UNIVERSITY OF CAPE TOWN

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT (UNDERGRADUATE)

2019

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The Registrar's and General Enquiries offices are located in the Bremner Building and remain open during the lunch hour. The Admissions Office and Student Records Office are located in the Masingene Building, Middle Campus, and are open from 08h30 to 16h30. The Cashier's Office is located in Kramer Building, Middle Campus, and is open from 09h00 to 15h30.

This handbook is part of a series that consists of

Book 1:	Undergraduate Prospectus
Book 2:	Authorities and information of record
Book 3:	General Rules and Policies
Book 4:	Academic Calendar and Meetings
Book 5:	Student Support and Services
Book 6-11:	Handbooks of the Faculties of Commerce, Engineering & the Built Environment, Health Sciences, Humanities, Law, Science
Book 12:	Student Fees
Book 13:	Bursary and Loan Opportunities for Undergraduate Study
Book 14:	Financial assistance for Postgraduate Study and Postdoctoral Research

CONTENTS

Guide to the usage of this Handbook

The following is a general overview of the structure of this handbook for the guidance of users. The contents are organised in a number of different sections, each of which has a particular focus. The sections are interlinked by cross-references where relevant.

(a) *General Information:* This section includes information on officers in the faculty, student councils, minimum requirements for admission, degrees and diplomas awarded by the faculty, lecture times, course codes and terminology and the credit system. Detailed information on the undergraduate entrance requirements can be found in the University Prospectus.

(b) *Rules for degrees:* This section covers the Faculty rules for each of the degree programmes. These rules should be read in conjunction with the general University rules in the General Rules and Policies Handbook (Handbook 3), which also contains the rules for the PhD degree. Students are expected to acquaint themselves with the rules in both handbooks and to check annually whether the rules or curriculum requirements have changed since the last edition, taking particular note of the following:

      i.   rules relating to registration and examinations;
      ii. rules relating to changes of curriculum;
      iii. rules relating to leave of absence;
      iv. rules on Academic Conduct, especially the rules concerning dishonest conduct and plagiarism.

(c) *Programmes of Study:* This section gives a brief introduction to each programme and lists the curricula (required courses) in table form. The curriculum tables must be read together with the course outlines in the Departments in the Faculty and Courses Offered section.

(d) *Departments in the Faculty and Courses Offered:* This section contains entries for each department in the Faculty, and lists members of staff and programmes of study, as well as course outlines of each course offered by the departments.

(e) *Departments in other Faculties and Courses Offered:* This section contains entries for departments located in other faculties, with course outlines for courses commonly taken by students in the Faculty of Engineering & the Built Environment.

(f) *Centres and other entities established in the Faculty:* There are entries for the principal faculty entities, centres and units which do not fall directly under academic departments, such as the Centre for Research in Engineering Education, and Continuing Professional Development.

(g) *Scholarships, Prizes, Class Medals and the Dean's Merit List:* This section lists the various prizes, medals and scholarships awarded on academic merit and contains information on the criteria for the Dean's Merit List.

(h) *Professional Status and Recognition of Degrees:* This section includes information on the professional status and recognition of the Faculty's degrees and its links with professional bodies.

GENERAL INFORMATION

Officers in the Faculty
Academic

Dean of the Faculty
Professor AE Lewis, PrEng BSc(Eng)Chem MSc(Eng) PhD *Cape Town* FSAIChE FSAIMM MASSAf FSAAE FIChemE

Personal Assistant to the Dean
M Scheepers

Deputy Deans
Associate Professor S Chowdhury, PrEng BEE(Hons) PhD (Eng) *Kolkata* MIET SMIEEE MIE SMSAIEE
Professor JCQ Fletcher, BSc(Eng) Chem PhD *Cape Town* MACS FSAAE
Professor MA Khan, MSc(Eng) PhD *Cape Town* SMIEEE
Professor M Vanderschuren, BSc(Eng) *Tilburg* MScEng *Delft* PhD *Enschede* MSAICE MSASITS

Heads of Departments
Architecture, Planning and Geomatics
TBC

Chemical Engineering
Professor A Mainza, BSc(Eng)Chem *UNZA* PhD *Cape Town*

Civil Engineering
Professor P Moyo, Pr Eng BSc(Eng) *Zimbabwe* MSc(Eng) *Newcastle-upon-Tyne* PhD *Nanyang* FSAAE MISAICE MIABSE MISHMII

Construction Economics and Management
Associate Professor KA Michell, BSc(QS) MPhil *Cape Town* PhD *Salford* PrQS PMAQS MRICS MSAFMA

Electrical Engineering
Professor ES Boje, PrEng BSc(Eng) *Wits* MSc(Eng) PhD *Natal* SMSAIMC MIEEE

Mechanical Engineering
Professor GS Langdon, BEng PhD *Liverpool* MIMechE Ceng

Academic Administration

Faculty Manager (Academic Administration)
G Valodia, BA Hons HDE *Cape Town*

Undergraduate Manager (Academic Administration)
TBC

Postgraduate Manager (Academic Administration)
TBC

Administrative Assistants
D Botha, BPrimEd *Wits*
R Carlse, BSocSc LLB *Cape Town*
B Cleenwerck, BSocSc LLB *Cape Town*
N Hartley, NDip Bus Mgmt *College of Cape Town*
C Hewitson, BSocSc PGDip LIS *Cape Town*
L Williams, BA *Cape Town*

Senior Secretary - Receptionist
TBC

Clinical Psychologist
N Ahmed, MA (Clinical Psychology) MA (Research Psychology) *Cape Town*

Communications, Marketing and Development

Manager
M Hilton

Finance

Faculty Finance Manager
B Daubenton, HND Civil Engineering Structures *Cape Technikon*

Assistant Faculty Finance Manager
S Kriel, BCom *Cape Town*

Senior Finance Officer
M Sigonyela, BSocSc *Cape Town*

Finance Officer
A Burmeister, BA LLB *UNISA*

Human Resources

Human Resources Officer
Y Banda, BA Personnel Management *Johannesburg*

IT and Facilities

Manager
S Niekerk, NDip Information Technology *Cape Technikon*

Student Councils
The Engineering & the Built Environment Student Council in the Faculty represents the interests of the student body. The EBESC and its counterparts in other faculties are concerned with promoting the academic and social interests of the students they represent. A Faculty Postgraduate Student Council represents the specific interests of postgraduate students.

Postgraduate Centre

The Postgraduate Centre is situated in the Otto Beit Building, Upper Campus. This state-of-the-art facility houses the executive committee of the Postgraduate Students Association (PGSA) as well as the Postgraduate Funding Office. The centre is equipped with IT facilities and includes a seminar room. This facility is open to all Master's and Doctoral students as well as postdoctoral research fellows. Postgraduates are encouraged to make full use of this centre, in particular, the Funding Office, which administers all postgraduate bursaries and scholarships. The Postgraduate Centre may be contacted at gradcentre@uct.ac.za. or visited at www.pgfo.uct.ac.za.

Distinguished Teachers

The University has instituted a Distinguished Teacher's Award in recognition of the importance of excellence in teaching at all levels in the University. The following current members of the Faculty staff have received this award.

Mr F Carter	(School of Architecture, Planning and Geomatics)	2007
Professor JM Case	(Chemical Engineering)	2007

Fellows in the Faculty

The Council of the University has established Fellowships for members of the permanent academic staff in recognition of original distinguished academic work of such quality as to merit special recognition. The following is a list of Fellows who are currently on the Faculty's staff:

Emeritus Professor MG Alexander	(Civil Engineering)
Emeritus Professor D Dewar	(Architecture, Planning and Geomatics)
Professor GA Ekama	(Civil Engineering)
Professor STL Harrison	(Chemical Engineering)
Professor AE Lewis	(Chemical Engineering)
Professor A Mainza	(Chemical Engineering)
Professor G Nurick	(Mechanical Engineering)
Emeritus Professor CT O'Connor	(Chemical Engineering)
Professor E Pieterse	(African Centre for Cities)
Emeritus Professor H Rüther	(Architecture, Planning and Geomatics)
Professor E van Steen	(Chemical Engineering)
Professor V Watson	(Architecture, Planning and Geomatics)
Professor A Zingoni	(Civil Engineering)

Minimum Requirements for Admission

Refer to rule FB 1, in the section on Degree Rules, for the minimum formal entrance requirements for the bachelor's degrees offered in the Faculty of Engineering & the Built Environment.

The minimum requirements for admission for Postgraduate Diploma, Honours and Master's degree programmes in the Faculty of Engineering & the Built Environment are set out in the rules for the appropriate postgraduate diplomas/degrees. The PhD requirements are set out in Handbook 3 of this series.

Degrees and Diplomas Offered in the Faculty

Degrees	SAQA ID
Bachelor of Architectural Studies	3933
Bachelor of Science in Construction Studies	11703
Bachelor of Science in Engineering in Chemical Engineering	13983

Bachelor of Science in Engineering in Civil Engineering	13974
Bachelor of Science in Engineering in Electrical Engineering	13979
Bachelor of Science in Engineering in Electrical & Computer Engineering	66518
Bachelor of Science in Engineering in Mechanical & Mechatronic Engineering	13982
Bachelor of Science in Engineering in Mechanical Engineering	13977
Bachelor of Science in Engineering in Mechatronics	13980
Bachelor of Science in Geomatics	TBC
Bachelor of Science in Property Studies	11693
Bachelor of Architectural Studies Honours	66569
Bachelor of City Planning Honours	94845
Bachelor of Landscape Architecture Honours	TBC
Bachelor of Science Honours in Geographical Information Systems	TBC
Bachelor of Science Honours in Construction Management	11703
Bachelor of Science Honours in Materials Science	21339
Bachelor of Science Honours in Property Studies	11699
Bachelor of Science Honours in Quantity Surveying	14435
Bachelor of Science Honours specialising in Nuclear Power	TBC
Postgraduate Diploma in Power Plant Engineering	TBC
Master of Architecture	3977
Master of Architecture Professional	TBC
Master of City and Regional Planning	94631
Master of Engineering	67426
Master of Geotechnical Engineering	97913
Master of Landscape Architecture	TBC
Master of Philosophy	TBC
Master of Science in Engineering	10681
Master of Science in Project Management	13854
Master of Science in Property Studies	11697
Master of Transport Studies	97727
Master of Urban Design	98987
Doctor of Architecture	19272
Doctor of Philosophy	TBC
Doctor of Science in Engineering	10687

NOTE: By virtue of inclusion on the Institution's DHET approved Programme and Qualification Mix (PQM), all qualifications included in this Handbook are accredited by the Council on Higher Education's permanent sub-committee - the Higher Education Quality Committee. Where a SAQA ID has not been provided, the qualification is awaiting the SAQA ID. The higher education sector has undergone an extensive alignment to the Higher Education Qualification sub Framework and thus all institutions are awaiting the finalisation of the process and completion of the awarding of SAQA ID's. Please consult Handbook 2 or the HEQsF Programme and Qualification Mix (PQM) on the Institutional Planning Department's website, as approved by the Department of Higher Education and Training, for a list of all UCT's accredited qualifications.

Term Dates for 2019

1st Semester

1st Quarter	11 February to 12 April
Mid-term break	13 April to 22 April
2nd Quarter	23 April to 9 June

Mid-year Vacation	10 June to 14 July

2nd Semester

3rd Quarter	15 July to 23 August
Mid-term Break	24 August to 1 September
4th Quarter	2 September to 24 December

Lecture periods

1	08:00 to 08:45	The **meridian**	13:00 to 14:00
2	09:00 to 09:45	**6**	14:00 to 14:45
3	10:00 to 10:45	**7**	15:00 to 15:45
4	11:00 to 11:45	**8**	16:00 to 16:45
5	12:00 to 12:45	**9**	17:00 to 17:45

Lecture timetable

The lecture timetables are published separately by the department concerned from where they are obtainable at Registration.

Key to Course Abbreviations, Codes and Terminology Guide to the Credit System

Course Codes

ACC	Accounting
APG	Architecture, Planning and Geomatics
AST	Astronomy
AXL	African & Gender Studies, Anthropology & Linguistics
BIO	Biological Sciences
BUS	Management Studies
CEM	Chemistry
CHE	Chemical Engineering
CIV	Civil Engineering
CML	Commercial Law
CON	Construction Economics and Management
CSC	Computer Science
ECO	Economics
EEE	Electrical Engineering
EGS	Environmental & Geographical Sciences
END	Faculty of Engineering & the Built Environment
GEO	Geological Sciences
HST	Historical Studies
HUB	Human Biology
INF	Information Systems
MAM	Mathematics & Applied Mathematics
MEC	Mechanical Engineering
POL	Political Studies
PBL	Public Law
PHI	Philosophy
PHY	Physics
SOC	Sociology
STA	Statistical Sciences

Course Codes – Explanatory Notes

Every course described in this Handbook has a course name and a corresponding course code. The code structure is uniform, and it gives important information about the course. The course code is an eight character code in the format AAAnnnnB, where

AAA   represents the department offering the course;

nnnn   is a number, where the first digit represents the year level of the course (no change) and the second, third and fourth digits represent a number between 000 and 999 which uniquely identifies the course at that level offered by that department (previously this was a number between 00 and 99);

B   (the course suffix) represents the position in the year in which the course is offered (as before).

The following suffixes are used:

A   1st quarter course
B   2nd quarter course
C   3rd quarter course
D   4th quarter course
F   1st semester course
S   2nd semester course
H   half course taught over whole year
W   full course, year-long
L   Winter Term
M   Multiterm
U   Summer Term Sessions 1 and 2
J   Summer Term Session 1
P   Summer Term Session 2
X   not classified
Z   other
EWA   Examination without attendance at course

The following example shows how this works:

CIV2031S Structural Engineering

The code shows that this is a Civil Engineering course (CIV), of second year level (2031) and that it is a second semester (S) course.

The first numeral in the course code (see description of the credit code system above) enables one to distinguish between this Faculty's undergraduate and postgraduate courses as follows:

•   levels 1 to 3 are all undergraduate courses;
•   level 4 may be either undergraduate or postgraduate courses depending on the code prefix: level 4 CHE, CIV, EEE and MEC courses are undergraduate and so also are level 4 APG Geomatics courses; level 4 APG (other than Geomatics), and CON courses are postgraduate; level 5 and above are all postgraduate.

The courses listed in the following pages are in alpha-numeric order, based on the course code prefix and number. Thus, all the courses offered by a particular department are grouped together.

Courses: Guide To Terminology

Core courses:	These courses form a central part of a Bachelor's degree programme. Inclusion of such courses in a curriculum is compulsory.
Co-requisites:	A co-requisite course is one for which a student must be registered together with (i.e. concurrently) another specified course.
Elective core courses:	This category comprises groups of courses from which the selection of one course or more is mandatory for a Bachelor's degree curriculum. Selection of these courses is made on the basis of specialisation (stream) or on the basis of interest.

Elective courses:	Courses required for degree purposes (e.g. to make up required number of programme credits), but in which the choice of courses is left to the student, except that a broad field of study may be specified (e.g. Humanities courses), and subject to timetable constraints.
Major Course:	A major course refers to the Design & Theory Studio and Technology courses in the BAS curriculum.
Optional courses:	Any approved courses other than the core courses and those selected as elective core or electives in the curriculum of the student concerned. Selection of these courses is made on the basis of interest, subject to prerequisite requirements, timetable constraints and the permission of the heads of departments concerned. Such courses will be included in the student's credit total and in the computation of the credit weighted average.
Prerequisites:	A prerequisite course is one which a student must have completed in order to gain admission to a specific other course.
Undergraduate course:	This is a course which is required for a first qualification, e.g. a Bachelor's degree.
Postgraduate course:	This is a course which is required for a higher qualification, e.g. a Postgraduate Diploma, Honours or a Master's degree.
DP requirements:	The classwork and test results which must be achieved in order to be allowed to write the examination in a course (DP = duly performed).
NQF credits:	The weighting a course is given in the national qualifications framework system. Students should ignore NQF credit values, and complete their degrees by faculty rules for number of courses.

Credit System

The Faculty has adopted the Higher Education Qualifications Framework (HEQSF) course credit system with effect from 2004. The Faculty's course credit ratings which were in effect prior to 2004 have been converted to HEQSF course credits. This conversion involves multiplying the pre-2004 credit values by four. The HEQSF system is based on the guideline that 10 notional hours of learning is equal to one credit. The Faculty's previous credit system was based on the guideline that 40 notional hours of learning is equal to one credit.

Ethics Clearance

Research that involves human participants or animal use for research or teaching must undergo ethics review, according to faculty-specific guidelines. Review generally entails prior approval of a research proposal by a Research Ethics or Animal Ethics Committee. In cases where prior approval is not appropriate, the research proposal should be subjected to appropriate deliberative procedures, according to faculty-specific guidelines. Research papers or dissertations that involve human participants or animal use may not be submitted for examination if they have not undergone any ethics review process.

RULES FOR UNDERGRADUATE DEGREES

The rules must be read together with the general rules for degrees and diplomas in Handbook 3 of this series.

Note: The offering of undergraduate programmes is subject to minimum student enrolment.

Minimum Formal Admission Requirements
BAS, BSc(ConstStudies), BSc(PropStudies), BSc(Eng) and BSc(Geomatics) candidates

FB1   Candidates who wish to be considered for one of the above-mentioned degrees must hold:

    (a)   a National Senior Certificate endorsed by Umalusi to state that they have met the minimum admission requirements for degree study; or

    (b)   a senior certificate with matriculation endorsement issued by the South African Certification Council; or

    (c)   a certificate of complete or conditional exemption issued by the Matriculation Board; or

    (d)   a degree of this, or another university recognised for the purpose by the Senate.

NOTE: The above are the minimum formal requirements. Please note that meeting the minimum requirements does not assure an applicant of admission. For detailed information on the entrance requirements for each degree, refer to the University's Undergraduate Prospectus.

Duration of Degree
BAS, BSc(ConstStudies) and BSc(PropStudies) candidates

FB2.1   The curriculum shall extend over not less than 3 academic years of study.

BSc(Eng) and BSc(Geomatics) candidates

FB2.2   The curriculum shall extend over not less than 4 academic years of study.

Curriculum
BAS, BSc(ConstStudies), BSc(Eng), BSc(PropStudies) and BSc(Geomatics) candidates

FB3.1   Candidates must comply with the curriculum and course requirements prescribed by Senate which are published in the Programmes of Study and Courses Offered sections of this Handbook.

FB3.2   Candidates must complete approved courses of not less than 576 credits in the case of the degrees which have a minimum duration of 4 years and not less than 432 credits in the case of degrees which have a minimum duration of 3 years. Rule FB3.1 above also applies.

FB3.3   Curriculum in each year shall be subject to the approval of the Dean and the Head of the Department administering the Degree Programme for which candidates are registered.

FB3.4   When registering for courses candidates shall be required to adhere to the prescribed lecture timetable slots, as documented in the departmental Lecture Timetable. Candidates shall inform the Head of the Department in writing of any clash of courses (lectures/tutorials/practicals etc.) arising from adherence to this Rule immediately it becomes apparent that such a clash exists. Except with the permission of the Head of Department, candidates may not be permitted to register for a course which clashes with another in the lecture timetable. In the event of such

a clash precedence shall be given, for registration purposes, to courses which are being repeated or undertaken in arrears.

FB3.5   Except by permission of the Dean candidates may not withdraw from a course which they are repeating.

Credit for and Exemption from Courses
BAS, BSc(ConstStudies), BSc(Eng), BSc(PropStudies) and BSc(Geomatics) candidates

FB4.1   Candidates may be granted credit for and/or exemption from a course or courses in accordance with the provisions of Rules GB2 and GB3, as the case may be.

FB4.2   Course credits of more than 10 years standing, whether obtained in this Faculty, other faculties or other universities, shall not be carried forward for credit except by special permission of Senate.

Progress through the Degree
FB5   Candidates academic year of study shall be determined on the basis of the year in which they are expected to graduate.

Method of Assessment
BAS, BSc(ConstStudies), BSc(Eng), BSc(PropStudies) and BSc(Geomatics) candidates

FB6.1   *General*
Courses are assessed by formal examination, by review or by satisfactory performance of the duly performed certificate (DP) requirements. If a course is assessed by formal examination or review, students may be refused permission (DPR) to present themselves for the examination or review if they fail to satisfy the Senate that they have satisfactorily attended and duly performed the work of the class by the date set in the conditions for the award of a DP certificate.

FB6.2   *Formal Examination*
Assessment by formal examination may be by means of written and/or oral examination, tutorials, class tests, term papers, notebooks or other course assignments. An external examiner is appointed for each course assessed by examination.

FB6.3   *Duly Performed (DP) Certificate*
A DP certificate may be withheld unless (i) all parts of each project, tutorial and other assignments are completed to an acceptable standard and submitted for assessment at stipulated times; (ii) there is satisfactory attendance (as prescribed by Senate) and satisfactory participation in all sections of the course.

FB6.4   *Duly Performed (DP) Courses*
In courses where the DP certificate constitutes the final result, candidates are required to satisfy the assessor that they have satisfactorily attended and duly performed the work of the class by the date set in the conditions for the award of a DP certificate. The result is published as an ungraded 'pass' (PA) or 'duly performed certificate refused' (DPR).

FB6.5   *Review*
Assessment by review consists of a review by the internal examiner(s) of the course work completed by means of written and/or oral class tests, tutorials, term papers, notebooks or other course assignments.

Supplementary Examinations
BAS, BSc(ConstStudies), BSc(PropStudies), BSc(Eng) and BSc(Geomatics) candidates

FB7　　　　Senate may permit candidates to take supplementary examinations in courses offered by a department, subject to supplementary examinations being offered by the department concerned.

Readmission Requirements
BAS candidates

FB8.1　　　BAS candidates shall not be permitted to renew their registration except by permission of the Senate, if they:
- (a)　at the end of first year fail either APG1020W or APG1003W;
- (b)　fail any major course prescribed for second or third year, after having been registered twice for the course;
- (c)　fail in any semester to obtain a DP for either or both major courses;
- (d)　fail to complete the courses prescribed for first year within two years; the courses prescribed for second year within four years;

BSc(Eng) and BSc(Geomatics) candidates

FB8.2　　　Except by permission of the Senate candidates may not renew their registration if:
- (a)　they are in their first year of registration at a tertiary institution, and in the courses recognised for the degree fail to obtain at least 80 credits or, if registered through the Academic Development Programme, ASPECT, to obtain at least 60 credits; or
- (b)　they are transferees from another tertiary institution or another qualification at UCT, in their first year of registration in the current qualification, and fail in the courses recognised for the degree to obtain at least 96 credits, or if registered through ASPECT, to obtain at least 80 credits; or
- (c)　they have re-registered in the Faculty after a break of one or more years, or are granted a concession to continue and fail in the courses recognised for the degree to obtain at least 96 credits in their first year of re-registration or, if first registered through ASPECT, to obtain at least 80 credits; or
- (d)　they, in any subsequent year of registration, fail in the courses recognised for the degree to obtain at least 192 credits over each successive two-year period, or if first registered through ASPECT, to obtain at least 160 credits over each successive two year period.

BSc(ConstStudies) and BSc(PropStudies) candidates

FB8.3　　　Except by permission of the Senate candidates may not renew their registration if:
- (a)　they are in their first year of registration at a tertiary institution and in the courses recognised for the degree fail to obtain at least 72 credits; or
- (b)　they are transferees from another tertiary institution or another qualification at UCT, in their first year of registration in the current qualification, and fail in the courses recognised for the degree to obtain at least 80 credits; or
- (c)　they have re-registered in the Faculty after a break of one or more years, or are granted a concession to continue and fail in the courses recognised for the degree to obtain at least 80 credits in their first year of re-registration; or
- (d)　they, in any subsequent year of registration, fail in the courses recognised for the degree to obtain at least 160 credits over each successive two-year period.

BAS, BSc(ConstStudies), BSc(Eng), BSc(PropStudies) and BSc(Geomatics) candidates

FB8.4   For the purposes of Rules FB8.1, FB8.2 and FB8.3:
   (a)   the credit count shall include supplementary (if offered) and deferred examinations;
   (b)   neither years registered nor credit points obtained in a previous year towards another qualification in another faculty or another institution will be counted;
   (c)   'major' refers to the Design and Theory Studio and Technology courses in the BAS curriculum.

BAS, BSc(ConstStudies), BSc(Eng), BSc(PropStudies) and BSc(Geomatics) candidates

FB8.5   Candidates who have not been readmitted in terms of rule FB8.1, FB8.2 or FB8.3, who do not appeal, or whose appeal is unsuccessful, may be considered for readmission by the Senate, after an interval of at least one year, if they show evidence of academic rehabilitation or evidence of significantly improved motivation to the satisfaction of the Senate.

Award of Degree with Distinction, Honours or First Class Honours

BAS candidates

FB9.1   To be awarded the degree with distinction, candidates must obtain a first class pass in the Design and Theory Studio III Examination and a first class pass or a second class (Division 1) pass in one of the other Design and Theory Studio Examinations and three additional first class passes in BAS course work. The degree may only be awarded with distinction if completed in the minimum time.

BSc(Eng) and BSc(Geomatics) candidates

FB9.2   To be considered for the award of the degree with first class honours or honours, students must (i) complete the requirements for the degree in the minimum time possible and, (ii) for first class honours obtain at least a first class pass for the research project or, (iii) for honours, a minimum of a second class pass in the research project.

