINEERING CHEMISTRY

123 Chemistry for Engineering Students (15)

A & E (4.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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; thermodynamics and thermochemistry; introduction to basic engineering applications.

Home department: Process Engineering
Method of Assessment: Flexible Assessment

Required modules:
C Engineering Mathematics 115

46825 ENGINEERING DRAWINGS

123 Orthographic Drawings (15)

A & E (1.00 l, 3.00 p, 3.00 t, 0.00 s per week)
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 Engineering Economics (8)

A+i (2.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Engineering Economics (15)

A+i (2.00 l, 0.00 p, 3.00 t, 1.00 s per week)
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 Geology for Civil Engineers (15)

A+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
This module does not grant admission to Geology 224, 244 and 254.
Introduction to the Earth system: internal structure, plate tectonics; Crystallography introductory; Mineralogy: physical properties of common minerals; Petrology: magma, igneous, sedimentary and metamorphic rocks; Structural geology: strike and dip of layers, folds and faults, tectonic forms, foliation, lineation, geological mapping.
Presented by: Earth Sciences (50%) and Civil Engineering (50%)

Home department: Earth Sciences
Method of Assessment: Flexible Assessment

Required modules:
P Engineering Chemistry 123

59560 ENGINEERING INFORMATICS

244 Object-Oriented Programming and Modelling (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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 Object Modelling of Physical Problems (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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 Engineering Economics and Professional Practice (15)

A+i (4.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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. Labour relations and project safety. Development projects. Infrastructure asset management. Building information models.

Home department: Civil Engineering
Method of Assessment: Flexible Assessment

38571 ENGINEERING MATHEMATICS

115 Introductory Differential and Integral Calculus (15)

A & E (5.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Further Differential and Integral Calculus (15)

A & E (5.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Differential Equations and Linear Algebra (15)

A & E (4.00 l, 0.00 p, 2.00 t, 0.00 s per week)
Ordinary differential equations of first order; linear differential equations of higher orders; Laplace transforms and applications. Matrices: linear independence, rank, eigenvalues. Laplace transforms and applications.

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 Series and Partial Differential Equations (8)

A & E (2.00 l, 0.00 p, 1.00 t, 0.00 s per week)
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 Physics for Engineering Students (8)

A & E (2.00 l, 0.50 p, 0.50 t, 0.00 s per week)
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 Physics for Engineering Students (6)

A+i (0.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Introduction to basic relativity and basic quantum mechanics; further 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

314 Engineering Statistics (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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 Enterprise Design (15)

A+i (2.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Entrepreneurship (Eng) (15)

A+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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

442 Engineering and the Environment (8)

E+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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

454 Environmental Engineering (15)

E+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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 (7 weeks).
Water chemistry, aspects and abatement of air pollution, solid-waste management, immobilisation of solid waste, engineering techniques for effluent and water treatment such as ultrafiltration and reverse osmosis, adsorption and ion exchange, precipitation and crystallisation, ultra violet radiation, biological techniques. Disposal of hazardous waste. (6 weeks)
[Presented by the Department of Civil Engineering (50%) and the Department of Process Engineering (50%)]

Home department: Process Engineering
Method of Assessment: Flexible Assessment

Required modules:
All the prescribed modules for the first 2 years of the relevant BEng programme

41726 FINITE ELEMENT METHODS

414 Finite Element Methods (Elective Module) (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 First Course in Fluid Mechanics (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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

21180 FOOD FACTORY MACHINERY

414 Engineering Fundamentals of Food Processing (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
Engineering approach to problem-solving; thermodynamic properties of water and an ideal gas; conservation of mass, momentum and energy, and entropy; thermodynamic processes in closed and open systems; generation, usage and reticulation of steam; pump and pipe systems; fans and ducts; 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

444 Food Process Engineering (15)

E (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
Behaviour 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
Formula for Final mark: P=0,5K+0,5E
Method of Assessment: Examination

Required modules:
P Food Factory Machinery 414

39667 GEOTECHNIQUE

254 Geotechnical Theories (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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

324 Geotechnical Theories (15)

A+i (3.00 l, 1.00 p, 1.50 t, 0.00 s per week)
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 Sliding Resistance, Retaining Walls, Foundations and Slopes (15)