NOTES:

(a)   For students who registered for the first time in 2016 or later, the award of honours or first class honours will be assessed on the student's cumulative credit weighted average, with 65% required for honours and 75% for first class honours. For students who registered for the first time prior to 2016, please refer to previous handbooks.
(b)   The research project is defined as one of APG4003/CHE4045/CHE4036/ CIV4044/EEE4022/MEC4110W.
(c)   In the case of students who have transferred from other faculties recognition will be given for those courses for which the student was granted credit - based on (a) above.
(d)   In view of the difficulty of assessing cases of students who have transferred from other universities, the dean, in consultation with the departmental head concerned may recommend that a student be awarded the degree with honours/first class honours, if satisfied that this is merited.

The award of first class honours or honours is subject to Senate approval and Senate reserves the right to change the above system requirements.

BSc(ConstStudies) and BSc(PropStudies) candidates

FB9.3   To be considered for the award of the degree with distinction a candidate must obtain a minimum credit weighted average of 75% for the degree.

Exemption from or Modification of Rules

BAS, BSc(ConstStudies), BSc(Eng), BSc(PropStudies) and BSc(Geomatics) candidates
FB10   Any exemption or deviation from the rules requires the approval of Senate.

PROGRAMMES OF STUDY

Architecture, Planning and Geomatics

Bachelor of Architectural Studies
BAS[EB012APG01]

Associate Professor and Programme Convenor:
A Steenkamp, B.Arch *Pret* M.Arch *Pret* PhD *Delft* PrArch

The BAS degree is a stand-alone exit degree which also provides for entry into a professional architectural programme or into postgraduate programmes in city and regional planning, urban design and landscape architecture. Streaming into other career possibilities, such as construction and property economics provided for in other departments, is also possible. The assessment for this BAS degree and the entry requirements for the BAS(Hons) degree differ in as much as the BAS degree is an exit degree with a professional qualification and the BAS(Hons) is a graduate degree in architecture with specific emphasis on critical thought and a high level of competence in architectural design. As such, successful completion of the BAS degree does not guarantee entry into the BAS(Hons) degree. Application to the BAS(Hons) is through formal application and portfolio assessment. However, a limited number of places in the BAS(Hons) degree will be guaranteed for BAS graduates with a credit weighted average of 70% and above in the following courses: APG3000F; APG3001S; APG3023W and APG3037W. The degree has stature in its own right for entry into the job market in architectural and other design and planning offices, interior design, landscape architecture, property development and in the building industry and can lead to professional registration as a senior architectural technician.

In the introductory year the programme involves familiarisation with precedent, elementary design exercises and later the design of more sophisticated places, sites, buildings and complexes. Other major areas of study are building technology (construction, environmental control, structures, etc.), representation (manual and digital), communication (written and verbal) and history and theory of architecture and related disciplines. Studio programmes absorb approximately half of student time and energy, and many subsidiary courses or projects are closely linked. Studios have formal lectures, informal talks and theory of design seminars.

Studio furniture includes a work station for each student. All students are required to work in the studios during Design Studio classes, and may elect to work in the studios after-hours. All students must provide their own books and drawing equipment. Students should be prepared to have to purchase approximately R3000 worth of drawing equipment and materials in the first year. Students in upper years should budget for approximately R3500 per year for plan prints, photocopying, graphic and other materials.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1003W	Technology I (major course)	24	5
APG1004F	History &Theory of Architecture I	12	5
APG1005S	History &Theory of Architecture II	12	5
APG1017F	Academic Development Class	0	5
APG1018S	Academic Development Class	0	5
APG1020W	Design &Theory Studio I (major course)	72	5
APG1021W	Representation I	24	5
	Total credits per year	**144**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2000F	History &Theory of Architecture III	8	6
APG2003S	History & Theory of Architecture IV	8	6
APG2009F	Theory of Structures III	6	6
APG2011S	Theory of Structures IV	6	6
APG2021W	Technology II (Major Course)	24	6
APG2038W	Environment &Services II	18	6
APG2039W	Design &Theory Studio II (Major Course)	74	6
APG2027X	Work Experience	0	6
	Total credits per year	**144**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3000F	History &Theory of Architecture V	8	7
APG3001S	History & Theory of Architecture VI	8	7
APG3023W	Technology III (major course)	24	7
APG3028X	Independent Research	0	7
APG3034W	Environment & Services III	6	7
APG3035F	Theory of Structures V	6	7
APG3036F	Management Practice Law	12	7
APG3037W	Design & Theory Studio III (major course)	80	7
	Total credits per year	**144**	

Course descriptions are set out in the section Departments in the Faculty and Courses Offered. The course code abbreviation for Architecture courses is APG.

NOTES:

(i)   *Core courses are sequential.*
(ii)   *The Theory of Structures courses (APG2009F, APG2011S, APG3035F) are sequential.*
(iii)   Mandatory Fieldwork: *APG1003W Technology I, APG2021W Technology II, APG1020W Design and Theory Studio I, APG2039W Design & Theory Studio II and APG3037W Design & Theory Studio III, have a mandatory fieldwork component.*
(iv)   *Non-core courses in a year may not lag behind core courses of the next year by more than twelve months.*

Bachelor of Science in Geomatics [EB019]

The courses given in the Geomatics programme comprise lectures, tutorials, laboratory sessions, computation sessions, and practical fieldwork. Students must show satisfactory performance in each aspect of the work to obtain a duly performed certificate. Students are required to complete approved courses of a value not less than 576 credits and to comply with the prescribed curriculum requirements. Students may choose a stream in Surveying or Geoinformatics. The Surveying stream is targeted at students wishing to register as a Geomatics Professional in a range of categories with the South African Geomatics Council; the Geoinformatics stream is targeted at students wishing to work in the spatial information industry and for registration as a Geomatics Professional with the South African Geomatics Council in the category of Geo-Information Sciences.

The design of the degree is outcomes-based, with a strong emphasis on the ability to plan, execute and report on Geomatics projects with demonstrated knowledge of underlying theory and the ability to critically analyse the project outputs. Graduates are equipped to meet the challenges of professional geomatics practice in African and international contexts through excellent teaching in a research-led environment. Problem solving, ethics, professionalism, professional communication and working in a team are critical outcomes.

Streams in Geomatics: There are two streams in the Geomatics programme: Surveying and Geoinformatics. If a first-year student is considering the Geoinformatics stream, then certain first and second year courses must be taken to allow that option. Course advice is given at registration, but students should think about whether to take environmental and geographical science or computer science to third year level, as these options will affect the choice of second semester courses in the first year. These can be changed up until the first week of the second semester (July).

Department of Rural Development and Land Reform Bursaries: The Department of Rural Development and Land Reform offers bursaries to students who are South African citizens to study in a range of geomatics qualifications including our BSc in Geomatics (all streams, four-year or five-year programmes). Applicants will be expected to enter into a contract with the Department. The bursary is for a full programme, but annually renewable based on performance. It covers academic fees (including registration, tuition and examination fees), book allowance, meal allowance, accommodation allowance (residential fees if applicable), and living allowance, as would be set out in the agreement.

Facilities: Lectures are supported by field and laboratory work. The principal facilities available for laboratory and field use are:

- **Surveying:** Standard and advanced survey equipment is available. This includes electronic theodolites, total stations, automatic and precise levels, Global Navigation Satellite System (GNSS) receivers, laser scanners, and robotic total stations. A number of survey control points on and in the vicinity of the University campus provide the basis for a variety of assignments, and vehicles are available for field work off the campus.
- **Geographic Information Systems:** Computation facilities include access to the Faculty's microcomputer laboratories as well as the Geomatics computer laboratory. The workstations in the Geomatics computer laboratory run ESRI's ArcGIS, and QGIS Open Source software in support of the GIS courses. There is also an operational ArcGIS Server to allow for web mapping services. Hand-held GNSS receivers are available for data collection as well as the surveying equipment.
- **Geodesy:** There are facilities for undertaking fundamental geodetic surveys, gravity surveys and levelling, and control network adjustment. Research interest in geodesy is centred currently on satellite and terrestrial gravimetry, horizontal and vertical geodetic datums, geoid determination and analysis, effective application of GNSS in local and regional positioning and surveying, determination and monitoring of Earth deformations and plate tectonics movements, geodetic network design and adjustments, numerical and approximation methods in geodesy and geomatic engineering, datum transformation and analysis of underground/surface mass.
- **Photogrammetry and Remote Sensing:** The Geomatics computer laboratory has ENVI, ERDAS, UASMaster, SURE and Agisoft software. These are industry-leading products which provide extensive digital image processing functionality. There is also a variety of in-house software and Open Source software available to support ongoing remote sensing and photogrammetric research activities. Digital SLR and video cameras form the basis for image capture for both research and practical assignments.

Bachelor of Science in Geomatics: Surveying Stream 4-year curriculum
[EB019APG09]

Senior Lecturer and Programme Convener:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1016H	Geomatics I	18	5
APG1022X	Practical Training in Geomatics	0	5
CSC1017F	Introduction to Programming	16	5
GEO1009F	Introduction to Earth and Environmental Sciences	18	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics I B for Engineers	18	5
STA1000S	Introductory Statistics	18	5
	Elective	18	5
	Total credits per year	**124**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2015F	Geographic Information Systems I	24	6
APG2019X	Practical Training I	0	6
APG2040F	Surveying I	18	6
APG2041S	Applied Surveying & GISc	14	6
MAM2083S	Vector Calculus for Engineers	16	6
MAM2084F	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
	Total credits per year	**148**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3015X	Practical Training II	0	7
APG3016C	Surveying II	12	7
APG3017D	Surveying III	12	7
APG3027Z	Cadastral Survey & Registration Projects	24	7
APG3033W	Land & Cadastral Survey Law	16	7
CON2027F	Real Property Law	16	6
	Total credits per year	**144**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3038F	Professional Communication Studies	12	7
APG4001S	Geodesy	24	8
APG4002Z	Land Use Planning & Township Design	16	8
APG4003Z	Research Project	40	8
APG4005F	Engineering Surveying & Adjustment	18	8
APG4010X	Geoinformatics Camp	4	8
APG4011F	Geomatics IV	24	8
APG4012S	Geomatics Management & Professionalism	24	8
	Total credits per year	**162**	

Bachelor of Science in Geomatics: Surveying Stream 5-year curriculum [EB819APG09]

Senior Lecturer and Programme Convener:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1016H	Geomatics I	18	5
APG1022X	Practical Training in Geomatics	0	5
CSC1017F	Introduction to Programming	16	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics I B for Engineers Extended	18	5
PHY1014S	Physics A for Aspect	18	5
STA1000S	Introductory Statistics	18	5
	Total credits per year	**106**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2019X	Practical Training I	0	6
APG2040F	Surveying I	18	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MAM2085F	Vector Calculus for Aspect	16	6
PHY1015F	Physics B for Aspect	18	5
	Elective	18	5
	Total credits per year	**110**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2015F	Geographic Information Systems I	24	6
APG2041S	Applied Surveying & GISc	14	6
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3015X	Practical Training II	0	7
GEO1009F	Introduction to Earth and Environmental Sciences	18	5

Code	Course	NQF Credits	HEQSF Level
	Total credits per year **120**		

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3016C	Surveying II 12		7
APG3017D	Surveying III 12		7
APG3027Z	Cadastral Survey & Registration Projects 24		7
APG3033W	Land & Cadastral Survey Law 16		7
APG4011F	Geomatics IV 24		8
CON2027F	Real Property Law 16		6
	Total credits per year **104**		

Students who have taken both APG1022X and APG2019X do not need to take APG3015X.

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3038F	Professional Communication Studies 12		7
APG4001S	Geodesy 24		8
APG4002Z	Land Use Planning & Township Design 16		8
APG4003Z	Research Project 40		8
APG4005F	Engineering Surveying & Adjustment 18		8
APG4010X	Geoinformatics Camp 4		8
APG4012S	Geomatics Management & Professionalism 24		8
	Total credits per year **138**		

Bachelor of Science in Geomatics: Geoinformatics Stream 4-year curriculum
Computer Science Specialisation[EB019APG11]

Senior Lecturer and Programme Convener:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1016H	Geomatics I 18		5
APG1022X	Practical Training in Geomatics 0		5
CSC1015F	Computer Science 1015 18		5
CSC1016S	Computer Science 1016 18		5
GEO1009F	Introduction to Earth and Environmental Sciences 18		5
MAM1020F	Mathematics IA for Engineers 18		5
MAM1021S	Mathematics IB for Engineers 18		5
STA1000S	Introductory Statistics 18		5
	Total credits per year **126**		

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2014S	Geomatics II 24		6
APG2015F	Geographic Information Systems I 24		6
APG2019X	Practical Training I 0		6
APG2040F	Surveying I 18		6
APG2041S	Applied Surveying & GISc 14		6

Code	Course	NQF Credits	HEQSF Level
MAM2083S	Vector Calculus for Engineers	16	6
MAM2084F	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
	Total credits per year	**148**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3015X	Practical Training II	0	7
APG3016C	Surveying II	12	7
CSC2001F	Computer Science 2001	24	6
CSC2002S	Computer Science 2002	24	6
CSC2004Z	Programming Assessment	0	6
INF2009F	Systems Analysis	18	6
	Total credits per year	**142**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3038F	Professional Communication Studies	12	7
APG4002Z	Land Use Planning & Township Design	16	8
APG4003Z	Research Project	40	8
APG4010X	Geoinformatics Camp	4	8
APG4011F	Geomatics IV	24	8
APG4012S	Geomatics Management & Professionalism	24	8
CSC3002F	Computer Science 3002	36	7
CSC3003S	Computer Science 3003	36	7
	Total credits per year	**192**	

Bachelor of Science in Geomatics: Geoinformatics Stream 5-year curriculum
Computer Science Specialisation[EB819APG11]

Senior Lecturer and Programme Convener:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1016H	Geomatics I	18	5
APG1022X	Practical Training in Geomatics	0	5
CSC1015F	Computer Science 1015	18	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics I B for Engineers Extended	18	5
PHY1014S	Physics A for Aspect	18	5
STA1000S	Introductory Statistics	18	5
	Total credits per year	**108**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2019X	Practical Training I	0	6
APG2040F	Surveying I	18	6
CSC1016S	Computer Science 1016	18	5
GEO1009F	Introduction to Earth and Environmental Sciences	18	5
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MAM2085F	Vector Calculus for Aspect	16	6
PHY1015F	Physics B for Aspect	18	5
	Total credits per year	**128**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2015F	Geographic Information Systems I	24	6
APG2041S	Applied Surveying GISc	14	6
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3015X	Practical Training II	0	7
CSC2001F	Computer Science 2001	24	6
CSC2002S	Computer Science 2002	24	6
CSC2004Z	Programming Assessment	0	6
	Total credits per year	**150**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3016C	Surveying II	12	7
APG4010X	Geoinformatics Camp	4	8
APG4011F	Geomatics IV	24	8
CSC3002F	Computer Science 3002	36	7
CSC3003S	Computer Science 3003	36	7
INF2009F	Systems Analysis	18	6
	Total credits per year	**130**	

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3038F	Professional Communication Studies	12	7
APG4002Z	Land Use Planning & Township Design	16	8
APG4003Z	Research Project	40	8
APG4012S	Geomatics Management & Professionalism	24	8
	Total credits per year	**92**	

Bachelor of Science in Geomatics: Geoinformatics Stream 4-year curriculum
Environmental and Geographical Science Specialisation[EB019APG11]

Senior Lecturer and Programme Convener:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1016H	Geomatics I	18	5
APG1022X	Practical Training in Geomatics	0	5
CSC1017F	Introduction to Programming	16	5
EGS1003S	Geography, Development & Environment	18	5
GEO1009F	Introduction to Earth and Environmental Sciences	18	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
STA1000S	Introductory Statistics	18	5
	Total credits per year	**124**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2015F	Geographic Information Systems I	24	6
APG2019X	Practical Training I	0	6
APG2040F	Surveying I	18	6
APG2041S	Applied Surveying & GISc	14	6
MAM2083S	Vector Calculus for Engineers	16	6
MAM2084F	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
	Total credits per year	**148**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3015X	Practical Training II	0	7
APG3016C	Surveying II	12	7
EGS2013F	The Physical Environment	24	6
EGS2014S	Contemporary Urban Challenges	24	6
	Total credits per year	**124**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3038F	Professional Communication Studies	12	7
APG4002Z	Land Use Planning & Township Design	16	8
APG4003Z	Research Project	40	8
APG4010X	Geoinformatics Camp	4	8
APG4011F	Geomatics IV	24	8
APG4012S	Geomatics Management & Professionalism	24	8

Choose two of the following electives

Code	Course	NQF Credits	HEQSF Level
EGS3012S	Atmospheric Science	36	7
EGS3021F	Sustainability & Environment	36	7
EGS3022S	Geographic Thought	36	7
EGS3023F	Anthropocene Environments in Perspective	36	7
	Total credits per year	**192**	

Bachelor of Science in Geomatics: Geoinformatics Stream 5-year curriculum
Environmental and Geographical Science Specialisation[EB819APG11]

Senior Lecturer and Programme Convener:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG1016H	Geomatics I	18	5
APG1022X	Practical Training in Geomatics	0	5
CSC1017F	Introduction to Programming	16	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics I B for Engineers Extended	18	5
PHY1014S	Physics A for Aspect	18	5
STA1000S	Introductory Statistics	18	5
	Total credits per year	**106**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2019X	Practical Training I	0	6
APG2040F	Surveying I	18	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MAM2085F	Vector Calculus for Aspect	16	6
PHY1015F	Physics B for Aspect	18	5
	Total credits per year	**92**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2015F	Geographic Information Systems I	24	6
APG2041S	Applied Surveying & GISc	14	6
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3015X	Practical Training II	0	7
EGS1003S	Geography, Development & Environment	18	5
GEO1009F	Introduction to Earth and Environmental Sciences	18	5
	Total credits per year	**138**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3016C	Surveying II	12	7
APG4002Z	Land Use Planning & Township Design	16	8
APG4010X	Geoinformatics Camp	4	8
APG4011F	Geomatics IV	24	8
EGS2013F	The Physical Environment	24	6
EGS2014S	Contemporary Urban Challenges	24	6
	Total credits per year	**104**	

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG3038F	Professional Communication Studies	12	7
APG4003Z	Research Project	40	8
APG4012S	Geomatics Management & Professionalism	24	8

Choose two of the following electives

Code	Course	NQF Credits	HEQSF Level
EGS3012S	Atmospheric Science	36	7
EGS3021F	Sustainability & Environment	36	7
EGS3022S	Geographic Thought	36	7
EGS3023F	Anthropocene Environments in Perspective	36	7
	Total credits per year	**148**	

Curriculum for University of Technology/University Transferees to the Bachelor of Science in Geomatics
[EB019APG09/EB019APG11]

Senior Lecturer and Programme Convenor:
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *Unisa* PrL(SA)

Transferees from Universities of Technology should have obtained matriculation exemption or the NSC endorsed for degree studies before they started their National Diploma, and have achieved a minimum of 70% aggregate.

Suitably qualified BTech and university graduates entering the BSc Geomatics degree programmes may be granted credit and exemption on a course by course basis, up to a maximum of 288 credits. All degree requirements must be complied with and students need to meet the knowledge and learning outcomes specified by South African Geomatics Council for the professional accreditation categories related to their chosen stream.

Chemical Engineering

Bachelor of Science in Engineering in Chemical Engineering

A four-year undergraduate chemical engineering degree is offered which prepares graduates for careers in the chemical, metallurgical, biotechnical and process industries. The degree focuses on the development of technical expertise, problem-solving, teamwork and communication skills, and is accredited by the Engineering Council of South Africa. There is an opportunity to stream the degree programme with a strong flavour in either minerals processing, bioprocess engineering, catalytic processing, process modelling, or environmental process engineering.

Practical training in the operation of laboratory and pilot scale equipment is given during the second and third years, while the fourth-year research project emphasises chemical engineering fundamentals. Chemical Engineering Design is addressed in all years of study, culminating in an integrated plant design in the final year.

A candidate shall comply with the prescribed curriculum requirements set out below.

Bachelor of Science in Engineering in Chemical Engineering 4-year curriculum
BSc(Engineering)(Chemical Engineering)[EB001CHE01]

Programme Convener:
Dr S Tai, BEng *Manchester* MSc (Eng) PhD *Delft*

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1000W	Chemistry 1000	36	5
CHE1005W	Chemical Engineering I	44	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
PHY1012F	Physics A for Engineers	18	5
STA1008S	Statistics for Engineers	12	5
	Total credits per year	**146**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CHE2000X	Field Trip	4	6
CHE2005W	Chemical Engineering II	72	6
MAM2083S	Vector Calculus for Engineers	16	6
MAM2084F	Linear Algebra and DEs for Engineers	16	6
	Approved elective courses	36-48	
	Total credits per year	**144-156**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CHE3006F	Fundamentals of Chemical Engineering III	54	7
CHE3007S	Non-ideal systems in Chemical Engineering	22	7
CHE3008S	Chemical Eng Project Management & Unit Operation Design	16	7
CHE3000X	Workplace Experience	0	7
	Approved elective courses	50-58	

Code	Course	NQF Credits	HEQSF Level
	Total credits per year **142-150**		

Fourth Year Core Courses
Students must be in their final year of study. Up to 34 credits of electives are considered to be part of the regular programme. Concessions to take additional credits (consisting of more electives or outstanding core courses) will be considered.

Code	Course	NQF Credits	HEQSF Level
CHE4036Z	Chemical Engineering Design 36		8
CHE4045Z	Chemical Engineering Project 36		8
CHE4048F	Business, Society & Environment 20		8
CHE4049F	Process Synthesis & Equipment Design.......................................20		8
	Approved elective courses...16-34		
	Total credits per year **128-146**		

ELECTIVE COURSES

1. **Science Electives**
    Students must do at least 42 credits of Science electives, with a minimum of 24 credits at HEQSF level 6. Approved options are shown below. Students may apply for other combinations of Science electives in this category**.**

Biotechnology

Code	Course	NQF Credits	HEQSF Level
BIO1000F	Cell Biology...18		5
CHE2006S	Introduction to Biotechnology..24		6

Chemical Sciences

Code	Course	NQF Credits	HEQSF Level
CEM2005W	Intermediate Chemistry... 48		6

Mineralogical Sciences

Code	Course	NQF Credits	HEQSF Level
GEO1009F	Introduction to Earth and Environmental Sciences 18		5
GEO2006S	Applied Mineralogy for Chemical Engineering 24		6

2. **Language elective (18 credits minimum)**
    Students must do any language course at UCT that will give them exposure to a language other than English that they do not already speak at this level. Most students will select from the intensive courses that are offered at first level, but students may alternatively select to study at the second level course a language they have previously studied at school.

3. **Humanities selection (18 credits minimum)**
    This selection involves courses that will broaden students' capacity to cope with complex social questions that they may be exposed to in their professional practice. These courses will also require students to read academic texts and produce extended written responses, usually in the form of essays. These are outcomes that are also valued by the engineering programme and will build skills that students will take forward in the core courses. Students may select any course for which they meet the admission criteria with the following UCT course code prefix:
    - AGE Archaeology
    - AXL Anthropology, Gender Studies, African Studies (excluding AXL Linguistics courses)
    - HST History
    - PHI Philosophy
    - POL Politics (note only option here is POL1004L/P offered in winter/summer term)
    - SOC Sociology

Other courses included in this elective group are:
- ☐ END1023S Citizen Professionals in Engineering & the Built Environment
- ☐ END1019L Social Infrastructures: Engaging with Community for Change (offered during the winter term)
- ☐ FAM1001F/L/P Media and Society
- ☐ REL1006S Judaism, Christianity and Islam

If students would like to do a course not mentioned here that they believe fulfils the objectives of this elective category, they may apply for it to be considered.

4.   Advanced Engineering Electives

Students must do at least 32 credits of advanced engineering electives, with a minimum of 16 credits at HEQSF level 8.

HEQSF Level 7 electives

Code	Course	NQF Credits	HEQSF Level
CHE3067S	Design and Operation of Catalytic Reactors	16	7
CHE3068S	Bioprocess Engineering Fundamentals	16	7
CHE3069S	Mineral and Metallurgical Processing	16	7
CHE3070S	Numerical Simulation for Chemical Engineers	16	7

HEQSF Level 8 electives

Code	Course	NQF Credits	HEQSF Level
CHE4057F	Industrial Ecology for Chemical Engineers	8	8
CHE4058Z	Life Cycle Assessment	8	8
CHE4067F	Heterogeneous Catalysis	16	8
CHE4068F	Bioprocess Engineering Design	16	8
CHE4069F*	Mineral & Metallurgical Processing II	16	8
CHE4070F	Numerical Optimisation for Chemical Engineers	16	8

* CHE4069F is compulsory for mining-house bursars.

Alternatively, students may wish to take any EBE course at or above the third year level (including Masters level) for which they meet the course entry requirements, and where they have not already covered that content in another course. Such courses must be approved by the Programme Convener.

5. Free Elective (16 credits minimum)

Students may do any course at UCT for which they meet the prerequisites, and where they have not already covered that content in another course.

Bachelor of Science in Engineering in Chemical Engineering 5-year curriculum
BSc(Engineering)(Chemical Engineering)[EB801CHE01]

Programme Convener:
Dr S Tai, BEng *Manchester* MSc (Eng) PhD *Delft*

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first

opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall comply with the prescribed curriculum requirements set out below.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1000W	Chemistry 1000	36	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics IB for Engineers Extended	18	5
PHY1014F	Physics A for ASPECT	18	5
STA1008S	Statistics for Engineers	12	5
	Total credits per year	**102**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CHE1005W	Chemical Engineering I	44	5
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MAM2085F	Vector Calculus for ASPECT	16	6
	Approved elective courses	36-48	
	Total credits per year	**112-124**	

Elective Note: First Semester - BIO1000F or GEO1009F (science elective) or free/humanities/language elective. Please refer to the Elective Courses section under the 4-year programme for more details. Students opting for GEO1009F must take the mathematics courses in the order MAM2084F and MAM2085S.

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CHE2000X	Field Trip	4	6
CHE2005W	Chemical Engineering II	72	6
	Approved elective courses	36-48	
	Total credits per year	**112-124**	

Elective Note: Science (CEM2005W or CHE2006S) and/or free/humanities/language elective. Please refer to the Elective Courses section under the 4-year programme for more details.

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CHE3006F	Fundamentals of Chemical Engineering III	54	7
CHE3007S	Non-ideal systems in Chemical Engineering	22	7
CHE3008S	Chemical Eng Project Management & Unit Operation Design	16	7
CHE3000X	Workplace Experience	0	7
	Approved elective courses	34-42	
	Total credits per year	**126-134**	

Elective Notes: Students who took a Chemistry and Biology elective previously must take a free/humanities/language elective in the first semester, and Advanced Engineering Elective in the second semester. Students who took a Mineralogy elective previously must take Advanced

Engineering electives and GEO2006S. Please refer to the Elective Courses section under the 4-year programme for more details.

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CHE4036Z	Chemical Engineering Design	36	8
CHE4045Z	Chemical Engineering Project	36	8
CHE4048F	Business, Society & Environment	20	8
CHE4049F	Process Synthesis & Equipment Design	20	8
	Approved elective courses	16	
	Total credits per year	**128**	

Three-Year Programme for Transferees into Bachelor of Science in Engineering in Chemical Engineering
[EB001CHE06]

This programme is available only to students who have completed at least one year of a Bachelor of Science or Bachelor of Science in Engineering programme. The entrance requirements are: 70% or above in each of Mathematics I, Chemistry I and Physics IA (PHY1012 or equivalent). Applications from students who have completed Mathematics I, Chemistry I and Physics IA but have not met the 70% requirement, will be considered on their merits.

Students who are provisionally accepted into the three-year transferee programme must first complete the course CHE1001Z Introduction to Chemical Engineering (HEQSF credits 22, HEQSF Level 5), which takes place over the four weeks prior to registration. If this course is successfully completed, students will be registered for the second year of the degree.

In addition to completing Mathematics I, Chemistry I, Physics IA and CHE1001Z, students on the three-year transferee programme are required to complete 464 credits. This requirement needs to be fulfilled by completing STA1008S (if not granted exemption with credit for a previously taken course), all second, third and fourth year core courses, as well as meeting the rules for elective credits.

In addition, since CHE1001Z Introduction to Chemical Engineering (22 credits) carries fewer credits than CHE1005W Chemical Engineering I (44 credits), students are required to take up at least 8 (Chemical Sciences elective) or 14 (Biotechnology and Mineralogical Sciences electives) additional elective credits to meet the required number of credits for graduation.
Students may apply for exemption with credit for MAM2083S and MAM2084F and elective courses, if equivalent courses have been completed previously.

Three Year Conversion Programmes for Bachelor of Science Graduates to Bachelor of Science in Engineering in Chemical Engineering
[EB001CHE06]

The entrance requirements are: a BSc degree in minimum time with Mathematics I, Chemistry I and Physics IA (PHY1012 or equivalent).

BSc graduates who are provisionally accepted into the three-year conversion programme must first complete the course CHE1001Z Introduction to Chemical Engineering (HEQSF credits 22, HEQSF Level 5), which takes place over the four weeks prior to registration. If this course is successfully completed, students will be registered for the second year of the degree

In addition to completing Mathematics I, Chemistry I, Physics IA and CHE1001Z, students on the three-year conversion programme are required to complete 464 credits. This requirement needs to be

fulfilled by completing STA1008S (if not granted exemption with credit for a previously taken course), all second, third and fourth year core courses, as well as meeting the rules for elective credits.

In addition, since CHE1001Z Introduction to Chemical Engineering (22 credits) carries fewer credits than CHE1005W Chemical Engineering I (44 credits), students on the three-year transferee programme are required to take up at least 8 (Chemical Sciences elective) or 14 (Biotechnology and Mineralogical Sciences electives) additional elective credits to meet the required number of credits for graduation.

Students may apply for exemption with credit for MAM2083S and MAM2084F and elective courses, if equivalent courses have been completed in their initial degree.

Access Programme for University of Technology Transferees
[EB001CHE01]

The entrance requirements are: a National Diploma in Chemical Engineering achieved in minimum time, with a 70% overall average and 75% in each of the two Mathematics courses. It is also necessary to have qualified for matriculation exemption or the NSC endorsed for degree studies before commencement of the National Diploma programme.

Students accepted on to this programme will be exempted from CHE3000X. This leaves the majority of each year's core courses to complete, and is therefore nominally a four year programme.

Students may choose however to register as occasional students in the year prior to entering the programme, and to attend classes and write the examinations for MAM1020F, MAM1021S, CEM1000W, PHY1012F and STA1008S (or any equivalents of these courses). Should these courses all be passed, students will be provisionally accepted into the three-year conversion programme, i.e. they must first complete the course CHE1001Z Introduction to Chemical Engineering (HEQSF credits 22, HEQSF Level 5), which takes place over the four weeks prior to registration. If this course is successfully completed, students will be registered for the second year of the degree. In addition to completing the abovementioned courses, students on the three-year conversion programme are required to complete 452 credits. This requirement needs to be fulfilled by completing all second, third and fourth year core courses (except for CHE3000X), as well as meeting the rules for elective credits.

In addition, since CHE1001Z Introduction to Chemical Engineering (22 credits) carries fewer credits than CHE1005W Chemical Engineering I (44 credits), students are required to take up at least 8 (Chemical Sciences elective) or 14 (Biotechnology or Mineralogical Sciences electives) additional elective credits to meet the required number of credits for graduation.

Students may apply for exemption with credit for elective courses, if equivalent courses have been completed in their initial diploma.

Course descriptions are set out in the section Departments in the Faculty and Courses Offered. The course code abbreviation for Chemical Engineering is CHE.

Civil Engineering

Bachelor of Science in Engineering in Civil Engineering

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements (which may exceed 576). Note: The core courses listed below, plus one elective course of 18 or more credits, constitute the courses recognised for the degree in terms of Rule FB8.2. DP and examination requirements to pass the core courses are set out in the course information sheets issued at the start of all Civil Engineering core courses.

The curriculum has a strong foundation in the natural sciences, mathematics and applied mechanics. From the second year of study, students are introduced to courses in structural engineering and materials, water engineering (hydraulics and water quality), geotechnical engineering, and transportation. In the final year, the two major courses of Design Project and Research Project allow students to integrate their knowledge and develop advanced problem-solving skills.

Professional aspects are covered in courses on Professional Practice and Civil Engineering practical experience.

In order to promote and enhance learning within the degree, the Department of Civil Engineering requires all students to have their own laptop or desktop computer with access to the internet. The minimum specifications of the computer required can be obtained from the Department.

Bachelor of Science in Engineering in Civil Engineering 4-year curriculum
BSc(Engineering)(Civil Engineering)[EB002CIV01]

Associate Professor and Programme Convener:
MHP Zuidgeest, MSc(Eng) PhD (Eng) *Twente*

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
CIV1005W	Introduction to Engineering	24	5
CIV1007S	Engineering Mechanics	16	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MEC1007F	Introduction to Engineering Drawing	8	5
MEC1008S	Introduction to Mechanical Design	8	5
PHY1012F	Physics A for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
	Total credits per year	**144**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2026S	Construction Surveying	16	6
CIV2011F	Mechanics of Materials	16	6
CIV2039S	Geotechnical Engineering I	16	6
CIV2040S	Fluid Mechanics	8	6
CIV2041S	Structural Analysis I	16	6
CIV2042F	Construction Materials	16	6

Code	Course	NQF Credits	HEQSF Level
GEO1008F	Introduction to Geology for Civil Engineers	12	5
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
STA1008F	Statistics for Engineers	12	5
CIV2020X	Practical Experience	0	6
	Total credits per year	**144**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CIV3042F	Geotechnical Engineering II	16	7
CIV3043F	Hydraulic Engineering	16	7
CIV3044F	Engineering Hydrology	8	7
CIV3045S	Transportation Planning	16	7
CIV3046S	Water Treatment	12	7
CIV3047S	Urban Water Services	16	7
CIV3048F	Structural Analysis II	16	7
CIV3049S	Structural Design I	16	7
ECO1007S	Economics for Engineers	18	5
	Humanities Elective	18	
	Total credits per year	**152**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CIV4035C	Design Project	24	8
CIV4041F	Professional Practice	12	8
CIV4042F	Waste Water Treatment	12	8
CIV4044S	Research Project	48	8
CIV4045F	Structural Design II	18	8
CIV4046F	Transportation Engineering	18	8
EGS1005F	Introduction to Environmental Assessment & Management	12	5
	Total credits per year	**144**	

Students are reminded of the university rules for undergraduate degrees as printed in this handbook. In particular it should be noted that timetable clashes are not allowed (this rule also applies to courses that are repeated) and that preference should be given to courses in arrears (Rule FB3.4). In the final year of study students may get concessions for a maximum of 18 credits per semester over and above the published fourth year core curriculum to repeat outstanding courses from prior years or attempt additional electives subject to the requirements of the three capping courses: CIV4041F, CIV4035C and CIV4044S. All applications for concessions must be made on the prescribed form for consideration by the Programme Convenor and the departmental Concessions Committee for a final decision.

Elective Courses

It is a requirement of the Engineering Council of South Africa (ECSA) that all engineering graduates be exposed to complementary studies which, inter alia, broaden the student's perspective in the humanities, social sciences or other areas to support an understanding of the world. To this end, every prospective graduate must take at least one course from a list of approved electives. It is the responsibility of the student to ensure that there are no lecture or tutorial or examination timetable clashes for courses which s/he wishes to take.

The core curriculum changes from time to time and it is the responsibility of each student to check the accumulating total of core course credits he or she has completed at any stage, in order to

determine any shortfall from the minimum number of 576 credits and the courses required for graduation. In the event of a shortfall, s/he may have to register for additional elective courses.

Course descriptions are set out in the section Departments in the Faculty and Courses Offered. The course code abbreviation for Civil Engineering is CIV.

Bachelor of Science in Engineering in Civil Engineering 5-year curriculum
BSc(Engineering)(Civil Engineering)[EB802CIV01]

Associate Professor and Programme Convener:
MHP Zuidgeest, MSc(Eng) PhD (Eng) *Twente*

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
CIV1007S	Engineering Mechanics	16	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics I B for Engineers Extended	18	5
PHY1014F	Physics A for ASPECT	18	5
PHY1015S	Physics B for ASPECT	18	5
	Total credits per year	**104**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CIV1005W	Introduction to Engineering	24	5
CIV2011F	Mechanics of Materials	16	6
CIV2041S	Structural Analysis I	16	6
MAM2085F	Vector Calculus for ASPECT	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC1007F	Introduction to Engineering Drawing	8	5
MEC1008S	Introduction to Mechanical Design	8	5
	Total credits per year	**104**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
APG2026S	Construction Surveying	16	6
CIV2039S	Geotechnical Engineering I	16	6
CIV2040S	Fluid Mechanics	8	6
CIV2042F	Construction Materials	16	6
CIV3046S	Water Treatment	12	7

Code	Course	NQF Credits	HEQSF Level
CIV3048F	Structural Analysis II	16	7
CIV3049S	Structural Design I	16	7
GEO1008F	Introduction to Geology for Civil Engineers	12	5
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**124**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CIV3042F	Geotechnical Engineering II	16	7
CIV3043F	Hydraulic Engineering	16	7
CIV3044F	Engineering Hydrology	8	7
CIV3045S	Transportation Planning	16	7
CIV3047S	Urban Water Services	16	7
CIV4045F	Structural Design II	18	8
ECO1007S	Economics for Engineers	18	5
	Humanities Elective	18	
	Total credits per year	**126**	

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CIV2020X	Practical Experience	0	6
CIV4035C	Design Project	24	8
CIV4041F	Professional Practice	12	8
CIV4042F	Waste Water Treatment	12	8
CIV4044S	Research Project	48	8
CIV4046F	Transportation Engineering	18	8
EGS1005F	Introduction to Environmental Assessment & Management	12	5
	Total credits per year	**126**	

Students are reminded of the university rules for undergraduate degrees as printed in this handbook. In particular it should be noted that timetable clashes are not allowed (this rule also applies to courses that are repeated) and that preference should be given to courses in arrears (Rule FB3.4). In the final year of study students may get concessions for a maximum of 18 credits per semester over and above the published final year core curriculum to repeat outstanding courses from prior years or attempt additional electives subject to the requirements of the three capping courses: CIV4041F, CIV4035C and CIV4044S. All applications for concessions must be made on the prescribed form for consideration by the Programme Convenor and the departmental Concessions Committee for a final decision.

Elective Courses

It is a requirement of the Engineering Council of South Africa (ECSA) that all engineering graduates be exposed to complementary studies which, inter alia, broaden the student's perspective in the humanities, social sciences or other areas to support an understanding of the world. To this end, every prospective graduate must take at least one course from a list of approved electives. It is the responsibility of the student to ensure that there are no lecture or tutorial or examination timetable clashes for courses which s/he wishes to take.

The core curriculum changes from time to time and it is the responsibility of each student to check the accumulating total of core course credits he or she has completed at any stage, in order to determine any shortfall from the minimum number of 576 credits and the courses required for graduation. In the event of a shortfall, s/he may have to register for additional elective courses.

Course descriptions are set out in the section Departments in the Faculty and Courses Offered. The course code abbreviation for Civil Engineering is CIV.

Programme for University of Technology Transferees to Bachelor of Science in Engineering in Civil Engineering
[EB002CIV01]

The Senate criteria for granting course credits and exemptions to Technikon/University of Technology transferees entering the BSc(Eng) Civil Engineering degree programme require Technikon/University of Technology students to have obtained a matriculation exemption or the NSC endorsed for degree studies before they started their National Diploma studies, an average of at least 70% for all prescribed final year subjects and a minimum of 75% for every Mathematics course in the National Diploma examinations. Students who satisfy these criteria will be granted credits and be exempted from the following courses; CIV1005W, CIV1007S, MEC1002W, CIV2011F, CIV2020X, APG2026S and CIV2042F. Such students may register for the following courses in their first year at UCT, provided that there are no timetable clashes:

First Year Core Modules

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
MAM1020F	Mathematics 1A for Engineers	18	5
MAM1021S	Mathematics 1B for Engineers	18	5
PHY1012F	Physics A for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
CIV2039S	Geotechnical Engineering I	16	6
CIV2040S	Fluid Mechanics	8	6
GEO1008F	Introduction to Geology for Civil Engineers	12	5
	Total credits per year	**124**	

After completing the above courses, subject to rule FB8.2, students will be required to complete the remainder of all prescribed Second Year, Third Year, Fourth Year courses including the elective in complementary studies. Note that it will not ordinarily be possible for Technikon/University of Technology transferees to complete the degree in less than four years.

Construction Economics and Management

Bachelor of Science in Construction Studies
BSc (Construction Studies)[EB015CON04]

Programme Convener:
Ms K Le Jeune, BSc(QS) MSc(Property Studies) *Cape Town* PrQS PMAQS MRICS

The curriculum of the 3-year BSc in Construction Studies programme equips graduates to: use computer packages for computer-aided draughting presentation, scheduling and information processing; manage and prepare tender and contractual documents relating to building work; estimate cost and undertake financial management of construction projects; manage the construction of buildings and related infrastructure; manage the human resources within a construction firm; understand and evaluate economic issues concerning the construction sector and the construction firm at both a micro and macro level; understand the time value of money and apply discounted cash flow techniques for evaluating alternative property investments; communicate with construction professionals concerning spatial concepts, financial issues and construction assembly problems. The aims of the programme are: to provide employable management graduates to the construction industry; to fully satisfy the criteria for accreditation in terms of the requirements of the Chartered Institute of Building (CIOB), the South African Council for the Project and Construction Management Professions (SACPCMP), the Royal Institution of Chartered Surveyors (RICS), and the South African Council for the Quantity Surveying Profession (SACQSP).

A candidate shall complete approved courses of a value not less than 450 credits and shall comply with all the prescribed curriculum requirements (which may in any given year exceed 450 credits).

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CIV1006S	Building Science I	16	5
CON1004W	Construction Technology I	32	5
CON1010S	Construction Information Systems	8	5
BUS1036F	Evidence-based Management	18	5
ECO1010F	Microeconomics	18	5
ECO1011S	Macroeconomics	18	5
MAM1010F	Mathematics 1010	18	5
MEC1002W	Engineering Drawing	16	5
CON1007X	Practical Training	0	5
	Total credits per year	**144**	

Second Year Core Modules

Code	Course	NQF Credits	HEQSF Level
ACC1006S	Financial Accounting I	18	5
APG2026F	Construction Surveying	16	6
CML1001F	Business Law I	18	5
CML2005F	Labour Law	18	6
CON1019S	Professional Communication Studies	16	5
CON2006W	Construction Technology II	32	6
CON2020S	Construction Management I	16	6
CON2022W	Measurement & Design Appraisal I	16	6
CON2013X	Practical Training	0	6
	Total credits per year	**150**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CON3012W	Construction Technology III	32	7
CON3030S	Construction Costing	16	7
CON3031W	Measurement & Design Appraisal II	32	7
CON3032W	Applied Contract Law I	12	7
CON3033F	Property Studies I	16	7
CON3038W	Construction Management II	32	7
CON3043W	Cost Engineering under Uncertainty	16	7
CON3023X	Practical Training	0	7
	Total credits per year	**156**	

Bachelor of Science in Property Studies
BSc(Property Studies)[EB017CON03]

Associate Professor and Programme Convenor:
MM Mooya, BSc(Land Economy) *Copperbelt* MPhil(Land Economy) *Cantab* PhD(Real Estate) *Pret*

The curriculum of the 3-year BSc in Property Studies programme equips graduates to: manage tender and contractual documents relating to building work; undertake financial analysis and financial management of property developments; undertake the valuation of fixed property; manage the human resources within a property firm; understand and evaluate economic issues concerning the property sector and the property firm at both a micro and macro level; communicate with construction and property professionals concerning spatial concepts, financial issues and construction assembly problems; inter-relate with colleagues and successfully manage and/or participate in team working situations; appreciate social and commercial business values within the context of codes of professional conduct and legal liability; construct solutions which relate to practical real-life problems and resolve disputes using appropriate methods; frame research questions, identify, collect and collate primary and secondary data sources and be aware of quantitative analysis methods; and understand the legal framework within which the property development, property valuation and property management processes occur. The aims of the programme are to provide employable graduates to the property industry; and to satisfy the criteria for accreditation in terms of the requirements of the South African Council for the Property Valuers Profession (SACPVP), and the Royal Institution of Chartered Surveyors (RICS).

A candidate shall complete approved courses of a value not less than 454 credits and shall comply with all the prescribed curriculum requirements (which may in any given year exceed 454 credits).

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CON1011F	Property Studies I A	16	5
CON1012S	Property Studies I B	16	5
CON1015S	Property Information Systems	8	5
CON1017S	Property Investment Mathematics I	8	5
CON1018W	Building Technology I T	16	5
BUS1036F	Evidence-based Management	18	5
ECO1010F	Microeconomics	18	5
ECO1011S	Macroeconomics	18	5
MAM1010F	Mathematics 1010	18	5
STA1000S	Introductory Statistics	18	5
	Total credits per year	**154**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
ACC1006F/S	Financial Accounting I	18	5
CML1001F	Business Law I	18	5
CON2024S	Property Studies II A	16	6
CON2027F	Real Property Law I	16	6
CON2029S	Measurement	8	6
CON2030F	Property Investments Mathematics II	8	6
CON2031S	Property Studies II B	16	6
FTX2020F	Business Finance	18	6
	Electives	34	
	Total credits per year	**152**	

Elective Core Courses

Courses totalling a minimum of 34 credits must be chosen from the following:

Code	Course	NQF Credits	HEQSF Level
BUS2010F/S	Marketing I	18	6
CML2005F	Labour Law	18	6
ECO2003F	Microeconomics II	18	6
ECO2004S	Macroeconomics II	18	6
END1019L	Social Infrastructures: Engaging with Community for Change	18	5
STA2020F	Applied Statistics	24	6

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CML2010S	Business Law II	18	6
CON1019F	Professional Communication Studies	16	5
CON3034F	Property Studies III A	16	7
CON3035S	Property Studies III B	16	7
CON3036W	Property and Contract Law	16	7
CON3040W	Cost Engineering I T	16	7
CON3041F	Property Studies III C	16	7
	Electives	34	
	Total credits per year	**148**	

Third Year Elective Core Courses

Courses totalling a minimum of 34 credits must be chosen from the following:

Code	Course	NQF Credits	HEQSF Level
ACC1012S	Business Accounting	18	5
ACC2022F/S	Management Accounting I	18	6
BUS2010F/S	Marketing I	18	6
CML2001F	Company Law	18	6
CML2005F	Labour Law	18	6
CON3039S	Construction Management I T	16	7
ECO2003F	Microeconomics II	18	6
ECO2004S	Macroeconomics II	18	6
END1019L	Social Infrastructures: Engaging with Community for Change	18	5
STA2020F	Applied Statistics	24	6
STA3022F	Research and Survey Statistics	36	7

Course descriptions are set out in the section Departments in the Faculty and Courses Offered. The course code abbreviation for Construction Economics and Management is CON.

Electrical Engineering

Bachelor of Science in Engineering in Electrical Engineering 4-year curriculum
BSc(Engineering)(Electrical Engineering)[EB009EEE01]

Professor and Programme Convener:
P Barendse, MSc(Eng) PhD *Cape Town* MIEEE

The BSc(Eng) Degree in Electrical Engineering covers a wide range of activities and disciplines. Students are able to select final year courses which allow some degree of specialisation in one or more disciplines such as Control & Instrumentation, Digital Systems, Electronics, Nuclear Engineering, Power Electronics and Machines, Power and Energy Systems, Signal & Image Processing and Telecommunications and RF & Microwave Systems.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
CSC1015F	Computer Science 1015	18	5
EEE1006F	Introduction to Electronic Engineering	12	5
MAM1020F	Mathematics IA for Engineers	18	5
MEC1003F	Engineering Drawing	8	5
PHY1012F	Physics A for Engineers	18	5
AXL1200S	Culture, Identity & Globalisation in Africa	8	5
CSC1016S	Computer Science 1016	18	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1021S	Mathematics IB for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
EEE1000X	Practical Training	0	5
	Total credits per year	**148**	

Second Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE2045F	Analogue Electronics	16	6
EEE2046F	Embedded Systems I	16	6
EEE2048F	Professional Communication for Electrical Engineering	8	6
MAM2083F	Vector Calculus for Engineers	16	6
MEC1009F	Introduction to Engineering Mechanics	16	5
EEE2044S	Introduction to Power Engineering	16	6
EEE2047S	Signals and Systems I	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2026S	Project Management	8	6
PHY2010S	Electromagnetism for Engineers	16	6
	Total credits per year	**144**	

Third Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE3088F	Electrical Engineering Design Principles	8	7
EEE3089F	Electromagnetic Engineering	16	7
EEE3090F	Electronic Devices and Circuits	16	7
EEE3091F	Energy Conversion	16	7
EEE3092F	Signals & Systems II	16	7

Code	Course	NQF Credits	HEQSF Level
EEE3093S	Communication & Network Engineering	16	7
EEE3094S	Control Systems Engineering	16	7
EEE3098S	Engineering Design: Electrical Engineering	8	7
EEE3100S	Power Systems Engineering	16	7
EEE3000X	Practical Training	0	7
	Approved Complementary Studies Elective F/S	16	
	Total credits per year	**144**	

Fourth Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE4113F	Engineering System Design	16	8
CML4607Z	Law for Engineers	8	8
EEE4006C	Professional Communication Studies	8	8
EEE4051C	New Venture Planning	8	8
MEC4063C	Industrial Ecology	8	8
EEE4022S	Final Year Project	40	8

Fourth Year Elective Core Courses (EE)

Select courses amounting to at least 48 credits from the following:

At least one course from:

Code	Course	NQF Credits	HEQSF Level
EEE4115F	Power Distribution & Transmission Networks	16	8
EEE4118F	Process Control & Instrumentation	16	8
EEE4121F	Mobile and Wireless Networks	16	8

And further courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4114F	Digital Signal Processing	16	8
EEE4086F	Microwave Engineering	16	8
EEE4116F	Power Systems Analysis, Operation & Control	16	8
EEE4117F	Electrical Machines & Power Electronics	16	8
EEE4122C	Communication Engineering	8	8
EEE4123C	Electrical Machines & Drives	8	8
HUB4045F	Introduction to Medical Imaging & Image Processing	12	8
	Total credits per year (minimum)	**140**	

Note: Some elective core courses in the first semester are in the same timetable slots and cannot be taken concurrently.