A+i (3.00 l, 1.50 p, 1.00 t, 0.00 s per week)
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 324

33928 HEAT TRANSFER A

326 Heat Transfer (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week), 1 Practical per semester
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: Process Engineering
Method of Assessment: Flexible Assessment

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

414 Heat Transfer (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 High-Frequency Technique (15)

A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)
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:
P Electromagnetics 344

21350 HYDRAULIC ENGINEERING

424 Storm Water Drainage and Hydraulic Structures (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

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 Flow Theory and Pipe Flow (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)

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 Open Channel Flow and Water Treatment (15)

E+i (3.00 l, 0.50 p, 2.00 t, 0.00 s per week)

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 Flood and Resource Hydrology (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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. 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.

Home department: Civil Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Hydraulics 354
P Engineering Statistics 314

31496 INDUSTRIAL ENGINEERING

152 Introduction to Industrial Engineering (6)

A+i (0.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Industrial Ergonomics (15)

A+i (3.00 l, 0.00 p, 1.50 t, 0.00 s per week)
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 Industrial Management (15)

A+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Management and Organisational Behaviour (8)

E+i (2.00 l, 0.00 p, 1.00 t, 1.00 s per week)
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 Industrial Programming (15)

A+i (2.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Industrial Project (30)

A & E (0.00 l, 0.00 p, 0.00 t, 1.00 s per week)
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 Information Systems (15)

A+i (2.00 l, 1.20 p, 2.00 t, 0.00 s per week)
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 Industrial Experience in Chemical Engineering (0)

A&E (0.00 l, 0.00 p, 0.00 t, 0.00 s per week)
Students experience, or observe first hand, typical chemical engineering work in the chemical, mineral processing or another appropriate industry. The work must be performed under the direct supervision of a chemical engineer. Students are required to, within the field of chemical engineering: 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 host 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, which must include at least 1200 hours of work on a plant or involvement with industrial design activities. 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: Process Engineering
Method of Assessment: Attendance

Required modules:
Final-year enrolment

39705 INTRODUCTORY MACHINE DESIGN

244 Design Process, Machine Parts and Machine Drawing (15)

A & E (1.00 l, 3.00 p, 2.00 t, 0.00 s per week)
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

16020 MACHINE DESIGN A

314 Fatigue, Fracture Mechanics and Machine Components (15)

E+i (2.00 l, 2.00 p, 2.00 t, 0.00 s per week)
3D-statics. Design for static loads, fatigue and fracture mechanics. Design of sliding bearings. Design projects where the theory is applied up to and including complete working drawings. Design for assembly, machining, casting, welding and plastic forming. Introduction to reverse engineering and rapid prototyping.

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 Design of Machine Subsystems (15)

A+i (2.00 l, 2.00 p, 2.00 t, 0.00 s per week)
Design of lead screws, bolt connections, fasteners, springs, clutches, breaks. 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 Maintenance Management (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 Manufacturing Processes (15)

E+i (2.00 l, 1.50 p, 1.00 t, 0.00 s per week)
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; rapid prototyping. 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

414 Manufacturing Systems (15)

A+i (2.00 l, 0.00 p, 2.00 t, 0.00 s per week)
Introduction to manufacturing systems, computer-aided design (CAD) systems and geometric modelling, reverse engineering; concurrent engineering; rapid prototyping and manufacturing; computer-aided process planning (CAPP); CNC technology; network automation of manufacturing systems; part inspection on automated coordinate measuring

machines (CMM); 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 Materials Science A (15)

A & E (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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

21539 MATHEMATICS

186 Introductory Mathematics (32)

A & E (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Principles of Systems Engineering (15)

E+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)

Principles of systems engineering; introduction to design optimisation; legal aspects of engineering practice and safety. 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 An introduction to mechanical engineering (6)

A+i 0.00 l, 0.00 p, 3.00 t, 0.00 s per week

Mechanical machines and components, measuring instruments and free hand drawings, modelling of machines and components, basic experimental investigation, measurement of physical quantities, processing of measured data, lay-out and assembly of a mechatronic system.