The following courses may be of interest, timetable permitting, and require approval:

Code	Course	NQF Credits	HEQSF Level
END1019L	Social Infrastructures: Engaging with community for change	18	5
EEE2051L	Practical Electronics, Components, Modules & Design	8	6
HUB2005F	Introduction to Medical Engineering	8	6

Bachelor of Science in Engineering in Electrical Engineering 5-year curriculum
BSc(Engineering)(Electrical Engineering)[EB809EEE01]

Professor and Programme Convener:
P Barendse, MSc(Eng) PhD *Cape Town* MIEEE

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with

assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE1006F	Introduction to Electronic Engineering	12	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
PHY1014F	Physics A for ASPECT	18	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1024S	Mathematics IB for Engineers Extended	18	5
PHY1015S	Physics B for ASPECT	18	5
	Total credits per year	**96**	

Second Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
CSC1015F	Computer Science 1015	18	5
EEE2045F	Analogue Electronics	16	6
MAM2085F	Vector Calculus for ASPECT	16	6
MEC1003F	Engineering Drawing	8	5
CSC1016S	Computer Science 1016	18	5
EEE2047S	Signals and Systems I	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2026S	Project Management	8	6
EEE1000X	Practical Training	0	5
	Total credits per year	**116**	

Third Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE2046F	Embedded Systems I	16	6
EEE2048F	Professional Communication for Electrical Engineering	8	6
EEE3090F	Electronic Devices and Circuits	16	7
MEC1009F	Introduction to Engineering Mechanics	16	5
AXL1200S	Culture, Identity & Globalisation in Africa	8	5
EEE2044S	Introduction to Power Engineering	16	6
EEE3094S	Control Systems Engineering	16	7
PHY2010S	Electromagnetism for Engineers	16	6
	Total credits per year	**112**	

Fourth Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE3088F	Electrical Engineering Design Principles	8	7
EEE3089F	Electromagnetic Engineering	16	7

Code	Course	NQF Credits	HEQSF Level
EEE3091F	Energy Conversion	16	7
EEE3092F	Signals & Systems II	16	7
CML4607Z	Law for Engineers	8	8
EEE3093S	Communication & Network Engineering	16	7
EEE3098S	Engineering Design: Electrical Engineering	8	7
EEE3100S	Power Systems Engineering	16	7
EEE3000X	Practical Training	0	7
	Approved Complementary Studies Elective F/S	16	
	Total credits per year	**120**	

Fifth Year Core Courses (EE)

Code	Course	NQF Credits	HEQSF Level
EEE4113F	Engineering System Design	16	8
EEE4006C	Professional Communication Studies	8	8
EEE4051C	New Venture Planning	8	8
MEC4063C	Industrial Ecology	8	8
EEE4022S	Final Year Project	40	8

Fifth Year Elective Core Courses (EE)
Select courses amounting to at least 48 credits from the following:
At least one course from:

Code	Course	NQF Credits	HEQSF Level
EEE4115F	Power Distribution & Transmission Networks	16	8
EEE4118F	Process Control & Instrumentation	16	8
EEE4121F	Mobile and Wireless Networks	16	8

And further courses from

Code	Course	NQF Credits	HEQSF Level
EEE4114F	Digital Signal Processing	16	8
EEE4086F	Microwave Engineering	16	8
EEE4116F	Power Systems Analysis, Operation & Control	16	8
EEE4117F	Electrical Machines & Power Electronics	16	8
EEE4122C	Communication Engineering	8	8
EEE4123C	Electrical Machines & Drives	8	8
HUB4045F	Introduction to Medical Imaging & Image Processing	12	8
	Total credits per year (minimum)	**132**	

Note: some elective core courses in the first semester are in the same timetable slots and cannot be taken concurrently.

The following courses may be of interest, timetable permitting, and require approval:

Code	Course	NQF Credits	HEQSF Level
END1019L	Social Infrastructures: Engaging with community for change	18	5
EEE2051L	Practical Electronics, Components, Modules & Design	8	6
HUB2005F	Introduction to Medical Engineering	8	6

Bachelor of Science in Engineering in Electrical and Computer Engineering 4-year curriculum
BSc(Engineering)(Electrical and Computer Engineering)[EB022EEE02]

Associate Professor and Programme Convener:
AJ Wilkinson, BSc(Eng) *Cape Town* PhD *London*

Electrical and Computer Engineering is an interdisciplinary branch of engineering which combines a fundamental study in electrical engineering with computing. Many universities and other institutions world-wide are now offering courses or degrees in Electrical and Computer Engineering, and it is recognised that the combination of electrical engineering and computer studies equips graduates with an excellent basis upon which valuable engineering roles in modern industry can be built. Apart from receiving a thorough grounding in both electrical engineering and computing, the Electrical and Computer Engineering student at UCT gains a foundation of understanding in physical science, advanced engineering mathematics, microcomputer technology and systematic engineering design.

Electrical and Computer engineers in industry generally possess expertise across a broad range of engineering disciplines, and are especially well-suited to a career in network engineering, control & instrumentation, power systems or telecommunications. Electrical and Computer engineers may also become involved in diverse fields such as bio-medical engineering, machine vision, power electronics and machines, or signal and image processing.

The Electrical and Computer Engineering programme is administered as a distinct programme within the Department of Electrical Engineering, and advice specific to the needs of Electrical and Computer Engineering undergraduates is available to students enrolled in the programme.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
CSC1015F	Computer Science 1015	18	5
EEE1006F	Introduction to Electronic Engineering	12	5
MAM1020F	Mathematics IA for Engineers	18	5
MEC1003F	Engineering Drawing	8	5
PHY1012F	Physics A for Engineers	18	5
AXL1200S	Culture, Identity & Globalisation in Africa	8	5
CSC1016S	Computer Science 1016	18	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1021S	Mathematics IB for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
EEE1000X	Practical Training	0	5
	Total credits per year	**148**	

Second Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
EEE2045F	Analogue Electronics	16	6
EEE2046F	Embedded Systems I	16	6
EEE2048F	Professional Communication for Electrical Engineering	8	6
MAM2083F	Vector Calculus for Engineers	16	6
MEC1009F	Introduction to Engineering Mechanics	16	5
EEE2044S	Introduction to Power Engineering	16	6
EEE2047S	Signals and Systems I	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2026S	Project Management	8	6
PHY2010S	Electromagnetism for Engineers	16	6
	Total credits per year	**144**	

Third Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
CSC2001F	Computer Science 2001	24	6
EEE3088F	Electrical Engineering Design Principles	8	7
EEE3089F	Electromagnetic Engineering	16	7
EEE3090F	Electronic Devices and Circuits	16	7
EEE3092F	Signals & Systems II	16	7
EEE3096S	Embedded Systems II	16	7
EEE3097S	Engineering Design: Electrical & Computer Engineering	8	7
EEE3000X	Practical Training	0	7
	Approved Complementary Studies Elective F/S	16	

Third Year Elective Core Courses (EC)

Select two out of the following three courses. Your choices will have an impact on which 4th year electives can be taken the following year.

Code	Course	NQF Credits	HEQSF Level
CSC2002S	Computer Science 2002	24	6
EEE3093S	Communication & Network Engineering	16	7
EEE3094S	Control Systems Engineering	16	7
	Total credits per year (minimum)	**152**	

Note: All three elective 3rd year core courses can be taken, but then the complementary studies elective must be taken in the winter or summer term.

Fourth Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
EEE4113F	Engineering System Design	16	8
CML4607Z	Law for Engineers	8	8
EEE4006C	Professional Communication Studies	8	8
EEE4051C	New Venture Planning	8	8
MEC4063C	Industrial Ecology	8	8
EEE4022S	Final Year Project	40	8

Fourth Year Elective Core Courses (EC)

Select courses amounting to at least 48 credits from the following:

At least two courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4118F	Process Control & Instrumentation	16	8
EEE4120F	High Performance Digital Embedded Systems	16	8
EEE4121F	Mobile and Wireless Networks	16	8

And further courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4086F	Microwave Engineering	16	8
EEE4114F	Digital Signal Processing	16	8
EEE4122C	Communication Engineering	8	8
EEE4123C	Electrical Machines & Drives	8	8
CSC3xxx	Approved 3rd year Computer Science course	24	7
HUB4045F	Introduction to Medical Imaging & Image Processing	12	8
	Total credits per year (minimum)	**140**	

The following courses may be of interest, timetable permitting, and require approval:

Code	Course	NQF Credits	HEQSF Level
EEE4115F	Power Distribution & Transmission Networks	16	8
EEE4116F	Power Systems Analysis, Operation and Control	16	8

Code	Course	NQF Credits	HEQSF Level
EEE2051L	Practical Electronics, Components, Modules & Design	8	6
END1019L	Social Infrastructures: Engaging with community for change	18	5
HUB2005F	Introduction to Medical Engineering	8	6

Bachelor of Science in Engineering in Electrical and Computer Engineering 5-year curriculum
BSc(Engineering)(Electrical and Computer Engineering)[EB822EEE02]

Associate Professor and Programme Convener:
AJ Wilkinson, BSc(Eng) *Cape Town* PhD *London*

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
EEE1006F	Introduction to Electronic Engineering	12	5
MAM1023F	Mathematics IA for Engineers Extended	18	5
PHY1014F	Physics A for ASPECT	18	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1024S	Mathematics IB for Engineers Extended	18	5
PHY1015S	Physics B for ASPECT	18	5
	Total credits per year	**96**	

Second Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
CSC1015F	Computer Science 1015	18	5
EEE2045F	Analogue Electronics	16	6
MAM2085F	Vector Calculus for ASPECT	16	6
MEC1003F	Engineering Drawing	8	5
CSC1016S	Computer Science 1016	18	5
EEE2047S	Signals and Systems I	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2026S	Project Management	8	6
EEE1000X	Practical Training	0	5
	Total credits per year	**116**	

Third Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
CSC2001F	Computer Science 2001	24	6
EEE2046F	Embedded Systems I	16	6
EEE2048F	Professional Communication for Electrical Engineering	8	6
MEC1009F	Introduction to Engineering Mechanics	16	5
AXL1200S	Culture, Identity & Globalisation in Africa	8	5
EEE2044S	Introduction to Power Engineering	16	6
PHY2010S	Electromagnetism for Engineers	16	6
	Approved Complementary Studies Elective F/S	16	
	Total credits per year	**120**	

Fourth Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
EEE3088F	Electrical Engineering Design Principles	8	7
EEE3089F	Electromagnetic Engineering	16	7
EEE3090F	Electronic Devices and Circuits	16	7
EEE3092F	Signals & Systems II	16	7
CML4607Z	Law for Engineers	8	8
EEE3096S	Embedded Systems II	16	7
EEE3097S	Engineering Design: Electrical & Computer Engineering	8	7
EEE3000X	Practical Training	0	7

Fourth Year Elective Core Courses (EC)

Select two out of the following three courses. Your choices will have an impact on which 4th year electives can be taken the following year.

Code	Course	NQF Credits	HEQSF Level
CSC2002S	Computer Science 2002	24	6
EEE3093S	Communication & Network Engineering	16	7
EEE3094S	Control Systems Engineering	16	7
	Total credits per year (minimum)	**120**	

Fifth Year Core Courses (EC)

Code	Course	NQF Credits	HEQSF Level
EEE4113F	Engineering System Design	16	8
EEE4006C	Professional Communication Studies	8	8
EEE4051C	New Venture Planning	8	8
MEC4063C	Industrial Ecology	8	8
EEE4022S	Final Year Project	40	8

Fifth Year Elective Core Courses (EC)

Select courses amounting to at least 48 credits from the following:

At least two courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4118F	Process Control & Instrumentation	16	8
EEE4120F	High Performance Digital Embedded Systems	16	8
EEE4121F	Mobile and Wireless Networks	16	8

And further courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4086F	Microwave Engineering	16	8
EEE4114F	Digital Signal Processing	16	8
EEE4122C	Communication Engineering	8	8
EEE4123C	Electrical Machines & Drives	8	8
CSC3xxx	Approved 3rd year Computer Science course	24	7

Code	Course	NQF Credits	HEQSF Level
HUB4045F	Introduction to Medical Imaging & Image Processing 12		8
	Total credits per year (minimum)... **132**		

The following courses may also be of interest, timetable permitting, and require approval:

Code	Course	NQF Credits	HEQSF Level
EEE4115F	Power Distribution & Transmission Networks 16		8
EEE4116F	Power Systems Analysis, Operation and Control......................... 16		8
EEE2051L	Practical Electronics, Components, Modules & Design................. 8		6
END1019L	Social Infrastructures: Engaging with community for change 18		5
HUB2005F	Introduction to Medical Engineering... 8		6

Bachelor of Science in Engineering in Mechatronics 4-year curriculum
BSc(Engineering)(Mechatronics)[EB011EEE05]

Associate Professor and Programme Convener:
F Nicolls, MSc(Eng) PhD *Cape Town*

Mechatronics is an interdisciplinary branch of engineering which combines a fundamental background in mechanical engineering with light-current electrical engineering. Many universities and other institutions worldwide are now offering courses or degrees in Mechatronics, and it is increasingly recognised that this combination of mechanical and electrical engineering studies equips graduates with an excellent basis upon which to build valuable engineering roles in modern industry.

Apart from receiving a thorough grounding in both electrical and mechanical engineering, the Mechatronics student at UCT will gain a foundation in physical science, advanced engineering mathematics, electro-mechanical control theory, microcomputer technology, systematic engineering design and some principles of engineering management. In addition, the Mechatronics Programme offers final-year optional courses in related fields, such as bio-medical engineering.

The Mechatronics engineer in industry may require expertise across a broad range of engineering disciplines, and will be especially well-suited to a career in light manufacturing or process control. Mechatronics engineers may become involved in fields such as instrumentation, automation, robotics, bio-medical engineering or machine vision. The Mechatronics Programme at UCT aims to equip its graduates with a solid and broad-based engineering education, including the skills in design and the knowledge of computers and other digital systems hardware, that will be necessary for a successful future career in any of these environments. The Mechatronics programme is administered as a distinct programme within the Department of Electrical Engineering, and student advice specific to the needs of Mechatronics undergraduates is available to students on the programme.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
CSC1015F	Computer Science 1015 18		5
EEE1006F	Introduction to Electronic Engineering 12		5
MAM1020F	Mathematics IA for Engineers 18		5
MEC1003F	Engineering Drawing 8		5
PHY1012F	Physics A for Engineers 18		5
AXL1200S	Culture, Identity & Globalisation in Africa................................... 8		5
CSC1016S	Computer Science 1016 18		5
EEE1007S	Introduction to Electrical Engineering 12		5

Code	Course	NQF Credits	HEQSF Level
MAM1021S	Mathematics IB for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
EEE1000X	Practical Training	0	5
	Total credits per year	**148**	

Second Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE2045F	Analogue Electronics	16	6
EEE2046F	Embedded Systems I	16	6
EEE2048F	Professional Communication for Electrical Engineering	8	6
MAM2083F	Vector Calculus for Engineers	16	6
MEC1009F	Introduction to Engineering Mechanics	16	5
EEE2044S	Introduction to Power Engineering	16	6
EEE2047S	Signals and Systems I	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2026S	Project Management	8	6
PHY2010S	Electromagnetism for Engineers	16	6
	Total credits per year	**144**	

Third Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE3088F	Electrical Engineering Design Principles	8	7
EEE3090F	Electronic Devices and Circuits	16	7
EEE3091F	Energy Conversion	16	7
EEE3092F	Signals & Systems II	16	7
MEC2047F	Engineering Dynamics	16	6
EEE3094S	Control Systems Engineering	16	7
EEE3096S	Embedded Systems II	16	7
EEE3099S	Engineering Design: Mechatronics	8	7
MEC2045S	Applied Engineering Mechanics	16	6
EEE3000X	Practical Training	0	7
	Approved Complementary Studies Elective F/S	16	
	Total credits per year	**144**	

Fourth Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE4113F	Engineering System Design	16	8
CML4607Z	Law for Engineers	8	8
EEE4006C	Professional Communication Studies	8	8
EEE4051C	New Venture Planning	8	8
MEC4063C	Industrial Ecology	8	8
EEE4022S	Final Year Project	40	8

Fourth Year Elective Core Courses (ME)
Select courses amounting to at least 48 credits from the following:
At least two courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4117F	Electrical Machines & Power Electronics	16	8
EEE4118F	Process Control & Instrumentation	16	8
EEE4119F	Mechatronics II	16	8

And further courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4086F	Microwave Engineering	16	8

Code	Course	NQF Credits	HEQSF Level
EEE4114F	Digital Signal Processing 16		8
EEE4120F	High Performance Digital Embedded Systems 16		8
EEE4123C	Electrical Machines & Drives 8		8
HUB4045F	Introduction to Medical Imaging & Image Processing 12		8
	Total credits per year (minimum)................................. **144**		

The following courses may be of interest, timetable permitting, and require approval:

Code	Course	NQF Credits	HEQSF Level
END1019L	Social Infrastructures: Engaging with community for change 18		5
EEE2051L	Practical Electronics, Components, Modules & Design.................. 8		6
HUB2005F	Introduction to Medical Engineering.. 8		6

Course descriptions are set out in the section on Departments in the Faculty and Courses Offered. The course code abbreviation for Electrical Engineering is EEE.

Bachelor of Science in Engineering in Mechatronics 5-year curriculum
BSc(Engineering)(Mechatronics)[EB811EEE05]

Associate Professor and Programme Convener:
F Nicolls, MSc(Eng) PhD *Cape Town*

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements.

First Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE1006F	Introduction to Electronic Engineering 12		5
MAM1023F	Mathematics IA for Engineers Extended 18		5
PHY1014F	Physics A for ASPECT 18		5
EEE1007S	Introduction to Electrical Engineering 12		5
MAM1024S	Mathematics IB for Engineers Extended.. 18		5
PHY1015S	Physics B for ASPECT 18		5
	Total credits per year.. **96**		

Second Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
CSC1015F	Computer Science 1015 18		5
EEE2045F	Analogue Electronics 16		6
MAM2085F	Vector Calculus for ASPECT.. 16		6

Code	Course	NQF Credits	HEQSF Level
MEC1003F	Engineering Drawing..8		5
CSC1016S	Computer Science 1016..18		5
EEE2047S	Signals and Systems I 16		6
MAM2084S	Linear Algebra and DEs for Engineers.......................16		6
MEC2026S	Project Management 8		6
EEE1000X	Practical Training 0		5
	Total credits per year **116**		

Third Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE2046F	Embedded Systems I 16		6
EEE2048F	Professional Communication for Electrical Engineering 8		6
EEE3090F	Electronic Devices and Circuits.................................16		7
MEC1009F	Introduction to Engineering Mechanics......................16		5
AXL1200S	Culture, Identity & Globalisation in Africa...................8		5
EEE2044S	Introduction to Power Engineering.............................16		6
EEE3094S	Control Systems Engineering 16		7
PHY2010S	Electromagnetism for Engineers.................................16		6
	Total credits per year **112**		

Fourth Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE3088F	Electrical Engineering Design Principles 8		7
EEE3091F	Energy Conversion 16		7
EEE3092F	Signals & Systems II 16		7
MEC2047F	Engineering Dynamics 16		6
CML4607Z	Law for Engineers 8		8
EEE3096S	Embedded Systems II 16		7
EEE3099S	Engineering Design: Mechatronics................................8		7
MEC2045S	Applied Engineering Mechanics.................................16		6
EEE3000X	Practical Training 0		7
	Approved Complementary Studies Elective F/S 16		
	Total credits per year **120**		

Fifth Year Core Courses (ME)

Code	Course	NQF Credits	HEQSF Level
EEE4113F	Engineering System Design...16		8
EEE4006C	Professional Communication Studies 8		8
EEE4051C	New Venture Planning..8		8
MEC4063C	Industrial Ecology..8		8
EEE4022S	Final Year Project...40		8

Fifth Year Elective Core Courses (ME)
Select courses amounting to at least 48 credits from the following:
At least two courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4117F	Electrical Machines & Power Electronics 16		8
EEE4118F	Process Control & Instrumentation 16		8
EEE4119F	Mechatronics II...16		8

And further courses from:

Code	Course	NQF Credits	HEQSF Level
EEE4086F	Microwave Engineering 16		8
EEE4114F	Digital Signal Processing..16		8

Code	Course	NQF Credits	HEQSF Level
EEE4120F	High Performance Digital Embedded Systems	16	8
EEE4123C	Electrical Machines & Drives	8	8
HUB4045F	Introduction to Medical Imaging & Image Processing	12	8
	Total credits per year (minimum)	**144**	

The following courses may be of interest, timetable permitting, and require approval:

Code	Course	NQF Credits	HEQSF Level
END1019L	Social Infrastructures: Engaging with community for change	18	5
EEE2051L	Practical Electronics, Components, Modules & Design	8	6
HUB2005F	Introduction to Medical Engineering	8	6

Course descriptions are set out in the section on Departments in the Faculty and Courses Offered. The course code abbreviation for Electrical Engineering is EEE.

Access for University of Technology Transferees

Students who have completed a National Diploma or Bachelor of Technology Degree in Engineering in minimum time and with a grade average of at least 70% and a minimum of 75% for Mathematics courses will be considered for entry into the Electrical Engineering, Electrical and Computer Engineering and Mechatronics degree programmes. Students must have qualified for matriculation exemption or the NSC endorsed for degree studies prior to commencement of the ND programme. Credits and exemptions may be granted on a course by course basis, but students must complete all the core and elective core courses, or their equivalent, prescribed for the degree and pass at least 288 credits at UCT, resulting in a total credit value of at least 576 credits. All students need to meet the knowledge and learning outcomes specified by ECSA.

Mechanical Engineering

Bachelor of Science in Engineering in Mechanical & Mechatronic Engineering 4-year curriculum
BSc(Engineering)(Mechanical & Mechatronic Engineering)[EB010MEC05]

Programme Convener:
EB Ismail, BSc(Eng) MSc(Eng) *Cape Town*

The programme in Mechanical & Mechatronic Engineering (formerly Electro-Mechanical Engineering) comprises courses selected from the Electrical Engineering and Mechanical Engineering curricula. Engineering design is made central to the curriculum and thus forms the core of the programme. The programme places an emphasis on integrated studies, in the broad area of professional engineering practice associated with the processing and manufacturing industries, developing both team and individual skills. Furthermore, the programme aims to meet the increasing demand for engineers with cross-discipline skills, particularly in the fields of robotics, automated manufacturing and electro-mechanical power systems.

A candidate shall complete approved courses to a value of at least 576 credits and shall comply with all the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MEC1005W	Introduction to Mechanical Engineering	24	5
MEC1007F	Introduction to Engineering Drawing	8	5
MEC1008S	Introduction to Mechanical Design	8	5
MEC1009S	Introduction to Engineering Mechanics	16	5
PHY1012F	Physics A for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
MEC1000X	Practical Training I	0	5
	Total credits per year	**144**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CSC1017F	Introduction to Programming	16	5
EEE2041F	Introduction to Electrical Engineering & Power Utilisation	16	6
EEE2042S	Introduction to Analogue & Digital Electronics	8	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2046F	Materials Science in Mechanical Engineering	12	6
MEC2047S	Engineering Dynamics	16	6
MEC2048S	Mechanical Engineering Design	16	6
MEC2049F	Solid Mechanics I	16	6
MEC2050S	Thermofluids I	16	6
MEC2000X	Practical Training II	0	6
	Total credits per year	**148**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
EEE2046F	Embedded Systems I	16	6
EEE3044S	Energy Conversion & Utilization	8	7
EEE3061W	Mechatronics Design	12	7
MEC2026S	Project Management	8	6
MEC3023F	Mechanics of Solids II	12	7
MEC3031S	Dynamics II	16	7
MEC3033F	Thermofluids II	20	7
MEC3035S	Computer Integrated Manufacture & Robotics	8	7
MEC3037S	Professional Communication Studies	8	7
MEC3072F	Mechanical Engineering Machine Element Design II	8	7
MEC3073S	Mechanical Engineering Machine Element Design III	16	7
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**144**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
MEC4047F	Mechanical Vibrations	12	8
MEC4053Z	Measurement and Control in Mechatronics	20	8
MEC4063C	Industrial Ecology	8	8
MEC4103F	Product Design	12	8
MEC4107S	Fundamentals of Control Systems	8	8
MEC4108S	System Design	12	8
MEC4109S	Engineering Professionalism	8	8
MEC4110W	Final-Year Project	46	8
	*Approved Complementary Studies (b) elective	18	5-8
	Total credits per year	**144**	

*Elective Complementary Studies Courses:
Complementary Studies courses cover disciplines outside of engineering sciences, basic sciences and mathematics and are split into two categories according to the requirements of ECSA: (a) are essential to the practice of engineering economics, the impact of technology on society, management and effective communication, and (b) broaden a student's perspective in the humanities or social sciences to support an understanding of the world. Students must select at least 18 credits worth of approved courses which fulfil the requirements of category (b).