Home department: Mechanical and Mechatronic Engineering
Method of Assessment: Project Assessment

Required modules:
P Engineering Drawings 124

414 Specialist Topics in Mechanical Engineering (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)

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 Capstone Project for Mechanical Engineering Students (45)

A & E (2.00 l, 3.00 p, 0.00 t, 0.00 s per week)

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 An introduction to mechatronic engineering (6)

Mechanical machines and components, measuring instruments and freehand drawings, modelling of machines and components, basic experimental investigation, measurement of physical quantities, processing of measured data, lay-out and assembly of a mechatronic system.

Home department: Mechanical and Mechatronic Engineering
Method of Assessment: Project

Required modules:
P Engineering Drawings 124

56790 MECHATRONIC PROJECT

478 Capstone Project for Mechatronic Engineering Students (45)

A & E (2.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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 Capstone Project for Mechatronic Engineering Students (45)

A & E (2.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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 Mechatronic Design (18)

A+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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. 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
P Modelling 334

47988 MINERAL PROCESSING

345 Mineral Processing (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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; leaching, 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 Chemical Engineering D 244
P Particle Technology 316

415 Extraction Processes (15)

E+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
High temperature process of natural raw materials and secondary materials: applied phase and reaction equilibrium thermodynamics relevant to solid state solutions, molten alloys, slag melts and matt melts. Process modelling and design of high temperature reactors for gasification, roasting, calcining, sintering, reactive smelting, converting and refining, with consideration of kinetic as well as thermodynamic factors. Energy, metallurgical fuels and reductants. Measurement and control techniques for high temperature reactors. Refractory materials.
Electrochemical processing: basic thermodynamics, kinetic and mass transfer principles of electrochemical reactors; electrode surface phenomena; design aspects; applications at both high and low temperatures.

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

478 Final-Year Project (30)

A & E (0.00 l, 6.00 p, 0.00 t, 0.00 s per week)
(0.00 l, 2.00 p, 0.00 t, 0.00 s, 3 hours per week, 4 credits in Semester 1);(0.00 l, 6.00 p, 0.00 t, 0.00 s, 20 hours per week, 26 credits 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

56804 MODELLING

334 Modelling and Simulation of Mechanical Systems (18)

A+i (4.00 l, 0.00 p, 3.00 t, 0.00 s per week)
Modelling of mechanical systems: kinematics of planar mechanisms, velocity and acceleration diagrams, balancing; formulation of differential equations, solutions using Laplace transforms, block diagrams and transfer functions; state space formulation, eigen values 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.

Home department: Mechanical and Mechatronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Applied Mathematics B 224
P Engineering Mathematics 214
P Engineering Mathematics 242

53678 NUMERICAL FLUID DYNAMICS

414 Numerical Fluid Dynamics (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 Numerical Methods (8)

A & E (2.00 l, 0.00 p, 1.00 t, 0.00 s per week)
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 Operations Research (Deterministic Models) (15)

A+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Operations Research (Stochastic Models) (15)

A+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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.

Home department: Industrial Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Engineering Statistics 314

47902 PARTICLE TECHNOLOGY

316 Particle Technology (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week), 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

P Chemical Engineering D 244

65609 PHILOSOPHY AND ETHICS

314 Philosophy and Ethics (8)

A+i (3.00 l, 0.00 p, 1.00 t, 0.00 s per week)

Culture and technology, applied ethics, social philosophy; 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.

Home department: Philosophy

Method of Assessment: Flexible Assessment

414 Philosophy and Ethics (8)

A+i (3.00 l, 0.00 p, 1.00 t, 0.00 s per week)

Culture and technology, applied ethics, social philosophy; 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.

Home department: Philosophy

Method of Assessment: Flexible Assessment

12998 PHYSICS

176 Preparatory Physics (32)

A & E (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
For BSc (Extended Degree Programme) students in AgriSciences and Sciences and in 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 Practical Workshop Training (0)

A & E (1.00 l, 0.00 p, 0.00 t, 0.00 s per week)
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 Practical Workshop Training (0)

A & E (1.00 l, 0.00 p, 0.00 t, 0.00 s per week)
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 PREPATORY TECHNICAL DRAWINGS

146 Preparatory Technical Drawings (16)

T (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
Principles of first- and third-angle projection. Linework and lettering. Isometric projections and drawings. Drawing layouts. Full section views. Geometric constructions, tangency and loci applications. True lengths and auxiliary views. Conic sections and interpenetrations of solids (excluding interpenetrations that require the use of generator lines). Developments. Introduction to parametric geometric modelling in computer-aided design (CAD).

Home department: Mechanical and Mechatronic Engineering
Method of Assessment: Flexible Assessment

23256 PRODUCTION MANAGEMENT

212 Production and Operational Management (8)

E+i (2.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Operations Facilities and Management (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 Financial and Production Management (12)

E+i (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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 Professional Communication (8)

A & E (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)
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; introduction to oral presentation skills; written communication in teams. Introduction to the engineering profession.

Home department: Engineering (Admin)
Method of Assessment: Project

30279 PROJECT (CIVIL)

418 Project (Civil) (30)

A & E (1.00 l, 20.00 p, 0.00 t, 0.00 s per week)
Each student must complete an approved design or research project during the final year, afterwhich 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 Project (Civil) (30)

A & E (1.00 l, 20.00 p, 0.00 t, 0.00 s per week)
Each student must complete an approved design or research project during their final year, afterwhich 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 Project (E) (45)

A & E (0.00 l, 20.00 p, 0.00 t, 0.00 s per week)
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 skill of each student is assessed.

Home department: Electrical and Electronic Engineering
Method of Assessment: Project

Required modules:
Final-year Enrolment

51993 PROJECT MANAGEMENT

412 Project Management (12)

A+i (3.00 l, 0.00 p, 1.00 t, 0.00 s per week)
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 Quality Assurance (15)

A+i (2.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Quality Management (15)

E+i (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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 Scientific Communication Skills (12)

A & E (3.00 l, 0.00 p, 3.00 t, 0.00 s per week)
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: Continuous Assessment

146 Scientific Communication Skills (6)

A & E (3.00 l, 0.00 p, 0.00 t, 0.00 s per week)

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: Continuous Assessment

53945 SIMULATION

442 Simulation (8)

A+i (2.00 l, 0.50 p, 1.00 t, 0.00 s per week)

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 Introduction: Mechanics of Deformable Bodies (12)

A & E (3.00 l, 0.00 p, 2.00 t, 0.00 s per week)

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 Stress Analysis (15)

A & E (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

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 Structural Analysis (15)

E+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
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 Displacements, Failure Criteria, Stress and Strain Transformations (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 Fracture Analysis, FEM and Composite Materials (15)

A+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
Fracture analysis; non-destructive testing (NDT); plate theory; introduction to variational methods for finite element structural analysis; introduction to manufacturing and strength of composite materials, with emphasis on fibre plastic structures.

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 Concrete Construction (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

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
C Theory of Structures 354

424 Steel Construction (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

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
C Theory of Structures 354

46779 SYSTEMS AND SIGNALS

214 Introduction to Systems and Signals (15)

E+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)

Sinusoidal steady state analysis; phasors; sinusoidal power and energy concepts; transient and phasor analysis of second order RLC circuits; instantaneous, average and RMS power; ideal operational amplifiers; two-port parameters.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Electrotechnique 143

244 Frequency Domain Techniques (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)

The Laplace transforms and their application to dynamic circuits; impulse and step response; convolution; transfer functions; Bode plots; basic passive filters; basic active filters; Fourier series; Fourier transforms and their applications to circuits; two-port networks; filters.