Bachelor of Science in Engineering in Mechanical & Mechatronic Engineering 5-year curriculum
BSc(Engineering)(Mechanical & Mechatronic Engineering)[EB810MEC05]

Programme Convener:
EB Ismail, BSc(Eng) MSc(Eng) *Cape Town*

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses to a value of at least 576 credits and shall comply with all the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics IB for Engineers Extended	18	5
MEC1005W	Introduction to Mechanical Engineering	24	5
PHY1014F	Physics A for ASPECT	18	5
PHY1015S	Physics B for ASPECT	18	5
MEC1000X	Practical Training I	0	5
	Total credits per year	**96**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
EEE2041F	Introduction to Electrical Engineering & Power Utilisation	16	6
EEE2042S	Introduction to Analogue & Digital Electronics	8	6
MAM2085F	Vector Calculus for Aspect	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC1007F	Introduction to Engineering Drawing	8	5
MEC1008S	Introduction to Mechanical Design	8	5
MEC1009S	Introduction to Engineering Mechanics	16	5
MEC2000X	Practical Training II	0	6
	Total credits per year	**104**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CSC1017F	Introduction to Programming	16	5
MEC2046F	Materials Science in Mechanical Engineering	12	6
MEC2047S	Engineering Dynamics	16	6
MEC2048S	Mechanical Engineering Design	16	6
MEC2049F	Solid Mechanics I	16	6
MEC2050S	Thermofluids I	16	6
	*Approved Complementary Studies (b) elective	18	5-8
	Total credits per year	**110**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
EEE2046F	Embedded Systems I	16	6
EEE3044S	Energy Conversion & Utilization	8	7
EEE3061W	Mechatronics Design	12	7
MEC2026S	Project Management	8	6
MEC3031S	Dynamics II	16	7
MEC3033F	Thermofluids II	20	7
MEC3035S	Computer Integrated Manufacture & Robotics	8	7
MEC3037S	Professional Communication Studies	8	7
MEC3072F	Mechanical Engineering Machine Element Design II	8	7
MEC3073S	Mechanical Engineering Machine Element Design III	16	7
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**132**	

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
MEC3023F	Mechanics of Solids II	12	7
MEC4047F	Mechanical Vibrations	12	8
MEC4053Z	Measurement and Control in Mechatronics	20	8
MEC4063C	Industrial Ecology	8	8
MEC4103F	Product Design	12	8
MEC4107S	Fundamentals of Control Systems	8	8
MEC4108S	System Design	12	8
MEC4109S	Engineering Professionalism	8	8
MEC4110W	Final-Year Project	46	8
	Total credits per year	**138**	

*Elective Complementary Studies Courses:

Complementary Studies courses cover disciplines outside of engineering sciences, basic sciences and mathematics and are split into two categories according to the requirements of ECSA: (a) are essential to the practice of engineering economics, the impact of technology on society, management and effective communication, and (b) broaden a student's perspective in the humanities or social sciences to support an understanding of the world. Students must select at least 18 credits worth of approved courses which fulfil the requirements of category (b).

Bachelor of Science in Engineering in Mechanical Engineering 4-year curriculum
BSc(Engineering)(Mechanical Engineering) [EB005MEC01]

Programme Convener:
BC Kloot, BSc(Eng) *Wits* MSc(Eng) PhD *Cape Town*

The Mechanical Engineering curriculum is structured to provide students with a fundamental understanding of solid mechanics, dynamics, thermodynamics, fluid mechanics and materials, which is conveyed via formal lectures, experimental investigations, laboratory sessions and the solving of structured problem sets. Engineering design is made central to the curriculum and thus forms the core of the programme. The programme draws in content from other Mechanical Engineering courses with design philosophies and principles of best practice, and develops both team and individual skills. The knowledge and skills that are developed through the curriculum are brought together through a number of capstone design courses and, towards the end of the degree, equip students with the skills to enter the broad area of professional engineering practice associated with the processing and manufacturing industries.

A candidate shall complete approved courses to a value of at least 576 credits and shall comply with all the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MEC1005W	Introduction to Mechanical Engineering	24	5
MEC1007F	Introduction to Engineering Drawing	8	5
MEC1008S	Introduction to Mechanical Design	8	5
MEC1009S	Introduction to Engineering Mechanics	16	5
PHY1012F	Physics A for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
MEC1000X	Practical Training I	0	5
	Total credits per year	**144**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CSC1017F	Introduction to Programming	16	5
EEE2041F	Introduction to Electrical Engineering & Power Utilisation	16	6
EEE2042S	Introduction to Analogue & Digital Electronics	8	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2046F	Materials Science in Mechanical Engineering	12	6
MEC2047S	Engineering Dynamics	16	6
MEC2048S	Mechanical Engineering Design	16	6
MEC2049F	Solid Mechanics I	16	6
MEC2050S	Thermofluids I	16	6
MEC2000X	Practical Training II	0	6
	Total credits per year	**148**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
EEE3044S	Energy Conversion & Utilization	8	7
MEC2026S	Project Management	8	6
MEC3023F	Mechanics of Solids II	12	7
MEC3031S	Dynamics II	16	7
MEC3033F	Thermofluids II	20	7
MEC3037S	Professional Communication Studies	8	7
MEC3044S	Thermofluids III	12	7
MEC3045F	Experimental Methods	12	7
MEC3060F	Materials Under Stress	8	7
MEC3069S	Production Processes	8	7
MEC3072F	Mechanical Engineering Machine Element Design II	8	7
MEC3073S	Mechanical Engineering Machine Element Design III	16	7
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**148**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
MEC4047F	Mechanical Vibrations	12	8
MEC4063C	Industrial Ecology	8	8
MEC4103F	Product Design	12	8
MEC4104F	Manufacturing and Nanotechnology	8	8
MEC4107S	Fundamentals of Control Systems	8	8
MEC4108S	System Design	12	8
MEC4109S	Engineering Professionalism	8	8
MEC4110W	Final-Year Project	46	8
	*Approved Complementary Studies (b) elective	18	5-8

Elective Core Courses

Students must select one of the following courses:

Code	Course	NQF Credits	HEQSF Level
MEC4045F	Numerical Methods in Heat and Fluid Flow	12	8
MEC4105F	Finite Element Analysis	12	8
MEC4113F	Heat Transfer and Psychrometry	12	8
	Total credits per year	**144**	

Elective Complementary Studies Courses
Complementary Studies courses cover disciplines outside of engineering sciences, basic sciences and mathematics and are split into two categories according to the requirements of ECSA: (a) are essential to the practice of engineering economics, the impact of technology on society, management and effective communication, and (b) broaden a student's perspective in the humanities or social sciences to support an understanding of the world. Students must select at least 18 credits worth of approvecourses which fulfil the requirements of category (b).

Bachelor of Science in Engineering in Mechanical Engineering 5-year curriculum
BSc(Engineering)(Mechanical Engineering) [EB805MEC01]

Programme Convener:
BC Kloot, BSc(Eng) *Wits* MSc(Eng) PhD *Cape Town*

Students on the 5-year curriculum take the same courses and credits as in the 4-year curriculum, but the courses are spaced out over 5 years to allow more time for learning new concepts, grappling with assignments, asking questions, and obtaining feedback. The 5-year curriculum is supported by ASPECT to ensure student success.

All students are admitted into the 4-year curriculum, and there are two opportunities in the first year to change to the 5-year curriculum and receive additional support from ASPECT. The first opportunity is after the initial set of class tests in the first term. The second opportunity is after the first semester's final examinations.

There are no additional tuition fees or charges for changing to the 5-year curriculum. Changing at the end of the first term is preferable as this enables students to switch before any courses are failed. Courses that are failed must be repeated and will be charged for.

A candidate shall complete approved courses to a value of at least 576 credits and shall comply with all the prescribed curriculum requirements.

First Year Core Courses

Code	Course	NQF Credits	HEQSF Level
MAM1023F	Mathematics IA for Engineers Extended	18	5
MAM1024S	Mathematics IB for Engineers Extended	18	5
MEC1005W	Introduction to Mechanical Engineering	24	5
PHY1014F	Physics A for ASPECT	18	5
PHY1015S	Physics B for ASPECT	18	5
MEC1000X	Practical Training I	0	5
	Total credits per year	**96**	

Second Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
EEE2041F	Introduction to Electrical Engineering & Power Utilisation	16	6
EEE2042S	Introduction to Analogue & Digital Electronics	8	6
MAM2085F	Vector Calculus for Aspect	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC1007F	Introduction to Engineering Drawing	8	5
MEC1008S	Introduction to Mechanical Design	8	5
MEC1009S	Introduction to Engineering Mechanics	16	5
MEC2000X	Practical Training II	0	6
	Total credits per year	**104**	

Third Year Core Courses

Code	Course	NQF Credits	HEQSF Level
CSC1017F	Introduction to Programming	16	5
MEC2046F	Materials Science in Mechanical Engineering	12	6
MEC2047S	Engineering Dynamics	16	6
MEC2048S	Mechanical Engineering Design	16	6
MEC2049F	Solid Mechanics I	16	6
MEC2050S	Thermofluids I	16	6
MEC3045F	Experimental Methods	12	7
MEC3069S	Production Processes	8	7
	*Approved Complementary Studies (b) elective	18	5-8
	Total credits per year	**130**	

Fourth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
EEE3044S	Energy Conversion & Utilization	8	7
MEC2026S	Project Management	8	6
MEC3023F	Mechanics of Solids II	12	7
MEC3031S	Dynamics II	16	7
MEC3033F	Thermofluids II	20	7
MEC3037S	Professional Communication Studies	8	7
MEC3044S	Thermofluids III	12	7
MEC3060F	Materials Under Stress	8	7
MEC3072F	Mechanical Engineering Machine Element Design II	8	7
MEC3073S	Mechanical Engineering Machine Element Design III	16	7
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**128**	

Fifth Year Core Courses

Code	Course	NQF Credits	HEQSF Level
MEC4047F	Mechanical Vibrations	12	8
MEC4063C	Industrial Ecology	8	8
MEC4103F	Product Design	12	8
MEC4104F	Manufacturing and Nanotechnology	8	8
MEC4107S	Fundamentals of Control Systems	8	8
MEC4108S	System Design	12	8
MEC4109S	Engineering Professionalism	8	8
MEC4110W	Final-Year Project	46	8

Elective Core Courses

Students must select one of the following courses:

Code	Course	NQF Credits	HEQSF Level
MEC4045F	Numerical Methods in Heat and Fluid Flow	12	8
MEC4105F	Finite Element Analysis	12	8
MEC4113F	Heat Transfer and Psychrometry	12	8
	Total credits per year	**126**	

*Elective Complementary Studies Courses

Complementary Studies courses cover disciplines outside of engineering sciences, basic sciences and mathematics and are split into two categories according to the requirements of ECSA: (a) are essential to the practice of engineering economics, the impact of technology on society, management and effective communication, and (b) broaden a student's perspective in the humanities or social sciences to support an understanding of the world. Students must select at least 18 credits worth of approved courses which fulfil the requirements of category (b).

Course descriptions are set out in the section Departments in the Faculty and Courses Offered. The course code abbreviation for Mechanical Engineering is MEC.

Access for Transferees from Universities of Technology

Students who have completed a National Diploma or Bachelor of Technology Degree in Engineering in minimum time and with a grade average of at least 70% and a minimum of 75% for Mathematics courses will be considered for entry into the Mechanical or Electro-Mechanical Engineering degree programmes. It is also a requirement to have qualified for matriculation exemption or the NSC endorsed for degree studies prior to commencement of the ND programme. Although there are situations where exemption with credit for equivalent courses may be granted, it will not ordinarily be possible to complete the degree in less than four years.

Academic Development in the Faculty of Engineering and the Built Environment

The ASPECT Programme
[EB801/EB802/EB805/EB809/EB810/EB811/EB819/EB822]

The Academic Support Programme for Engineering in Cape Town (ASPECT) is designed to help engineering students who, after being accepted into the EBE faculty, find they struggle to adapt to the initial load and pace of the degree. Students who are struggling are given opportunities during the year to transfer to the 5–year curriculum while receiving academic support from ASPECT. The programme provides a supportive environment that is sensitive to students' academic, social and emotional needs.

In the first year, ASPECT support is focused on the Mathematics and Physics courses, where ASPECT staff teach in these courses. Students also register for up to two more credit-bearing courses, specific to their programme of study, which are taught in the departments by the department responsible.

In the second year of the 5-year curriculum, students complete the remaining first year courses, two second year courses in Mathematics, the first of which is taught by ASPECT, and up to two courses from the second year engineering curriculum. After second year, the remaining courses needed to graduate are spread out to maintain an even credit load of approximately 120 credits per year.

ASPECT continues to provide non-academic support and counselling throughout the degree, monitoring and advising students as they complete the remaining degree requirements.

ASPECT STAFF

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Administrative Staff
L Nkomo

DEPARTMENTS IN THE FACULTY AND COURSES OFFERED
ARCHITECTURE, PLANNING AND GEOMATICS

The School offers the following Undergraduate Degree Programmes:

Bachelor of Architectural Studies
Bachelor of Science (Geomatics)

The Architecture and Planning division of the School is situated in the Centlivres Building on the Upper campus, fronting onto University Avenue. The Geomatics division is located on level 5 of the Menzies Building.

Staff

Professor and Director
T Berlanda, Dipl Arch, *USI*, PhD (Arch & Design) *Turin*

Professors
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H Rüther, Dipl-Ing *Bonn* PhD *Cape Town* PrS*(SA)* FRSSAf FSAAE

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C Hindes, BLA *Pretoria* MLArch
S Hull, BSc(Surv) *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *UNISA* PrL(SA)
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G Sithole, BSc(Surv)(Hons) *Zimbabwe* MSc IGP *ITC(NL)* PhD *TU Delft(NL)* LSZ *Zimbabwe*

Adjunct Senior Lecturer
N Roux, BFA *Rhodes* MA *Witwatersrand* PhD *Birkbeck*

Lecturers
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S Le Grange, BArch *Cape Town* M Urban Design *UC Berkeley*
K Singh, BSc Land Surveying, MSc Land Surveying, *Kwazulu Natal*
S Spamer, BAS *Cape Town,* B.Arch *Cape Town*
M Toffa, BAS BArch *Cape Town* MSc Architecture *Leuven*

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R Cronwright, BA MC & RP MBA *Cape Town* TRP(SA) MSA/TRP
T Klitzner, BArch *Cape Town* MLA *Penn*

Honorary Researcher
H Wolff, BSc(Arch) *Pretoria* BArch *Cape Town*

Principal Technical Officer
J Coetzee, NHD (Building Tech)
D Matthee, NHD (Mechanical Eng) ND (Surveying)

Chief Technical Officer
M Wells

Departmental Manager
J Meyer

Photographic Technician
N Stanley

Administrative Officers
T Jansen
M Joubert

Administrative Assistants
N Gihwala
N Pickover
M Waglay

Senior Secretaries
J Abrahams
M Mdluli

Print Room Manager
T Swarts

Departmental Assistant
C Ohlson

Laboratory Assistant
S Schroeder

Technical Assistant
S Matthews

IT Liaison
L Coetzee

Course Outlines

APG1003W   TECHNOLOGY I
24 NQF credits at HEQSF level 5; First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: APG1020W.
Course outline:
This course is an introduction to the basic principles and concepts of construction and structure with emphasis on the tectonic qualities and sustainability properties of architectural materials. Familiarity with technical terminology and technical drawing conventions are developed.
Lecture times: Tuesday, 2nd to 8th periods (refer to departmental timetable)
DP requirements: 80% attendance and participation and 100% completion of all tutorials, assignments and projects.
Assessment: By written examination, *en-loge* test, and examination of portfolio of all tutorials, projects and assignments.

APG1004F   HISTORY & THEORY OF ARCHITECTURE I
12 NQF credits at HEQSF level 5; First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: None
Course outline:
This course introduces students to architectural history and theory as understood through cultural studies. The course follows a chronology of World Architecture until the beginning of the 19th Century. This chronology is occasionally interrupted and reframed by thematic content based on contemporary theoretical issues and architecture.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance and participation and 100% completion of all essays, tutorials and assignments.
Assessment: By written examination and examination of all essays, presentations and assignments.

APG1005S   HISTORY & THEORY OF ARCHITECTURE II
12 NQF credits at HEQSF level 5; First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: None
Course outline:
The course follows the chronology of major administrative and stylistic architectural shifts at the Cape until the early 20th Century and introduces theoretical readings pertinent to particular buildings, precincts and epochs. Students visit, analyse and then present their findings of their assigned local case studies to the class. These case studies form the basis of research for the final essay.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance and participation and 100% completion of all projects, tutorials and assignments.
Assessment: By written examination and examination of all essays, presentations and assignments.

APG1016H   GEOMATICS I
18 NQF credits at HEQSF level 5; First year undergraduate.
Convener: Mr S Hull
Course entry requirements: None
Co-requisites: CSC1015F or CSC1017F
Course outline:
Introduction to geomatics, principles of measurement science, geometry of spatial measurement, spatial data, reference systems and datums, coordinate systems, projections, spatial computations on the plane, surveying principles and instrumentation, representation of spatial data in two dimensions, interpretation of maps and plans in three dimensions, spreadsheets.
Lecture times: 3rd period Wednesday and Friday and 6th period on alternate Mondays. Assignments on alternate Mondays 14h00-17h00.
DP requirements: Attendance at and completion of all practicals and tutorials, a minimum class test average of 40%.
Assessment: Tests count 25%, practicals and tutorials count 25%, mid-year examination of 1 ½ hours counts 25% (sub-minimum 40%), end of year examination of 1 ½ hours counts 25% (sub-minimum 40%).

APG1017F   ACADEMIC DEVELOPMENT CLASS I
0 NQF credits at HEQSF level 5; First semester, DP course. First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: APG1003W, APG1020W.
Course outline:
A seminar based practical class to support the development of visual and verbal literacy, for students in need of academic support as a result of prior education inequities.
DP requirements: None.
Assessment: Portfolio review of all project work.

APG1018S   ACADEMIC DEVELOPMENT CLASS II
0 NQF credits at HEQSF level 5; June vacation, DP course. First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: APG1003W, APG1020W or APG2039W, APG2021W.
Course outline:
A tutorial based practical class in which individual learning difficulties evident in mid-year review are clarified and which provides academic support.
DP requirements: None.
Assessment: Portfolio review of all project work.

APG1020W   DESIGN & THEORY STUDIO I
72 NQF credits at HEQSF level 5; First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: APG1003W
Course outline:
As a basic course for architecture, urban design and landscape architecture, its focus is on initiating the development of transferable design ability through the medium of architecture. Its primary objective is to introduce students to essential concepts, three dimensional spatialisation and inhabitation and to develop skills and techniques. Particular emphasis is paid to the development of productive working methods in design. The format of the course consists of short experimental exercises, longer projects and *en loge* tests.
Lecture times: Refer to departmental timetable

DP requirements: 80% attendance and participation. 100% completion of all projects and assignments.
Assessment: Theory of Design assignments and reports and/or *en-loge* design test, and examination of portfolio of all projects.

APG1021W   REPRESENTATION I
24 NQF credits at HEQSF level 5; First year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: APG1003W, APG1020W
Course outline:
This is a hands-on course, divided between freehand, geometric drawing and digital drawing. While the aim is to introduce techniques and disciplines, once understood these are intended to enhance creativity rather than conformity. The freehand drawing tutorials will address drawing elements such as line, tone, mass, texture, measure and proportion, in wet and dry media. The geometric drawing tutorials will address the elements of planar geometry as well as the projections and conventions useful to designers. The digital drawing, while introducing digital 2 & 3D visualisation in terms of view studies, material studies and lighting studies, will reiterate the visual and graphic understanding built up in the course.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance and participation and 100% completion of tutorials and assignments.
Assessment: By examination of portfolio of all projects and assignments.

APG1022X   PRACTICAL TRAINING IN GEOMATICS
0 NQF credits at HEQSF level 5
Convener: Associate Professor J Whittal
Course outline:
This course aims to consolidate knowledge and skills of field surveying and data processing learnt in the course APG1016W. Allied outcomes are to equip the student with skills relating to the workplace, which may include: group work, professional communication skills, office procedures, timekeeping, logistical planning, organisational skills and administrative procedures. Outcomes: After completing this practical training module the student should have an appreciation of basic technical surveying operations in the field and the roles of the professional, technical, assistant staff; the student should have an appreciation of office operations and data processing. The student should have a developing understanding of the following: the importance of timekeeping, communication norms and procedures within the survey team, care of equipment before, during and after fieldwork operations. The course includes practical work of not less than 2 weeks (10 working days) duration related to surveying. The student is required to submit a daily work diary, signed daily by both students and employer. Copies of observations and calculations are to be submitted. A signed letter from each employer on company letterhead must accompany the diary. The letter should confirm the practical training duration and the range of tasks undertaken. For students in the surveying stream, this is a prerequisite for third year courses.
DP requirements: Satisfactory completion determined from the following submissions: a daily diary of work signed by student and employer, copies of observations and calculations and a signed letter from the employer on a company letterhead.
Assessment: Pass/fail determined according to whether tasks have been duly performed.

APG2000F   HISTORY & THEORY OF ARCHITECTURE III
8 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: None

Course outline:
This course focuses on architectural modernism and urbanism. The intention is to give students an insight into the culture, tradition, programmes and movements of early modern architecture, as a global as well as local practice. The aim is to develop a critical understanding of the historical period.
Lecture times: Refer to departmental timetable
DP requirements: 100% completion of: tutorial assignments: seminar presentation, examination and/or essay; 80% attendance and participation in lectures and tutorials.
Assessment: By written examination as well as tutorials, presentations and/or essay.

APG2003S   HISTORY & THEORY OF ARCHITECTURE IV
8 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: None
Course outline:
This course is an introduction into postmodern architectural theory and practice. It examines the various responses to modernism after WWII and starts a debate with critical contemporary architectural concerns. It aims to offer students a meaningful framework to assess contemporary architectural issues.
Lecture times: Refer to departmental timetable
DP requirements: 100% completion of projects and assignments; seminar presentation on examination and an essay; 80% attendance and participation.
Assessment: By written examination and examination of all essays, presentations and assignments.

APG2009F   THEORY OF STRUCTURES III
6 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: None
Course outline:
Understanding the concepts of load, equilibrium, bending, shear, compression, tension and torsional forces and stresses. Understand and be able to produce various structural concepts of horizontal spanning elements and vertical elements pertaining to buildings at and beyond residential scale. The concepts will show how the structure carries the loads (in all three directions), how it connects to the vertical structure and introduction to structural materials. Here vector and other relevant force diagrams are used to argue the form and material. Structural elements include roofs, suspended floors and beams and their various evolutions. Fixed and pinned connections are introduced. Arches are developed into vaults and domes.
Lecture times: Refer to departmental timetable.
DP requirements: 80% attendance, participation and 100% completion of all essays, assignments and tests.
Assessment: By written class tests, tutorials and final examination.

APG2011S   THEORY OF STRUCTURES IV
6 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: TBA
Course entry requirements: APG2009F
Co-requisites: None
Course outline:
This course enables students to understand and produce various structural concepts to buildings at and beyond the residential scale. The concepts will show how the structure (with appropriate material choices) connects to earth. Here vector and other relevant force diagrams are used to argue

the form and material and the founding conditions. Structural elements include load bearing walls, retaining walls, foundations, basements and large span tension structures.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance, participation and 100% completion of all projects, assignments and tests.
Assessment: By written class tests, tutorials and final examination.

APG2014S   GEOMATICS II
24 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: Dr P Odera
Course entry requirements: CSC1015F or CSC1017F, APG1016F/H
Co-requisites: APG2040F, APG2041S, MAM2084F/S, STA1000S
Course outline:
This course builds further upon the introduction to co-ordinate systems provided in Geomatics I, and extends it to cover co-ordinate transformations, 3-D co-ordinate systems and time variations. The student is also introduced to the method of least squares as a means of solving over-determined systems of equations, with applications in co-ordinate transformations. Course Content: Introduction to error theory and error propagation; method of least squares - parametric case; two-dimensional co-ordinate systems; motions of the Earth; time; satellite orbits; three-dimensional co-ordinate systems and spherical trigonometry.
Lecture times: 4th period Monday-Friday. Practicals: one per week, Monday 14h00- 17h00
DP requirements: Attendance at and completion of all assignments with a minimum average of 40%, a minimum class test average of 40%.
Assessment: Tests count 15%, practical assignments count 25%, examination of 3 hours counts 60% (sub-minimum 40%).

APG2015F   GEOGRAPHIC INFORMATION SYSTEMS I
24 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: Mr S Hull
Course entry requirements: CSC1015F or CSC1017F, APG1016F/H
Co-requisites: APG2018X
Course outline:
This course aims to provide knowledge and skills in the fundamental concepts of geographic information systems and remote sensing. Course Content: GIS concepts, Cartographic concepts and GIS map production, Map Projections and their application in GIS, GIS data structures and their analysis, Spatial databases, GIS data input with special emphasis on Remote Sensing, GIS analysis and its application.
Lecture times: 4th period Monday to Friday. Practicals: one per week, Friday 14h00-17h00
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 40%.
Assessment: Tests count 20%, practical assignments count 25%, examination of 3 hours counts 55% (sub-minimum 40%).

APG2019X   PRACTICAL TRAINING I
0 NQF credits at HEQSF level 6
Convener: Associate Professor J Whittal
Course entry requirements: None
Co-requisites: APG2040F
Course outline:
This course aims to consolidate knowledge and skills learnt in the course APG2016W, to equip the student with skills relating to the workplace, which may include: group work, professional communication skills, office procedures, timekeeping, logistical planning, organisational skills and administrative procedures. The course includes practical work of not less than 2 weeks (10 working

days) duration related to surveying. The student is required to submit a daily work diary, signed daily by both students and employer. Copies of observations and calculations are to be submitted. A signed letter from each employer on a company letterhead must accompany the diary. The letter should confirm the practical training duration and the range of tasks undertaken. For students in the surveying stream, this is a prerequisite for third year courses.

Lecture times: None

DP requirements: Satisfactory completion determined from the following submissions: a daily diary of work signed by student and employer, copies of observations and calculations and a signed letter from the employer on a company letterhead.

Assessment: Pass/Fail determined according to whether the tasks have been duly performed.

APG2021W　TECHNOLOGY II

APG2021F/S versions are available for Semester Abroad students only.

24 NQF credits at HEQSF level 6; Site visits, tutorials. Second year undergraduate.

Convener: TBA

Course entry requirements: APG1003W

Co-requisites: APG2038W, APG2039W

Course outline:

Understanding materials, components, assembly systems, and generic details applicable to composite construction systems and small framed structures in reinforced concrete and steel. Development of an awareness of materials and construction as an informant of design at the scale of 2 - 4 storey buildings with basements, and of the link between design development and detail resolution both in precedent of architectural merit and in the students own design development work based on Studiowork projects. Understanding of 2d and 3d graphic representation of building assembly.

Lecture times: Refer to departmental timetable

DP requirements: 80% attendance and participation and 100% completion of all projects and assignments.

Assessment: By *en-loge* test, written test, and examination of portfolio of all tutorials, projects and assignments.

APG2026F　CONSTRUCTION SURVEYING

16 NQF credits at HEQSF level 6

Convener: Mr K Singh

Course entry requirements: Civil Engineering students: MAM1020F/S or MAM1023F/S. Construction Studies students: MAM1010F/S.

Co-requisites: None

Course outline:

This course aims to provide an understanding of graphical and spatial concepts and skills of plane surveying for students of the built environment, who are not intending to study higher courses in surveying. The course develops problem solving skills in relation to practical surveying problems and group work and technical report writing skills. The course includes the South African co-ordinate system; introduction to reduction of observations to a reference surface and projection to a mapping surface. Joins, polars, understanding error, traversing, theodolite and level instruments and their calibration, height determination by levelling and trigonometric heighting, distance measurement, tachaeometry and map creation and interpretation, GIS as a tool for representation and analysis of spatial data, construction surveying: setting out of horizontal works and vertical alignment, calculation of volumes from plan, introduction to GPS as a data collection tool.

Lecture times: 4th period Tuesday to Friday. Practicals: one per week Monday 08h00-12h00

DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 40%.

Assessment: Tests count 25%, practical assignments count 25%, examination of 3 hours counts 50% (sub-minimum 40%).

APG2026S   CONSTRUCTION SURVEYING
16 NQF credits at HEQSF level 6
Convener: Mr K Singh
Course entry requirements: Civil Engineering students: MAM1020F/S or MAM1023F/S. Construction Studies students: MAM1010F/S.
Co-requisites: None
Course outline:
This course aims to provide an understanding of graphical and spatial concepts and skills of plane surveying for students of the built environment, who are not intending to study higher courses in surveying. The course develops problem solving skills in relation to practical surveying problems and group work and technical report writing skills. The course includes the South African co-ordinate system; introduction to reduction of observations to a reference surface and projection to a mapping surface. Joins, polars, understanding error, traversing, theodolite and level instruments and their calibration, height determination by levelling and trigonometric heighting, distance measurement, tachaeometry and map creation and interpretation, GIS as a tool for representation and analysis of spatial data, construction surveying: setting out of horizontal works and vertical alignment, calculation of volumes from plan, introduction to GPS as a data collection tool.
Lecture times: 4th period Tuesday to Friday. Practicals: one per week Monday 08h00-12h00
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 40%.
Assessment: Tests count 25%, practical assignments count 25%, examination of 3 hours counts 50% (sub-minimum 40%).

APG2027X   WORK EXPERIENCE
0 NQF credits at HEQSF level 6; Second year undergraduate. DP course.
Convener: TBA
Course entry requirements: None
Co-requisites: APG2021W, APG2039W
Course outline:
Students find their own employment for a three week period of work experience during the second year mid-year break, to consolidate learning and gain exposure to career directions, requiring the submission of a logbook. Approved work experience can be undertaken in a variety of contexts, including design offices, government departments, NGOs, community-based projects, building sites, etc.
Lecture times: None
DP requirements: None.
Assessment: Submission of Work Experience Report.

APG2038W   ENVIRONMENT & SERVICES II
APG2038F/S versions are available for Semester Abroad students only.
18 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: TBA
Course entry requirements: None
Co-requisites: APG2021W, APG2039W
Course outline:
The course offers a broad understanding of building design in the context of the micro- and macro-environment. Its focus is on building performance in relation to human comfort standards. The content is developed around building science approaches and different methods for servicing medium size buildings with the incorporation of sustainable design principles as needed.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance and participation, 100% completion and submission of tutorials, projects, tests and assignments.
Assessment: By examination of all tutorials, tests, projects and assignments.

APG2039W   DESIGN & THEORY STUDIO II
APG2039F/S versions are available for Semester Abroad students only.
74 NQF credits at HEQSF level 6; 240 hours studio. Second year undergraduate..
Convener: TBA
Course entry requirements: APG1020W
Co-requisites: APG2021W, APG2038W
Course outline:
The course reiterates in more sophisticated form the issues explored in first year studio in order to gain familiarity with them. They are addressed within the exploration of the architecture of place making, conceived as having four cornerstones: it is ordered by experience, has tectonic quality, is eminently habitable and contributes to its urban context. An undercurrent is the study of design method and digital design techniques are introduced. Design exercises are linked to theoretical concerns related to the contemporary South African city in global context. The format of the course consists of experimental exercises, longer projects and en loge tests.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance and participation; 100% submission of assignments and projects.
Assessment: By portfolio examination.

APG2040F   SURVEYING 1
18 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: Mr S Hull
Course entry requirements: MAM1021F/S or MAM1004F and STA1000S; APG1016F/H
Co-requisites: None.
Course outline:
This course aims to provide students of Geomatics with an understanding of graphical and geo-spatial concepts and skills of plane surveying measuring and calculation. The course aims to develop problem solving skills in relation to practical surveying problems and to equip students with group work and technical report writing skills.
Collection of geospatial information for land management and development purposes: planning a detail survey, fieldwork methods and techniques, use of basic surveying instrumentation including theodolites, levels, electronic distance measurement; reduction of survey data to the mapping plane, plane spatial calculations, coordinate systems; reduction of heighting data and calculation of height differences; basic statistical data processing and assessment of precision and accuracy of results; representation of geo-spatial data including contouring, surface fitting; spatial data modelling and cartography; horizontal curve theory and setting out for engineering works, are covered.
DP requirements: Attendance at and completion of all practical assignments with a minimum average of 50%, a minimum class test average of 40%, and sub-minimum of 40% in the examination.
Assessment: Tests count 15%, practical assignments count 35%, mid-year examination of 3 hours counts 50% (sub-minimum 40%).

APG2041S   APPLIED SURVEYING AND GISC
14 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: Mr S Hull
Course entry requirements: DP for APG2040F and APG2015F
Co-requisites: None.
Course outline:
This course aims to consolidate and extend understanding of graphical and geo-spatial concepts. The course aims to further develop problem solving skills in relation to practical surveying problems, to equip students with group work skills and engender tolerance of diversity, and to further develop technical report writing skills. The course builds individual competency in the solution of integrated survey calculations. It consolidates basic surveying fieldwork, instrumentation and processing skills

and knowledge from the 1-week camp in the mid-semester vacation. This camp is project-based and relies on groupwork and outcomes. The course further teaches problem solving skills in relation to practical spatial data management challenges in Geoinformation Science (GISc) through a simulated office project design to consolidate skills and knowledge. The content includes GISc project planning, needs analysis, user requirements, project layout, multi-source data acquisition and conversions, data fusion, data manipulation, data models and modelling, database modelling, design and implementation (including DBMS), GISc analysis, cartographic principles and application, system implementation and system maintenance.

Lecture times: Friday afternoons from 14h00 – 17h00 and one week-long camp during the mid-semester break.

DP requirements: Attendance at and completion of all tutorials with a minimum average of 50%.

Assessment: Tutorials count 40%, Survey camp counts 20%, and the GISc project counts 40%. There is no exam.

APG3000F   HISTORY & THEORY OF ARCHITECTURE V

8 NQF credits at HEQSF level 7; Third year undergraduate.

Convener: TBA

Course entry requirements: None

Co-requisites: None

Course outline:

The subject matter of the course varies. Its broad intention is to foster a knowledge and critical perspective of current practice and theory in architecture and urbanism. The subject matter varies from year to year.

Lecture times: Refer to departmental timetable

DP requirements: 80% attendance and participation, 100% completion of all exercises and assignments.

Assessment: By examination of essays and assignments.

APG3001S   HISTORY & THEORY OF ARCHITECTURE VI

8 NQF credits at HEQSF level 7; Third year undergraduate.

Convener: TBA

Course entry requirements: None

Co-requisites: None

Course outline:

The main educational objective is to locate aspects of architectural design in relation to major theoretical and philosophical movements. The course aims to give students the means by which to locate themselves within the contradictory conditions of contemporary cultural production and thereby to articulate their own design positions.

Lecture times: Refer to departmental timetable.

DP requirements: 80% attendance and participation and 100% completion of all essays and assignments.

Assessment: By examination of essays and assignments.

APG3011S   GEOGRAPHICAL INFORMATION SYSTEMS II

24 NQF credits at HEQSF level 7; Third year undergraduate.

Convener: Associate Professor J Smit

Course entry requirements: MAM1021F/S, STA1000S, CSC1015F or CSC1017F, APG2014S, APG2015F, APG2018X or APG2041S

Co-requisites: None

Course outline:

Course Aims: This course builds on the theory developed in the GIS I course. By the end of this course the student should have developed the knowledge and skills required to design and implement specialised GIS applications and an understanding of the theory, capabilities and

limitations of various spatial analysis and optimisation techniques that are currently applied in the business of GIS. Furthermore the student should be aware of graphic design and presentation methods and have a grasp of some of the algorithms that are used in digital mapping. Certain legal and management issues are also addressed. **Course Content:** multidimensional GIS and advanced data structures, spatial data infrastructures and metadata, distributed GIS, digital cartography, GIS application design and development using software engineering tools, GIS project management, spatial analysis, copyright and privacy issues.

Lecture times: 3rd period Monday to Friday. Practicals: one per week, Monday 14h00-17h00

DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.

Assessment: Tests count 20%, practical assignments count 25%, examination of 3 hours counts 55% (sub-minimum 40%).

APG3012S   GEOMATICS III

24 NQF credits at HEQSF level 7; Third year undergraduate.

Convener: Associate Professor J Smit

Course entry requirements: BSc(Geomatics) students: MAM1000W or MAM1021F/S, STA1000S, CSC1015F or CSC1017F, APG2014S, APG2015F; APG2016W or (APG2040F and APG2041S). BSc(Hons) in Geomatics: APG2018X, APG4007F, APG4009F

Co-requisites: None

Course outline:

This course develops an understanding of the nature and concept of satellite and airborne remote sensing: the nature of remote sensing, optical radiation models, sensor models, data models spectral transforms, spatial transforms, thematic image classifications and remote sensing for decision support. This course also introduces airborne laser scanning (ALS), application and sensor systems for ALS, photogrammetry, geometry of images, image measurement and co-ordinate refinement, stereo restitution, camera calibration and photogrammetric applications.

Lecture times: 1ˢᵗ period Mon to Fri. Practicals: one per week, Tues 14h00-17h00

DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.

Assessment: Tests count 20%, SDI project counts 35%, 3D GIS / spatial statistics practical assignments count 10%, examination of 3 hours counts 35% (sub-minimum 40%).

APG3013F   NUMERICAL METHODS IN GEOMATICS

16 NQF credits at HEQSF level 7; Third year undergraduate.

Convener: Dr G Sithole

Course entry requirements: MAM2084F/S, APG2014S, APG2016W or (APG2040F and APG2041S).

Co-requisites: None

Course outline:

Course Aims: To consolidate the knowledge the student acquired in the introductory course on adjustment, and provide skills and knowledge required to solve all standard adjustment problems. Course Content: Advanced least squares modelling using the parametric adjustment case, condition equation adjustment, survey statistics, network design, elimination of nuisance parameters, combined and general case, quasi-parametric case, parametric adjustment with condition equations for the unknowns, generalised inverses, free net adjustment and S-transformation. Programming of least squares applications.

Lecture times: 3ʳᵈ period Mon-Fri. Practicals: one per week, Mon 14h00-17h00

DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.

Assessment: Tests count 15%, practical assignments count 25%, examination of 3 hours counts 60% (sub-minimum 40%).

APG3015X PRACTICAL TRAINING

0 NQF credits at HEQSF level 7; Third year undergraduate.
Convener: Associate Professor J Whittal
Course entry requirements: APG2019X, APG2016W or (APG2040F and APG2041S).
Co-requisites: None
Course outline:
This course aims to consolidate knowledge and skills learnt in geomatics courses, to equip the student with skills relating to the workplace, which may include: group work, professional communication skills, office procedures, timekeeping, logistical planning, organisational skills and administrative procedures. The course includes practical work of not less than 2 weeks (10 working days) duration related to any area of geomatics. The student is required to submit a daily work diary, signed daily by both students and employer. Copies of observations and calculations are to be submitted. A signed letter from each employer on a company letterhead must accompany the diary. The letter should confirm the practical training duration and the range of tasks undertaken.
Lecture times: None
DP requirements: Satisfactory completion determined from the following submissions: a daily diary of work signed by student and employer, copies of observations and calculations and a signed letter from the employer on a company letterhead.
Assessment: Pass/Fail determined according to whether the tasks have been duly performed.

APG3016C SURVEYING II

12 NQF credits at HEQSF level 7; Third year undergraduate..
Convener: Associate Professor J Whittal
Course entry requirements: APG1016F/H; for BSc Geomatics students APG2016W or (APG2040F and APG2041S) is also a prerequisite.
Co-requisites: None
Course outline:
Course Aims: To provide insight into the origins of the surveying discipline. To introduce some specialised instruments and methods used currently. To equip the student with a theoretical and working knowledge of satellite positioning methods. To further equip the student with group work, technical report writing, research, oral presentation, and problem solving skills, and to encourage critical enquiry. Course Content: The history of surveying in southern Africa is self-taught through reading and assessed by essay. Some additional surveying instrumentation/methods not mentioned in pre-requisite courses are introduced. Surveying with the global navigation satellite systems is covered in detail and consists of 80% of the course.
Lecture times: Third or fourth quarter. 4th period Mon-Fri. Assignments: one per week, Wed 14h00-17h00
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.
Assessment: Tests count 20%, practical assignments count 20%, examination of 1 ½ hours counts 60% (sub-minimum 40%).

APG3017D SURVEYING III

12 NQF credits at HEQSF level 7; Third year undergraduate..
Convener: Associate Professor J Whittal
Course entry requirements: APG2016W or (APG2040F and APG2041S), APG2019X, MAM1021S
Co-requisites: APG3016C.
Course outline:
Course Aims: To build on the students' knowledge and skills in surveying principles, instrumentation, and calculation. To equip the student with knowledge of various sources of error and their elimination or mitigation, as well as furthering knowledge of specialised instruments and methods used. To introduce hydrographic surveying. To further equip the student with group work,

technical report writing, research and oral presentation, problem solving skills and to encourage critical enquiry. Course Content: This course continues from Surveying I and II and provides more depth on surveying principles, instrumentation, and calculation.

Lecture times: Third or fourth quarter. 4th period Mon-Fri. Assignments: one per week, Wed 14h00-17h00

DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.

Assessment: Tests count 20%, practical assignments count 20%, examination of 1 ½ hours counts 60% (sub-minimum 40%).

APG3023W   TECHNOLOGY III

24 NQF credits at HEQSF level 7; Site visits and tutorials. Third year undergraduate.
Convener: TBA
Course entry requirements: APG2021W
Co-requisites: APG3034W, APG3037W
Course outline:
To integrate students' understanding of materials/construction with their design process, to critically and strategically work with those who will appropriately reinforce their individual designs. To extend knowledge and understanding of more advanced construction and more specialised materials and services to encompass larger and more complex buildings. To raise awareness of the importance of specialist information, and where and when to find this. Presentation of case studies of international buildings that are milestones in innovative construction principles/processes and/or materials, including issues of environmental sustainability. Revisiting basic materials and investigating more advanced techniques that extend their use to larger more complex structures. Introduction to more recent materials and technology, where and how they have been appropriately used. Students' own Studio designs are used as assignments to develop construction details and material decisions, to emphasise integration into the design process.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance, participation and 100% completion of all essays, assignments, projects and tutorials.
Assessment: By *en-loge* test and examination of portfolio of all tutorials, projects and assignments.

APG3027Z   CADASTRAL SURVEYING AND REGISTRATION PROJECTS

24 NQF credits at HEQSF level 7; Assignments, and 1-week camp-project..
Convener: Associate Professor J Whittal
Course entry requirements: APG2016W or (APG2040F and APG2041S), APG2019X.
Co-requisites: CON2027F, APG3033W
Course outline:
Course Aims: To enhance theoretical knowledge from course work with practical skills and understanding of cadastral surveying, land registration and spatial analysis. Course Content: Urban and rural cadastral farm surveys, including design, fieldwork, calculations, analysis, and plan preparation. This course includes 2 major projects, tutorials and a one-week camp project, which takes place during a vacation, away from the UCT campus.
Lecture times: Thursdays, 6th to 8th period
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%.
Assessment: Projects and assignments count 100%.

APG3028X   INDEPENDENT RESEARCH

0 NQF credits at HEQSF level 7; Third year undergraduate.
Convener: TBA
Co-requisites: APG3037W

Course outline:
Development of independent research initiative in the quantitative and qualitative analysis of architectural and urban programmatic requirements during a three week period in the mid-year break, resulting in the development of a brief for the major design project in studio.
Lecture times: None
DP requirements: None.
Assessment: Submission of research report.

APG3030F   DESIGN & THEORY STUDIO III
40 NQF credits at HEQSF level 7; For study abroad students.
Convener: TBA
Co-requisites: None
Course outline:
This course focuses on the integration of design proposals and theoretical issues in coherent responses which cross urban, landscape and architectural scales, and which are well developed in detail. The use of digital media is emphasised in terms of conceptualisation, design development and presentation. The format of the course consists of short experimental exercises, longer projects and en-loge tests. The third quarter is spent on a major project, which provides scope for individual direction within the constraints of the course objectives.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance and 100% submission of assignments and projects
Assessment: By portfolio examination

APG3033W   LAND AND CADASTRAL SURVEY LAW
16 NQF credits at HEQSF level 7; Third year undergraduate..
Convener: Associate Professor J Whittal
Co-requisites: CON2027F.
Course outline:
Case law and practical aspects of land tenure systems, ownership, fundamentals of Roman Dutch law, acquisition and cession of rights in land, land registration, cadastral systems and cadastral survey law. Statutes and case law relating to cadastral survey, registration, planning, property ownership and land information management in South Africa. International law and law of the sea. Delimitation and delineation of offshore rights. Post-apartheid land policies and legislation. Land reform and delivery issues in the developing world.
Lecture times: First semester. Tues 09h00 to 10h00. Assignments and seminars: First semester, Wed 14h00-17h00. Second semester Fri 12:00 – 12:45. Assignments and seminars: 14h00 – 16h00.
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 40%.
Assessment: Tests count 34%, assignments count 66%.

APG3034W   ENVIRONMENT & SERVICES III
6 NQF credits at HEQSF level 7; Third year undergraduate..
Convener: TBA
Course entry requirements: APG2038W.
Co-requisites: APG3023W, APG3037W.
Course outline:
Introduction of sophisticated architectural strategies for passive and hybrid environmental control systems and services for medium-scaled buildings. Best practice case studies, and independent research in relation to students' own design work.
Lecture times: Refer to departmental timetable
DP requirements: 80% attendance; 100% completion and submission of all projects and assignments.
Assessment: Final report counts 100%

APG3035F   THEORY OF STRUCTURES V

6 NQF credits at HEQSF level 7; Third year undergraduate..

Convener: TBA

Course entry requirements: APG2009F and APG2011S.

Co-requisites: None

Course outline:

Understand and be able to produce various structural concepts of all vertical and horizontal spanning elements pertaining to buildings beyond the residential scale. The concepts must show how the structure carries the load (in all three directions), and the most appropriate material choice. Here vector and other relevant force diagrams are used to argue the form and material. Structural elements include bridges, large span building structures and tall buildings, etc. planar space frames, shells, girders, etc. are explored in this section.

Lecture times: Refer to departmental timetable

DP requirements: 80% attendance and participation and 100% submission of all projects, assignments and tests.

Assessment: Tutorials and class tests (20%), examination (80%).

APG3036F   MANAGEMENT PRACTICE LAW

12 NQF credits at HEQSF level 7; Third year undergraduate.

Convener: TBA

Course outline:

The course provides a broad understanding of social and organisational principles which influence the production of the built environment as well as business principles of practice management related to architectural design and practice. Economic and legal principles are introduced in global and national contexts, giving emphasis to the following two themes: production of the built environment (incl. financial, sectoral, professional and ethical issues) and regulation of the built environment (providing an overview of multiple legislative frameworks and responsibilities, documentation methods).

Lecture times: Refer to departmental timetable

DP requirements: 80% attendance, 100% submission of lectures and tutorials.

Assessment: Tutorials and reports (50%); written examination (50%).

APG3037W   DESIGN & THEORY STUDIO III

80 NQF credits at HEQSF level 7; 1 theory and studio, 10 hours per week. \third year undergraduate..

Convener: TBA

Course entry requirements: APG2039W.

Co-requisites: APG3023W, APG3034W.

Course outline:

The course focuses on the integration of design proposals and theoretical issues in coherent responses which cross urban, landscape and architectural scales, and which are well developed in detail. The use of digital media is emphasised in terms of conceptualisation, design development and presentation. The format of the course consists of short experimental exercises, longer projects and *en-loge* tests. The third quarter is spent on a major project, which provides scope for individual direction within the constraints of the course objectives.

Lecture times: Refer to departmental timetable

DP requirements: 80% attendance and participation and 100% submission of all projects and assignments.

Assessment: By portfolio examination.

APG3038F   PROFESSIONAL COMMUNICATION STUDIES
12 NQF credits at HEQSF level 7
Convener: Associate Professor Jane English
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to develop an understanding of effective reporting. Students learn the requirements for written and oral reports in terms of planning, organisation and selection of information, as well as in terms of linguistic style and final presentation. Students will have to demonstrate proficiency in both formats.
DP requirements: 80% attendance at all sessions and 100% submission of all assignments and tests.
Assessment: Tests count 13%, assignments count 30%, Examinations: presentation examination counts 32%, written examination of 3 hours counts 25% (sub-minimum 40%).

APG4001S   GEODESY
24 NQF credits at HEQSF level 8
Convener: Dr P Odera
Course entry requirements: APG3013F, APG3016C, APG3017D, MAM2084S, STA1000S, PHY1031F, PHY1032S.
Course outline:
Course Aims: This course describes the objectives, concepts and methods of modern geodesy. On completion of this course the student will have a good understanding of the use of satellite positioning techniques in geodesy and will be able to design and carry out high precision GPS surveys. The student will also be able to design, adjust and analyse modern three-dimensional networks and transform data from one datum to another. The student will have a good understanding of the influence of the Earth's gravity field on geodetic methods and will know how to compute geoid models from gravity and satellite data. Course Content: Introduction to geodesy; satellite positioning in geodesy; geodetic networks; datum transformations; Earth gravity field.
Lecture times: 2nd period Mon to Fri. Practicals: one per week, Wed 6th to 8th period
DP requirements: Attendance at and completion of all assignments with a minimum average of 40%, a minimum class test average of 35%.
Assessment: Tests count 15%, practical assignments count 25%, examination of 3 hours counts 60% (sub-minimum 40%).

APG4002Z   LAND USE PLANNING & TOWNSHIP DESIGN
16 NQF credits at HEQSF level 8
Convener: Associate Professor J Smit
Course entry requirements: APG3016C
Course outline:
Course Aims: This course provides students with both a theoretical and a practical background in land use planning and the design of townships in the Southern African context. Course Content: Historical and theoretical bases of land use planning, hierarchy of land use plans, land use control and management. Sub-division and township layouts; site analysis. Social considerations; financial and economic considerations, institutional framework. Property development; current development issues.
Lecture times: Monday, 13h00- 17h00
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.
Assessment: Tests count 15%, practical assignments count 30%, examination of 3 hours counts 55% (sub-minimum 40%).

APG4003Z   GEOMATICS PROJECT
40 NQF credits at HEQSF level 8; 10 - 12 contact sessions, mid-year seminar..
Convener: Mr S Hull
Course entry requirements: The candidate must be able to graduate in the year in which the course is taken.
Course outline:
This project will provide an opportunity to demonstrate ability to design, execute and report on a Geomatics-related problem. Students will start a Geomatics project at the beginning of the year, and will submit a planning and proposal document before the end of the first term. Students shall then perform their project plan and report their results and conclusions in a main project report of their work in the second semester.
Lecture times: Friday, 6th to 8th period
DP requirements: None.
Assessment: Project report counts 100%.

APG4005F   ENGINEERING SURVEYING & ADJUSTMENT
18 NQF credits at HEQSF level 8
Convener: Dr G Sithole
Course entry requirements: APG3013F, APG3017D.
Course outline:
Course Aims: To provide knowledge on the design and optimisation of two- and three- dimensional engineering network, precision survey techniques and deformation analysis methods. To equip the student with problem solving skills for practical applications in precise engineering surveying and general project management. Course Content: Statistical analysis, deformation and subsidence surveys. Instrumentation and methods of precise engineering surveying, Kalman filters, engineering and industrial metrology, deformation analysis methods, case studies.
Lecture times: 2nd period Mon to Fri. Practicals: one per week, Wed 14h00-17h00.
DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.
Assessment: Tests count 15%, practical assignments count 25%, examination of 3 hours counts 60% (sub-minimum 40%).