Home department: Electrical and Electronic Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Systems and Signals 214
P Engineering Mathematics 214

315 Signal Theory (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)

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:
P Systems and Signals 244

344 Stochastic Signals (15)

A+i (3.00 l, 1.50 p, 1.50 t, 0.00 s per week)

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:
P Systems and Signals 315

414 Digital Signal Processing (15)

E+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)

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:
P Systems and Signals 344

20419 TELECOMMUNICATION

414 Introduction to Telecommunications (15)

A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)

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:
P Systems and Signals 344

19984 THEORY OF STRUCTURES

354 Finite Element Methods (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

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 Applied Thermodynamics A (15)

A & E (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)

Specific heat, Cp and Cv; 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.
[Presented by the Department of Mechanical and Mechatronic Engineering (50%) and by the Department of Process Engineering (50%)]

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

59544 THERMOFLUID DYNAMICS

214 Introductory Thermofluid Dynamics (15)

A+i (3.00 l, 3.00 p, 0.00 t, 0.00 s per week)
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 Thermodynamics and Fluid Dynamics (15)

E+i (3.00 l, 1.00 p, 2.00 t, 0.00 s per week)
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 Transportation Engineering (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

Traffic flow theory: travel patterns, traffic flow variables and their relationships (speed, volume, travel time, delay). Traffic engineering: speed studies, parking, capacity and level of service, intersection control. Transport safety; human factors; causes and severity of crashes, non-motorised traffic, public transport and safety, road safety audits. Transportation planning: stakeholders, travel demand forecasting, traffic impact assessments. Intelligent Transport System (ITSs) applications.

Home department: Civil Engineering
Method of Assessment: Flexible Assessment

Required modules:
C Engineering Statistics 314

354 Transportation Engineering (15)

A+i (3.00 l, 1.00 p, 1.50 t, 0.00 s per week)

To 2016:
Traffic flow models; road capacity and level of service; statistical applications; traffic control; transportation planning; modelling: trip generation, trip distribution, modal choice and trip assignment; traffic impact studies; parking; traffic safety; public transport planning; intelligent transport systems.
From 2017: Pavement Design
Overview of pavements; elastic layer theory, stresses and strain development, behaviour of granular, asphaltic and cementitious materials, behaviour; alternative pavement design methods, 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:
C Engineering Statistics 314 to 2016
P Transport Science 324 from 2017

434 Road Design (15)

A+i (3.00 l, 1.00 p, 1.50 t, 0.00 s per week)
From 2018: (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)

To 2017:
Transportation modes; movement equations; human factors; geometric design; overview of pavements; elastic layer theory; properties and behaviour of granular, asphaltic and cementitious materials, behaviour and transfer functions; alternative design methods, including CBR design, mechanistic design and low-volume road design; flexible and rigid pavements; influence of climate; construction; rehabilitation and maintenance.
From 2018: Infrastructure and Design
Urban transport networks: network development and classification, traffic calming and universal accessibility, travel demand management. Road geometric design: human factors and vehicle movements, movement equations, alignment design, route determination, parking design, intersection design, international standards. Public transport (PT): modes

and intermodal transport; planning for public transport; elements of efficient PT system, PT scheduling. Transport safety: safety standards, forgiving road, systems approach. ITS Infrastructure. Non-motorised transport.

Home department: Civil Engineering
Method of Assessment: Flexible Assessment

Required modules:
P Transport Science 324 from 2018

64007 UNIVERSITY PRACTICE IN THE NATURAL SCIENCES

176 University Practice in the Natural Sciences (8)

A & E (3.00 l, 0.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Civil) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Mechanical and Mechatronic) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Civil) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Industrial) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Chemical) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Mechanical and Mechatronic) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vacation Training (Industrial) (0)

A & E (0.00 l, 1.00 p, 0.00 t, 0.00 s per week)
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 Vibration and Noise of Mechanical Systems (12)

A+i (3.00 l, 1.00 p, 1.00 t, 0.00 s per week)
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 Fundamentals of wastewater treatment (15)

A+i (3.00 l, 0.00 p, 2.50 t, 0.00 s per week)
Objectives of wastewater treatment; wastewater test methods for organic, nitrogen and phosphorus content; physical characterisation of wastewater, settleable, non-settleable and dissolved constituents; primary sedimentation; unit operations in wastewater treatment,

biodegradable and unbiodegradable organics, biological growth and death behaviour; reactor kinetics; biological process kinetic equations; the steady state activated sludge model; oxygen demand, sludge production, system volume and nutrient requirements; sewage sludge.

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

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

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	Civil
2004	JH Knoetze	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

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	JR 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	M 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

A.7 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

Index of undergraduate modules

Please refer to Section 4.1 for an explanation of module names.