APG4010X   GEOINFORMATICS CAMP
4 NQF credits at HEQSF level 8
Convener: Associate Professor J Smit
Course entry requirements: APG3012S.
Course outline:
This camp aims to consolidate knowledge and skills learnt in the course APG3012S. To further teach practical problem solving and production tasks in photogrammetry and remote sensing. In addition to perform 3D data modelling of results achieved and present the output by means of suitable visualisation methods. The practical work will be conducted in groups and the outcomes should be reported as a critical evaluation of the processes and methods used.
Lecture times: One week during a vacation.
DP requirements: Attendance at and completion of all assignments.
Assessment: Pass/Fail based on achieving the learning outcomes of the course.

APG4011F   GEOMATICS IV
24 NQF credits at HEQSF level 8
Convener: Dr G Sithole
Course entry requirements: APG3012S, MAM2084F/S.
Course outline:
The nature and concept of satellite and airborne remote sensing: advanced spectral and spatial image transforms, advanced thematic image classification methods, and an introduction to data fusion and

hyperspectral image analysis concepts. Processing of ALS data, including: data filtering, segmentation, object classification and 3D modelling. Photogrammetric production concepts including: aerial triangulation, DTM and ortho image production, pictometry, 3D reconstruction and visualisation.

Lecture times: 1st period Monday - Fridays. Practicals: Tuesdays 14h00 - 17h00.

DP requirements: Attendance at and completion of all assignments with a minimum average of 50%, a minimum class test average of 35%.

Assessment: Tests count 15%, practical assignments count 25%, examination of 3 hours counts 60% (sub-minimum 40%).

APG4012S GEOMATICS MANAGEMENT AND PROFESSIONALISM

24 NQF credits at HEQSF level 8

Convener: Mr K Singh

Course entry requirements: It is intended that this course is taken by students in the final year of their degree programme.

Course outline:

This course aims to prepare students for professional practice in the private and public sector and to provide an understanding of the interaction between business practices, land policies and the Geomatics profession. Topics will include: management functions (planning, controlling, organising, decision-making), human resource management, labour legislation, financial management and management accounting, taxation, capital financing, estimating, depreciation, risk management, project planning, costing, resource allocation, project control and reporting, business communication, report writing, contract law, marketing and client relations, health and safety, professionalism, professional ethics, SA Council for Professional and Technical Surveyors (including legislation and rules), different types of professional practices, partnerships and partnership law, structuring a practice, civil service in South Africa, government structures, and parastatals, The Access to Information Act, copyright, SDI, ISO, role of international associations/societies in Geomatics and social responsibility will also be covered.

Lecture times: Thursday, meridian to 9th period

DP requirements: Attendance at and completion of all assignments with a minimum average of 40%, a minimum class test average of 35%.

Assessment: Assignments count 40%, examination of 3 hours counts 60% (sub-minimum 40%).

CHEMICAL ENGINEERING

The Department offers the following degree programme:

BSc(Eng) in Chemical Engineering

The Department of Chemical Engineering is situated in the New Chemical Engineering Building, which is on the Upper Campus. Access to the Building is from South Lane, off Madiba Circle.

Website: www.chemeng.uct.ac.za

Staff

Professor and Head of Department
A Mainza, BSc(Eng)Chem *UNZA* PhD *Cape Town*

Professors
M Claeys, Dipl Ing(Chem Eng) Dr Ing *Karlsruhe*
DA Deglon, BSc(Eng) *Witwatersrand* MBA PhD *Cape Town* MSAIMM FSAAE
JCQ Fletcher, BSc(Eng)Chem PhD *Cape Town* MACS FSAAE
STL Harrison, BSc(Hons) *Cape Town* PhD *Cantab* MSAIChE SASM FSAIMM FSAAE ASSAf FWISA
PJ Kooyman, Drs Chemie (MSc) *Leiden* PhD ChemE *Delft University of Technology* MSAIChE
AE Lewis, PrEng BSc(Eng)Chem MSc PhD *Cape Town* FSAIChE FSAIMM MASSAf FSAAE FIChemE
KP Möller, BSc(Eng)Chem PhD *Cape Town*
J Petersen, BSc(Eng)Chem *Witwatersrand* PhD *Cape Town* MSAIMM
E van Steen, MSc(Eng) *Eindhoven* Dr.-Ing. *Karlsruhe* FSAIChE FSAAE AFIChemE
HB von Blottnitz, PrEng BSc(Eng)Chem *Cape Town* BSc(Hons) *UNISA* MSc *Cape Town* Dr Ing *RWTHAachen* MSAIChE

Associate Professors
M Becker, BSc(Hons) Geology MSc *Cape Town* PhD *Pretoria*
JL Broadhurst, BSc(Hons) MSc *Port Elizabeth* PhD *Cape Town*
KC Corin, BSc(Hons) PhD *Cape Town*
NF Fischer, Dipl.-Ing.(Chem Eng) *Karlsruhe* PhD *Cape Town*
A Isafiade*, BSc(Hons) Ilorin* MSc *Ife* PhD *Cape Town* AMIChemE (Director of Postgraduate Studies)
PBJ Levecque, MSc(Eng) PhD *Leuven*

Emeritus Professors
J-P Franzidis, BSc(Eng) MSc Cape Town PhD *Open* MSAIChE MSAIMM
CT O'Connor, PrEng BSc *UNISA* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAIChE FSAAE FRSSAf

Honorary Professors
JM Case, BSc(Hons) *Stellenbosch* HDE MSc *Cape Town* MEd *Leeds* PhD *Monash* MASSAf
I Govender, BSc *UDW* BSc(Hons)Physics PhD *Cape Town* HDE *UNISA*
GJ Hutchings BSc(Chem) PhD *UCL* DSC (Heterogeneous Catalysis) *London* FIChemE FRS CBE
MJ Nicol, BSc(Hons) PhD *Witwatersrand* FSAIMM, FAUSIMM
JW Niemantsverdriet, BSc (Phys+Math) MSc *Amsterdam* PhD *Delft* (TechSciences)
JG Petrie, CEng BSc(Eng)Chem *Cape Town* MSc *Houston* PhD *Cape Town* FIChemE

Honorary Associate Professor
B Cohen, BSc(Eng)Chem PhD *Cape Town*

Adjunct Professors
B J Chicksen, MBChB *Harare* FCP (SA) *Durban* MBA *Johannesburg*
P Dempsey, NHD Metallurgy *Wits Technikon* BSc *UNISA* MDP *UNISA*
CM Digby, BA Hons(Econ) *Trinity College Dublin* MA(Econ) *British Columbia* MSc(Environment) *London School of Economics and Political Science*
AS Lambert, BSc(Hons) Extractive Metallurgy *Glasgow* FSAIMM
JW Mann, BSc(Eng) Extractive Metallurgy *Witwatersrand* MBL *UNISA*
R Schouwstra, BSc(Hons) *NWU* MSc *Johannesburg* DSc *NWU*
MH Solomon, BSc(Eng)Mining, *Witwatersrand,* FSAIMM, FIQ, Mine Manager's Certificate of Competency (Metalliferous)*, MDP(Mining) *South Africa*
WA van Dyk, BEng (Chemical, Extractive Metallurgy) PhD *Stellenbosch*
DW Wright, BSc(Eng)Chem *Natal* MSAIChE FSAAE

Adjunct Associate Professor
PJ Notten, BSc(Eng)Chem PhD *Cape Town*

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L Bbosa, BSc(Eng)Elec-Mech MSc PhD *Cape Town* MSAIMM
MA Fagan-Endres, BSc(Eng)Chem *Cape Town* PhD *Cantab*
HR Heydenrych, BSc(Eng)Chem MSc *Cape Town*
TP Mokone BSc Hons(Chem) *UFS* MSc *UFS* PhD(Chem Eng) *Cape Town*
S Tai, BSc(Hons)*UMIST* MSc PhD *Delft* (Director of Undergraduate Studies)

Lecturer
T Rampai, BSc(Hons) MSc *Cape Town*

Contract Lecturers
E Govender-Opitz, BSc(Eng)Chem PhD *Cape Town*
MS Manono, BSc(Eng)Chem MSc *Cape Town* PGDBM Regenesys, AMIChemE, MSAIChE, MSAIMM
MN Naidoo, BSc(Eng)Chem Eng *UKZN*
T van Heerden, BSc(Eng)Chem MSc *Cape Town*

Honorary Research Associates
MJ Griffiths, BSc(Med)(Hons) MSc PhD *Cape Town*
M Johnstone Robertson, BSc(Eng)Chem PhD *Cape Town*
MA Petersen, BSc MSc *Cape Town* PhD *Cantab*
RP van Hille, BSc MSc PhD *Rhodes*

Chief Research Officer
MC Harris, BSc(Eng)Chem MSc *Cape Town*

Senior Research Officers
K Carden, BSc(Chem) MSc PhD *Cape Town* FWISA
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APP van der Westhuizen, BEng *Stellenbosch* MSc *Cape Town*
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RJ Huddy, BSc(Hons) PhD *Cape Town*
A Kotsiopoulos, BScChem MSc PhD *Cape Town*
N Hussain, BSc(Eng)Chem MSc *Cape Town*
NTJ Luchters, BTech *Leiden* MSc *Cape Town*
R Mohamed, BSc BScHons(Chemistry) MSc *NMMU* PhD(Chem Eng) *Cape Town*

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Chief Technical Officers
MA Jakoet, BSc(Eng) Mechatronics *Cape Town*
P Johnston, BSc *Cape Town*

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WP Koorts BTech(Chem Eng) MTech *CPUT*
CA Le Roux, NDip *CPUT* BTech(Chem) *UNISA*
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T Khoza, BSc(Eng) Chem MSc(Eng) Chem *Cape Town*
Z Le Riche, ND(Analytical Chemistry) *CPUT*
M Lisso, BSc(Eng) Chem MSc *Cape Town*
MC Richter, BSc(Hons) Physics MSc PhD *Cape Town*
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RE Van Schalkwyk, BTech(Chem Eng) *CPUT*

Department Laboratory Manager
A Mentoor, BSc(Hons) MSc *Stellenbosch*

Analytical Laboratory Manager
S Govender, BSc(AppChem) Hons(Chem) MSc *UKZN*

Department Manager
SI Pillay

Building Supervisor
E Matthews

Administrative Staff
B Cloete (Undergraduate Administrator)
B Davids (Postgraduate Administrator)
N Davids (Finance Assistant)
S Jeppie (Purchaser)
N Dili (Receptionist)
K Mfundisi (Administrative Assistant)

The Department offers both undergraduate and postgraduate programmes in Chemical Engineering. The undergraduate programme draws top school leavers from South Africa and further afield, with an annual intake of approximately 140 students. Graduates from this programme are highly sought-after in a wide variety of industries. The Department has dynamic research programmes and students who have obtained satisfactory results in their undergraduate courses are encouraged to return for postgraduate study. The Department's research activities are at present centered on:

- Biological leaching of mineral ores, with work concentrated on the fundamental processes involved
- Bioprocess engineering focused on biotransformation, process design, process kinetics, novel bioprocesses and the recovery of biological product
- Catalysis research aimed at synthesis, characterisation and modelling of heterogeneous catalysts and their application in a variety of reactions and reactor types
- Crystallization and precipitation research focusing on metal recovery in mineral processing and metal removal for environmental protection and crystallization for water treatment
- Educational research aimed at improving the quality of undergraduate teaching and learning
- Environmental process engineering, both at a conceptual and a practical level
- Hydrogen and fuel cell technologies focusing on fuel processing catalysis and devices, electrodes development and fuel cell and stack development
- Hydrometallurgy for metal extraction
- Minerals processing research focused on milling, classification and flotation of ores
- Process modelling and optimization
- Process synthesis featuring the application of pinch technology to heat and mass transfer systems as well as the control of process systems
- Value recovery from waste, contributing to industrial ecology and the circular economy
- Water remediation, treatment, recovery and footprinting

Course Outlines

CHE1001Z   INTRODUCTION TO CHEMICAL ENGINEERING
22 NQF credits at HEQSF level 5
Convener: Dr L Bbosa
Course entry requirements: None
Course outline:
This course introduces the field of chemical engineering, unit conversions, material and energy balances, process analysis and design, natural foundations, graphical analysis, engineering drawing, modelling using spreadsheets and COCO and professional development.
DP requirements: Satisfactory performance in mastery tests, competency tests, class test, projects and satisfactory attendance at contact sessions.
Assessment: Mastery tests, competency tests, class test , project, final examination.

CHE1005W   CHEMICAL ENGINEERING I
44 NQF credits at HEQSF level 5
Convener: Dr L Bbosa
Course outline:
This course introduces the field of chemical engineering, unit conversions, material and energy balances, process analysis and design, natural foundations, graphical analysis, engineering drawing, modelling using spreadsheets and COCO and professional development.
DP requirements: 80% in each mastery and competency test, 40% weighted average over class and mid-year tests, attendance all class sessions (notably project sessions), attendance at first-year camp, participation in and submitting of all practicals, assignments and projects, touch-typing at appropriate level (30 words per minute with 90% accuracy).
Assessment: Mastery tests, competency tests, class tests, June test, practicals, projects; November examination 3 hours.

CHE2000X   FIELD TRIP
4 NQF credits at HEQSF level 6
Convener: TBC
Co-requisites: CHE2005W
Course outline:
The aim of the field trip is expose the student engineer to industrial scale equipment and processes, as well as opportunities for application of material studied in class to real systems. It also provides experience of industrial safety requirements and opportunities to engage with practising engineers and other plant personnel.
Lecture times: None
DP requirements: None
Assessment: Presentation on site. Report. Attendance at feedback session. Pass/Fail.

CHE2005W   CHEMICAL ENGINEERING II
72 NQF credits at HEQSF level 6
Convener: Professor J Fletcher
Course entry requirements: CEM1000W, CHE1005W, MAM1020F/S, MAM1021S/F, PHY1012F/S, STA1008S
Co-requisites: CHE2000X
Course outline:
This course aims to further develop the understanding of chemical engineering theory and practice. The theory is taught in integrated blocks and is reinforced and contextualised by: theory-related tools (e.g. heuristics, flowsheeting, charts, tables); engineering practice-related tools and skills (e.g. sustainability, environment & economics, safety & health, communication, teamwork, drawing and computing); practicals; and project work. Detailed theory topics are:
Energy Balances and Thermodynamic Properties of Substances: ideal gas; phase diagrams; energy balance elements and influence of T and p; Bernouilli equation; simultaneous mass and energy balances; Mollier diagrams; cyclic systems; entropy.
Reaction Systems: heats of formation/reaction/combustion; mass and energy balances with reaction; chemical equilibrium; reactor mole balances; CSTR, PFR and multiple reactors; chemical kinetics; recycle effects; design using data; reactor profiles.
Interface Systems: binary systems; equilibrium diagrams; equilibrium constants; volatility; flash calculations; counter-current cascade systems; multistage vapour-liquid equilibrium; column internals; multicomponent distillation.
Heat Systems: heat transfer mechanisms; resistances in series; heat exchanger networks.
Fluid Systems: forces on submerged surfaces; fluids under constant acceleration; linear momentum and forces on bends; viscosity; laminar and turbulent flow; Hagen-Poiseuille law; friction; drag coefficients; pump characteristics.

DP requirements: 50% in Project 1, 50% in Practicals 1, 2 and 3, 40% in practical exam, 50% theory mark in each of blocks 1, 2, 3 and 4.
Assessment: Basic concept tests, competency tests, class tests, mid-year tests, practicals, projects, end of year examinations.

CHE2006S   INTRODUCTION TO BIOTECHNOLOGY
24 NQF credits at HEQSF level 6
Convener: Dr R Huddy
Course entry requirements: BIO1000F, CHE1005W
Co-requisites: CHE2005W
Course outline:
The course aims to introduce engineers to the fundamentals of biotechnology, pertinent to bioprocess engineering. This is achieved by building an understanding of the key concepts and elements of biotechnology, including molecular components, information transfer and metabolism; the basic concepts of applied microbiology, including microbial cell structure, microbial classification, cell division and nutritional requirements; and the basic concepts of molecular biology and genetic engineering, especially recombinant DNA technology. Using these, a working knowledge of microbial growth kinetics, enzymology and bioenergetics is built. Further, a working knowledge of mixed microbial culture dynamics is established. Skills are developed to enable quantitative descriptions of microbial transformations. Further a practical working knowledge of enzymology, microbial growth, kinetic studies and aseptic transfer are developed.
DP requirements: Attendance at all practical, project and tutorial sessions. Submission of all assignments, tutorials and practicals. A weighted average of 40% for the class mark (includes class tests, assignments, tutorials and practicals).
Assessment: Class test, assignment portfolio including practical assignments and written exam.

CHE3000X   WORKPLACE EXPERIENCE
0 NQF credits at HEQSF level 7
Convener: Dr T Rampai
Course outline:
Chemical Engineering students shall complete a minimum of four weeks of workplace experience (before registering for the 4th year of their studies, if possible). The work can be project-based (i.e. involve the application of knowledge and skills from the 2nd or 3rd year curriculum) and/or involve experiencing typical aspects of an engineering work environment (e.g. working in a team, data retrieval, industrial safety practices and standards, how meetings are run, typical day of an engineer, company/business driving-forces, management-structure of a company). Evidence of this work, in the form of a log book as well as a report to the satisfaction of the programme convener (or a letter of confirmation from a practising engineer that a satisfactory report has been written, if the work is confidential) shall be submitted immediately on return to campus (i.e. day of registration or first day of second semester).
DP requirements: None
Assessment: Final report. Submission of log book

CHE3006F   FUNDAMENTALS OF CHEMICAL ENGINEERING III
54 NQF credits at HEQSF level 7
Convener: Dr M Fagan-Endres
Course entry requirements: CHE2005W, MAM2084F/S
Course outline:
Course aims to further develop chemical engineering theory and practice. The theory is taught in blocks and is reinforced and contextualised by theory-related tools (heuristics, flowsheeting, charts, tables); engineering practice-related tools/skills (sustainability, environment & economics, safety & health, communication, drawing and computing); practicals and project work. Detailed theory topics: Thermodynamic systems: multicomponent mixtures, estimation of Gibbs Free Energy and

fugacity of species in mixtures; phase equilibrium in mixtures; chemical equilibrium; combined phase and chemical equilibrium and applications of computational methods to solve thermodynamic problems Solid-fluid Systems: particle characterisation; motion of a particle in a fluid and fluid through a bed of particles; sedimentation, thickening hydrocyclones and centrifugation, mixing and agitation, rheology, flow through packed beds; fluidisation and filtration. Reaction Systems: non-isothermal reactor design, Multiple reactions, Multi-step reactions: rate determining step, activated complex theory, Residence time distribution and non-ideal reactors, heterogeneous reactor design. Interface Systems: Types of diffusion, Fick's law, Maxwell-Stefan theory, molecular diffusion, single and multicomponent mass transfer analysis. Film coefficients, boundary conditions, macroscopic balances using film coefficients. Boundary layer theory, turbulent flow. Overall coefficients, use of overall coefficients, interfacial mass transfer, analogies, practical analysis of mass transfer with simultaneous heat and momentum transfer, solid-fluid reaction systems with mass transfer.
DP requirements: 40% average across all theory assessments (concept tests and class tests),attendance of all practical and project sessions, submission of all practical and project assignments.
Assessment: Basic concept tests, competency tests, class tests, practicals, projects, mid-year examinations.

CHE3007S   NON-IDEAL SYSTEMS IN CHEMICAL ENGINEERING
22 NQF credits at HEQSF level 7
Convener: Associate Professor N Isafiade
Course entry requirements: CHE2005W, MAM2083F/S, MAM2084F/S
Course outline:
This course aims to extend the concepts and understanding build in the first 2.5 years of the curriculum into real world systems and equip students with tools to analyse, design and control these systems. Dynamic systems and control: Unsteady state balances on heat, fluids, mass transfer systems, analysis of system dynamics, analytically and numerically, Process controllers, systems dynamic response and controller dynamics, controller and system stability, controller tuning, open/closed loop responses, dynamic simulations, controller design and analysis. Process systems and process industries: Systems analysis and efficiency, 2nd law analysis, exergy, overview of world industries, commodity chemicals, speciality chemicals, international drivers in chemical engineering, design of various equipment, project management, process sensitivity, site layout. Non-Ideal and Non-Standard Systems - the study of the influence of coupling multiple phenomena (phase condensation) or non-ideal properties (azeotropes) in the performance of reaction and separation systems and the development of design criteria for such systems. Integrated laboratory experience: design an experimental program, to perform the experiments and to analyse the subsequent data relevant to process control. The focus is on comparing theoretical descriptions and empirical data with experimentally observed phenomena.
DP requirements: 40% average across all theory assessments (concept tests and class tests), attendance and submission of practical.
Assessment: Basic concept tests, competency tests, class tests, practical, end of year examinations.

CHE3008S   CHEMICAL ENGINEERING PROJECT MANAGEMENT AND UNIT OPERATION DESIGN
16 NQF credits at HEQSF level 7
Convener: Professor K Moller
Course entry requirements: CHE3006F, MAM2083F/S
Co-requisites: CHE3007S
Course outline:
This course aims to develop the basic concepts of projects management and then requires application in a dedicated design project around a chemical process unit. Special focus is on the design of reactor and separation units and how they integrate within a process unit. The project entails 4 stages: (1) conceptual design, flowsheet development, mass and energy balances, (2) reactor design, (3) separator design, (4) process integration, optimisation and economics.

DP requirements: 40% average on concept test and class test, submission of all project tasks.
Assessment: Basic concept test, class test, projects, end of year examination. Satisfy the requirements of the ECSA exit level outcomes of the course.

CHE3067S   DESIGN AND OPERATION OF CATALYTIC REACTORS
16 NQF credits at HEQSF level 7
Convener: Associate Professor P Levecque
Course entry requirements: CHE2005W
Course outline:
The course focuses on the fundamental aspects of heterogeneously catalysed reactions with the aim to design reactors for catalytic reactors. The course will introduce Langmuir-Hinshelwood kinetics together with internal and external mass transport limitations to describe the rate of the process, from which catalytic reactors will be designed. Students will be expected to develop their own code to design reactors. Catalyst deactivation will be modelled. Catalyst regeneration will be modelled using classical solid-fluid models such as the shrinking core model.
DP requirements: 40% in class test, pass score on 2/3 of tutorials and 50% for design project.
Assessment: Class test 25%; Design project (design of catalytic reactor) 25%; Final examination 50%.

CHE3068S   BIOPROCESS ENGINEERING
16 NQF credits at HEQSF level 7
Convener: Professor S Harrison
Course entry requirements: CHE2005W, CHE2006S
Course outline:
The course aims to develop an advanced understanding of the fundamental engineering science of bioprocess engineering. The course will build on an adequate understanding of life sciences to address the process requirements of microbial and enzymatic processes. The fundamentals of biokinetics and bioreactor systems will be addressed. Sterilisation, aseptic operation and clean room technology will be covered, as will downstream processing for product recovery. Study of important bioprocesses will be included, with examples drawn from those of significance to South Africa. The course includes selected case studies and visits to local bioprocess industries.
DP requirements: Active participation in designated assignments and seminars. Completion of assignments, tutorials and projects.
Assessment: Written exam (60 %), Assignment portfolio (40%).

CHE3069S   MINERAL AND METALLURGICAL PROCESSING
16 NQF credits at HEQSF level 7
Convener: TBC
Course entry requirements: CHE2005W
Co-requisites: GEO2006S
Course outline:
This course aims to develop an understanding of the processes involved in the beneficiation of minerals, and will include the principles involved in comminution, classification, flotation, hydrometallurgy, pyro-metallurgy, crystallisation and precipitation. The course begins with a multimedia-based introduction to the field of mineral and metallurgical processing, from the mining operation to environmental rehabilitation. Students will be required to perform experiments and analyse data from a closed circuit comminution operation and batch or pilot scale flotation tests, and complete practicals using pilot scale leach cell and DC plasma-arc furnace units, respectively.
DP requirements: Attendance at 75% of practicals and an average of 40% in all marked assignments.
Assessment: The course will be assessed through projects, practicals and a practical exam. Projects will contribute 40%, practicals will contribute 50%, and the practical exam 10%.

CHE3070S   NUMERICAL SIMULATION FOR CHEMICAL ENGINEERS

16 NQF credits at HEQSF level 7
Convener: Professor K Möller
Course entry requirements: CHE2005W
Course outline:
This course aims to develop an advanced understanding of computer arithmetic, application of similarity transforms to reaction-diffusion and rate based mass transfer; data fitting by linear leasts squares regression; application of non-linear equations techniques in mass and energy balances (VLE); application of ODE solvers, BVP solvers and the method of lines in reaction and mass transfer systems described by ODEs and PDEs; stiffness ratio; non-linear leasts squares estimation of model parameters with variance; formulate objective functions and minimisation/maximisation of process operating models; and embedded systems.
DP requirements: Submission of all assignments.
Assessment: 10 computer assignments, 10% each = 100%.

CHE4036Z   CHEMICAL ENGINEERING DESIGN

This course is not eligible for additional assessment
36 NQF credits at HEQSF level 8
Convener: TBC
Course entry requirements: All core third year courses, CHE4048F, CHE4049F.
Course outline:
This course brings together many of the elements previously covered in the chemical engineering degree and is intended to be the culmination of the previous years' study. The course is structured around an open ended design problem and includes: process evaluation, comparison and selection; material and energy balancing; hazard analysis and operability; economic evaluation; unit operation design; plant equipment selection and specification, materials selection and plant layout; and project evaluation. The work will be presented in the form of an individual feasibility report and oral examination, followed by a group-based design in 5 or 6 member teams.
DP requirements: None
Assessment: Individual and group submissions and oral presentations. Sub-minimum:40% for each of: individual feasibility study, group-based design contribution and specialist engineering assignment. Satisfy the requirements of the ECSA exit level outcomes of the course.

CHE4045Z   CHEMICAL ENGINEERING PROJECT

This course is not eligible for additional assessment
36 NQF credits at HEQSF level 8
Convener: TBC
Course entry requirements: All core third year courses.
Course outline:
This course is an assigned experimental or theoretical investigation involving limited staff supervision. The assessment of performance is based on engineering ability and initiative displayed in the formulation of objectives, execution of the project and presentation of the results. There are limited lectures in the scientific method, survey of the literature, design of experiments, relevant analytical equipment and techniques, safety in the laboratory, the handling of wastes, introduction to statistics, analysis and interpretation of data, report writing, presentation of research findings.
Assessment: Oral presentations; project proposal; final written report; poster. Sub-minimum: Satisfactory attendance at all sessions. Satisfactory performance in written proposal and specialist oral presentation. Satisfy the requirements of the exit level outcomes of the course and a minimum of 40% for the final report.

CHE4048F   BUSINESS, SOCIETY AND ENVIRONMENT
20 NQF credits at HEQSF level 8
Convener: Professor H von Blottnitz
Course entry requirements: All core third year courses.
Co-requisites: CHE4049F
Course outline:
The course aims to provide a foundation for students to engage with their future roles as practising professionals or entrepreneurs relative to the expectations of society, and of employers. The course covers: benefit indicators, physical risk in the process industries, environmental sustainability, social impacts and license, innovation and entrepreneurship, business planning, capital and operating cost estimation, profitability assessment and engineering ethics.
DP requirements: Exit level outcomes attained for the ethics assignment and the multi-disciplinary work assignment; satisfactory participation in the group work for the risk management and new business venture planning projects.
Assessment: Class test; projects; June examination 3 hours. Sub-minimum: Satisfy the requirements of the exit level outcomes of the course.

CHE4049F   PROCESS SYNTHESIS AND EQUIPMENT DESIGN
20 NQF credits at HEQSF level 8
Convener: Dr S Tai
Course entry requirements: All core third year courses.
Co-requisites: CHE4048F
Course outline:
The course aims to familiarise students with the design of entire chemical processes, building on but going beyond the detailed sizing of major equipment as learned in third year and minor equipment, pipe work and heat exchangers as learned in second year. It covers: process flowsheeting conventions; process flowsheet development using process synthesis theory and heuristics; chemical engineering process simulation using Aspen Plus; equipment design heuristics; process control philosophy; health, safety and environmental (HSE) reviews and plant layout.
DP requirements: Average of 50% for projects. Maximum one project less than 50%. 100% for Aspen competency test. Satisfactory completion of all tutorials. Satisfy the requirements of the exit level outcomes of the course.
Assessment: Projects, tutorials, Aspen competency test, June examination 3 hours (subminimum: 50%).

CHE4057F   INDUSTRIAL ECOLOGY FOR CHEMICAL ENGINEERS
8 NQF credits at HEQSF level 8
Convener: Professor H von Blottnitz
Course entry requirements: CHE3006F, CHE3007S, CHE3008S
Co-requisites: None
Course outline:
This elective course aims to introduce 4th year chemical engineering students to the field of industrial ecology, its main topics of enquiry, the associated analysis tools, as well as the emerging practise resulting from it. Topics covered start from the biological metaphor and the systems dimension of biomimicry: interplays of producers, consumers, degraders; metabolism; symbiosis; young vs. mature eco-systems; signalling in nature. Applications covered include industrial symbiosis, material flow analysis, the circular economy, resource efficiency. Assessment is by means of one term-time assignment (40%), applying learnings to a current topic, and by a final written examination (60%).
DP requirements: Satisfactory completion of the assignment.
Assessment: Individual topical research assignment resulting in an essay or report, for 40% of the course mark. Final examination for 60% of the final course mark.

CHE4058Z   LIFE CYCLE ASSESSMENT
8 NQF credits at HEQSF level 8
Convener: Professor H von Blottnitz
Course entry requirements: 3 years of engineering or science studies at university level
Co-requisites: None
Course outline:
This course aims to familiarise students with the environmental assessment tool known as Life Cycle Assessment, the history of its development, its diverse uses, the ISO norms, the science behind some of its key impact categories (beyond carbon and water), its use to support decision-making in product systems, process systems or in policy-making. Furthermore, to develop skills and insights in the important steps of goal and scope definition, inventory modelling, data quality assessment, choice of impact assessment categories, interpretation and uncertainty propagation, partly by working with LCA software and databases. Assessment is by project 50% and written final examination 50%.
DP requirements: Attendance at 75% of class sessions.
Assessment: Project in which two product systems are modelled and the results are presented in a report. (50%) Written examination. (50%)

CHE4067F   HETEROGENEOUS CATALYSIS
16 NQF credits at HEQSF level 8
Convener: Professor P Kooyman
Course entry requirements: CHE2005W or CEM2005W
Course outline:
This course aims to introduce advanced students to basic principles in heterogeneous catalysis; diffusion and adsorption; catalyst testing (reactions, product analysis); catalyst preparation (zeolites; metal-based catalysts); catalyst characterisation; catalysed reactions: acid catalysed reactions, metal catalysed reactions, bi-functional catalysis, oxidation catalysis and important chemical processes based on heterogeneous catalysis.
DP requirements: 40% class average (class test and tutorials)
Assessment: Tutorials, class test, final examination.

CHE4068F   BIOPROCESS ENGINEERING DESIGN
16 NQF credits at HEQSF level 8
Convener: Dr S Tai
Course entry requirements: CHE3068S
Course outline:
This course aims to give advanced students an opportunity to apply all of their acquired knowledge of the fundamentals of bioprocess engineering and biotechnology to the integrated design of a complete bio-manufacturing plant
DP requirements: Completion of assignments, projects and tutorials
Assessment: Assignment portfolio.

CHE4069F   MINERAL AND METALLURGICAL PROCESSING II
16 NQF credits at HEQSF level 8
Convener: Professor A Mainza
Course entry requirements: CHE3006F, CHE3007S, CHE3008S, CHE3069S, GEO2006S
Course outline:
This course aims to equip students with the knowledge required to model and simulate mineral beneficiation processes. The course includes principles of modelling comminution, classification, flotation, hydrometallurgy, crystallisation and precipitation processes. An overview of how the geo-metallurgy model affects the design and operation of a mine is included. Simulators commonly applied to designing and optimising mineral processing circuits will be used. Students model and simulate comminution and flotation circuits separately. The modelling of hydrometallurgical

flowsheets are covered and students complete a project involving the modelling of leach cell. Crystallisation and precipitation includes modelling concepts of supersaturation; basic mechanisms of nucleation, growth, aggregation, breakage and dissolution for crystallisation and precipitation systems, applied in minerals beneficiation flowsheets.

DP requirements: Attendance at 75% of tutorials and an average of 40% in all marked projects.

Assessment: Projects.

CHE4070F   NUMERICAL OPTIMISATION FOR CHEMICAL ENGINEERS

16 NQF credits at HEQSF level 8

Convener: Professor K Möller

Course entry requirements: CHE3006F, CHE3007S, CHE3008S

Course outline:

This course aims to develop students' knowledge of rigorous optimisation techniques and tools with application to chemical engineering problems and processes. The course content consists of : convex, concave, quadratic function interpretation, objective functions, single variable optimisation: bracketing, newtons and secant methods, quadratic interpolation, multivariable optimisation: simplex, conjugate gradient concepts, indirect methods of first and second order, conjugate gradient method, newtons methods, quasi-newton, secant methods, BFGS,secant updates, non-linear programming: lagrange multipliers, conditions for a minimum(max), quadratic programming (QP), generalised reduced gradient (GRG), penalty functions, sequential quadratic programming (SQP), linear programming (LP), integer constraints (MINLP), formulating objective functions of processes with constraints, linearisation of models, and optimal control.

DP requirements: Submission of all assignments

Assessment: 10 computer assignments, 10% each = 100%.

CIVIL ENGINEERING

The Department offers the following undergraduate degree programme:

BSc (Eng) in Civil Engineering

The Department of Civil Engineering is housed in the New Engineering Building, situated on the top terrace of the Upper Campus. This brand new facility is shared with the Department of Chemical Engineering and the Faculty Office.

Staff

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P Moyo, PrEng BSc(Eng) *Zimbabwe* MSc(Eng) *Newcastle-upon-Tyne* PhD *Nanyang* FSAAE
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D Kalumba, BSc(Eng) *Makerere* MSc(Eng) *Cape Town* PhD *Newcastle-upon-Tyne*
S Skatulla, Dipl-Ing *Karlsruhe* PhD *Adelaide*

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Principal Technical Officer
TBC

Laboratory Manager/Principal Scientific Officer
N Hassen

Water Quality Laboratory Manager
N Thela, NDip Chem Eng *MUT* BTech Chem Eng *DUT* BSc Hon(Appl Sci) *Pretoria*

Chief Technical Officer
A Rule

Senior Technical Officer
T Mukaddam, ND Civil Eng *CPUT*

Departmental Manager
AB Dalwai, BSocSc *Cape Town*

Administrative Officer - Postgraduate
R Geswindt

Administrative Officer – Undergraduate
I Ncube

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A Sulo, ND Financial Management *PE FET College*
G Verster

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A Courie

Senior Secretary
C Wright

Receptionist
Z Mcoteli

Laboratory Technical Staff
L Adams
H Mafungwa
C May
E Witbooi

Workshop Assistant
M Swayiza

Course Outlines

CIV1005W   INTRODUCTION TO ENGINEERING
24 NQF credits at HEQSF level 5
Convener: Dr N Wolmarans/Professor M Zuidgeest
Course entry requirements: None
Course outline:
This course aims at forming the platform for the development of personal, academic and professional skills needed for successful study and practice of civil engineering. Skills are developed through hands-on participation in projects set in the context of civil engineering practice. A basic level of computer literacy is established. The course is designed to motivate and engage the student in the civil engineering degree and its practice. Aspects of civil engineering are introduced by means of practical sessions involving problem solving, personal, academic and professional skills, numerical and computational methods, laboratory experiments and project work, group work, fieldwork, the use of measurement techniques, and elementary aspects of planning. The course includes a module which will address the development of academic skills needed for studying in a university environment, and a module to ensure productive use of Information Technology.
DP requirements: Participate in and submit all tasks as per deadlines. Actively contribute to group work exercises. Attendance at all formal sessions. Submit Portfolio as per deadline.
Assessment: Assignments (60%), Major projects (20%), Tests (20%).

CIV1006S   BUILDING SCIENCE I
16 NQF credits at HEQSF level 5
Convener: Professor H Beushausen
Course entry requirements: None
Course outline:
The course aims to introduce students to the nature and the properties of construction materials, to provide an understanding on relevant physical, chemical and mechanical properties of common construction materials, and to highlight proper selection and application of materials in practice. The course illustrates problems that might arise through injudicious choice of materials and the reasons behind the selection of materials for particular applications. The course contents include: a general overview on relevant material properties for structural and non-structural construction materials (strength, toughness, elastic deformations, density, time-dependent deformations, durability, etc.); the nature, properties, and application of common construction materials (soils, cement and concrete, stone, timber, metals (iron and steel, aluminium, copper, brass, bronze, zinc), ceramics, glass, polymers, paints and bitumen, composites); corrosion of metals; thermal, acoustic and fire properties of building components.
DP requirements: At least two thirds of the class average for the class tests; satisfactory submissions of all assignments.
Assessment: Examination (50%), Assignments (25%), Class Tests (2 tests, 25% total). November examinations 2 hours.

CIV1007S   ENGINEERING MECHANICS

16 NQF credits at HEQSF level 5
Convener: Associate Professor S Skatulla
Course entry requirements: PHY1012F/S (DP), MAM1020F/S (DP)
Co-requisites: None
Course outline:
The course aims to introduce students to concepts of engineering mechanics, which are the foundations of structural engineering, hydraulic engineering and geotechnical engineering. It develops the concept of equilibrium, which is foundational for solving engineering problems in many civil engineering disciplines. It introduces external and internal forces as vectors. External forces include point loads in the same and different directions; uniformly and non-uniformly distributed loads; externally applied moments and pressure. Internal forces include axial, shear, bending and torsional forces. The course is restricted to the reactions of simple statically determinate systems, and simple applications to structures and fluids.
DP requirements: At least two thirds of the class average for the class tests. Student must achieve at least 40% in the final exam. Attempt all tests.
Assessment: Examination 50%, class tests 50%, November examination 3 hours

CIV2011F   MECHANICS OF MATERIALS

16 NQF credits at HEQSF level 6
Convener: Associate Professor S Skatulla
Course entry requirements: CIV1007S (DP); MAM1021F/S (DP)
Course outline:
This course aims to develop an understanding of the concepts of stress and strain; elasticity versus plasticity; effects of known actions on various cross-sections; determination of the magnitude of stresses and strains caused by prescribed actions (axial forces, bending moments, shear forces, twisting moments); fundamentals of the 2-dimensional theory of elasticity and simplifications for bars, beams and shafts.
DP requirements: At least two thirds of the class average for the class tests.
Assessment: Examination 50% - of which a sub--minimum of at least 40% must be obtained in the final exam, class tests 50%. June examination 3 hours.

CIV2020X   PRACTICAL EXPERIENCE

0 NQF credits at HEQSF level 6; 6 weeks.
Convener: Professor M Vanderschuren
Course outline:
This course requires Civil Engineering students to gain at least 6 weeks of practical experience and insight into the practice of civil engineering by working during vacations. Students are encouraged to engage in a wide variety of civil engineering work, but must ensure that adequate experience in both site work and design office practice (a minimum of three weeks in each) is achieved. This course provides the framework for gaining practical experience to supplement academic study.
DP requirements: None
Assessment: Practical Report.

CIV2039S   GEOTECHNICAL ENGINEERING I

16 NQF credits at HEQSF level 6
Convener: Ms F C Chebet
Course entry requirements: CIV2011F (DP), GEO1008F (DP).
Course outline:
This course aims to provide an understanding of the engineering principles –applied in the analysis of soil materials for civil engineering purposes. The main topics include: nature and physical characteristics of soils as engineering materials; soil structure, grain size distribution and common soil classification systems; principle of effective stress, significance of the presence of water in soil

and the effects of its movement in the ground on the engineering properties of soil, permeability of soil, seepage and flow nets; distribution of applied stresses, consolidation and settlement, analysis of soil response to loading; soil strength, stress-strain response of soils, and other theories relevant to engineering soil behaviour.
DP requirements: Submission of all assignments and a soil report. At least two thirds of the class average is required for the tests.
Assessment: Examination (50%), Continuous assessment course work - assignments, laboratory report, class tests (50%), November examination 3 hours.

CIV2040S   FLUID MECHANICS
8 NQF credits at HEQSF level 6
Convener: TBC
Course entry requirements: None.
Course outline:
This course aims to develop an understanding of fluids and fluid properties; fluid statics; pressure and pressure forces; basics of fluid flow; conservation of mass: conservation of energy; conservation of momentum; and similitude.
DP requirements: At least two thirds of the class average for the semester (the weighted sum of the tests and practicals).
Assessment: Examination (100%). November examination 2 hours.

CIV2041S   STRUCTURAL ANALYSIS I
16 NQF credits at HEQSF level 6
Convener: Professor A Zingoni
Course entry requirements: CIV2011F (DP)
Course outline:
This course aims to develop an understanding of various structural systems; conditions of equilibrium and external and internal structural indeterminacies. Topics include analysis of statically determinate structures: determination of actions in trusses, beams and frames; axial force, shearing force and bending moment diagrams; calculation of displacements by the method of successive integration; virtual work method; buckling of struts and geometric instability; thermal stresses. Computer based methods for analyses of statically determinate structures are introduced.
DP requirements: At least two thirds of the class average for the class tests; satisfactory submission of all assignments; attendance at tutorials.
Assessment: Examination: (50%), Class Tests and assignments (50%). November examination 3 hours.

CIV2042F   CONSTRUCTION MATERIALS
16 NQF credits at HEQSF level 6
Convener: Professor H Beushausen
Course entry requirements: None.
Co-requisites: None.
Course outline:
This course aims to introduce the science and application of construction materials. Topics include: engineering material properties such as strength, elastic and plastic deformations, viscoelastic and time-dependent behaviour, toughness, fracture, deterioration, durability, sustainability, heat and sound insulation, thermal conductivity; Analytical modelling and prediction of material properties; experimental investigations and interpretation of data; application of statistical principles to experimental analysis; manufacturing processes; selection of materials; elements of steel corrosion science; common construction materials such as concrete, cements, lime, clay, clay bricks, rocks, steel, cast iron, aluminium, timber, bitumen, rubber, sealants, plastics, dry-building materials.
DP requirements: Minimum of 50% average mark for the class assessments (assignments, project, test); Attendance at practicals and tutorials.

Assessment: Examination (50%), Assignments (15%); Experimental design project (20%); One class test (15%); June examination 3 hours.

CIV3042F   GEOTECHNICAL ENGINEERING II
16 NQF credits at HEQSF level 7
Convener: Associate Professor D Kalumba
Course entry requirements: CIV2039S
Course outline:
This course aims to provide an understanding of the factors influencing soil strength, and to practice the application of this knowledge by exploring the stability of slopes, retaining walls, and foundations. Geotechnical investigations are also covered.
DP requirements: Submission of all assignments. At least two thirds of the class average for the tests.
Assessment: Examination (50%), Continuous assessment course work - assignments, class tests (50%), June examination 3 hours

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CIV3043F   HYDRAULIC ENGINEERING
16 NQF credits at HEQSF level 7
Convener: Professor N P Armitage
Course entry requirements: CIV2040S (DP)
Course outline:
This course aims to develop an understanding of flow in pipelines: laminar & turbulent flow - Reynolds; head losses in pipelines & fittings; the design of pipe systems. Pump selection. Open channel flow: the steady flow equations; Froude; uniform, gradually & rapidly varied flow; hydraulic structures, e.g. flumes, weirs, spillways and control gates.
DP requirements: At least two thirds of the class average.
Assessment: Examination (100%). A sub-minimum of 40% is required in the final exam paper. June examination 3 hours.

CIV3044F   ENGINEERING HYDROLOGY
8 NQF credits at HEQSF level 7
Convener: Professor N P Armitage
Course entry requirements: STA1008F/S (DP)
Course outline:
This course aims to develop an understanding of engineering hydrology. Topics include: factors affecting runoff; flow measurements; selected flood prediction methods; flood routing; and reservoir sizing:
DP requirements: At least two thirds of the class average for the class assignments and test mark.
Assessment: Examination (50%). Exam counts 100% if this is to the advantage of the student; Assignments (20%); Tests (30%). June examination 2 hours

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CIV3045S   TRANSPORTATION PLANNING
16 NQF credits at HEQSF level 7
Convener: Professor M Vanderschuren
Course entry requirements: None.
Co-requisites: None.
Course outline:
This course aims to develop an understanding of the causes and motivations of personal travel, the means by which movement takes place, as well as the impact personal travel, freight and transport infrastructure have on the environment, economy and society. This is done by providing a grounding in techniques for modelling, analysing and assessing (multi-modal) transport systems and their impacts. Transport policy and appraisal and fundamentals of data collection, as well as professional communication (presentation skills) are included.

DP requirements: At least two thirds of the class average for the 2 class tests; submission of project and all assignments.
Assessment: Examination (50%), Class marks (50%). November examinations 3 hours

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CIV3046S   WATER TREATMENT
12 NQF credits at HEQSF level 7
Convener: Dr D Randall
Course entry requirements: CEM1008F
Course outline:
This course aims to develop an understanding of potable water quality criteria. Topics include Water treatment: objectives, processes and systems. Surface water characterization: aqueous equilibria, alkalinity, acidity, pH, buffer capacity and titration curves, log-species pH diagrams of the inorganic carbon system; pH control. Aqueous-gas phase equilibrium, conversion between concentration units, aqueous-solid phase interactions, calcium carbonate saturation, using the Modified Caldwell Lawrence Diagram for 2 and 3 phase equilibrium, changes of state with dosing and water stabilization.
DP requirements: At least two-thirds of the class average for the two class tests/or two-thirds of the class average for the tutorial tests.
Assessment: Examination (60%), class tests (2 tests – 2 hours each and counts 25%), tutorial tests (15%) of final mark. A sub-minimum exam mark of 50% and a final course mark greater than 50% are required to pass the course. November examination 3 hours.

CIV3047S   URBAN WATER SERVICES
16 NQF credits at HEQSF level 7
Convener: Professor N P Armitage
Course entry requirements: APG2026S; CIV3043F (DP) and CIV3044F (DP).
Course outline:
This course aims to develop an understanding of the design and operation of water services in urban areas (formal and informal), including: water supply and distribution; sanitation and urban drainage.
DP requirements: Complete all projects with a subminimum of 40% for each.
Assessment: Examination (40%), three design projects (60%). November examination 2 hours.

CIV3048F   STRUCTURAL ANALYSIS II
16 NQF credits at HEQSF level 7
Convener: Professor A Zingoni
Course entry requirements: CIV2041S
Co-requisites: n/a
Course outline:
This course aims to develop an understanding of flexibility versus stiffness methods in structural analysis. Analysis of statically indeterminate structures by the force method and displacement method (trusses, beams and frames); the principles of loading (types of loading, code provisions, safety factors). The course introduces computer based structural analysis of statically indeterminate structures.
DP requirements: At least two thirds of the class average for the class tests; satisfactory submission of all assignments and project.
Assessment: Two class tests (15% each); Project (loading and computer modelling of frame structure) (20%); Examination (50%). June examination 3 hours.

CIV3049S   STRUCTURAL DESIGN I
16 NQF credits at HEQSF level 7
Convener: Mr K Mudenda
Course entry requirements: CIV3048F
Co-requisites: n/a

Course outline:
This course aims to develop an understanding of behaviour, analysis and limit state design of reinforced and prestressed concrete members and steel structures. Topics include: properties of structural concrete; properties of reinforcing and prestressing steel; properties of structural steel, elastic and plastic behaviour of reinforced concrete structures and steel structures; serviceability limit-state design and ultimate limit-state design of reinforced concrete elements (beams and slabs) and steel structures.

DP requirements: At least two thirds of the class average for the class tests; satisfactory submission of all assignments. Attendance at tutorials.

Assessment: Two class tests (10% each); Design project (steel structure) (15%); Experimental design project (reinforced concrete beams) (15%); Examination (50%).**.** November examination 3 hours. Student must achieve at least 40% in final examination.

CIV4035C   DESIGN PROJECT
24 NQF credits at HEQSF level 8; 5 weeks full time duration.
Convener: Adjunct Associate Professor V Collis/Ms L Nolutshungu
Course entry requirements: All core Civil Engineering design (CIV) courses, including successful completion of their respective pre-requisites, as well as MAM2083F, MAM2084S, CIV2042F, EGS1005F and CIV4041F.
Course outline:
 This course aims to develop the competence of students to perform civil engineering planning and design of a major civil engineering project and to provide a reasonable response to the problem posed in both content and communication. This is a capstone course, which requires integration and application of a wide range of knowledge and skills developed in the programme. A key requirement is that the project posed must be a complex problem, made complex by a combination of conceptual and contextual considerations (i.e. of engineering knowledge, as well as the context in which it is applied).
DP requirements: Course outcomes, as set out in the Course Handout, are aligned with ECSA Exit Level Outcomes (ELOs), in relation to the project undertaken by the class. A student judged to have not met any course outcome will be refused a DP and will fail the course.
Assessment: Course work: with various submissions which will be set out in the Course Handout: 100%.

CIV4041F   PROFESSIONAL PRACTICE
12 NQF credits at HEQSF level 8
Convener: Ms F Chebet
Course entry requirements: Students must be potential qualifiers (i.e. anticipated final year of study).
Course outline:
This course aims to prepare student engineers for the world of civil engineering through exposure to key professional issues including: the structure of the profession; engineering economics; project prioritization, the project life cycle; engineering contracts; contract management options; tender and contract documents; project planning; universal access; engineering risk management; contract administration; Health & Safety; professional ethics; and sustainability in engineering.
DP requirements: A minimum of 50% for each of the two tests, construction project and oral presentation.
Assessment: Continuous assessment by class tests, project and presentation.

CIV4042F   WASTEWATER TREATMENT
12 NQF credits at HEQSF level 8
Convener: Dr D Ikumi
Course entry requirements: CEM1008F

Course outline:
This course aims to develop an advanced understanding of the objectives of wastewater treatment; wastewater test methods for organic, nitrogen and phosphorus content; physical characterization of wastewater, settleable, non-settleable and dissolved constituents; unit operations in wastewater treatment, primary sedimentation; 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, nutrient requirements; sewage sludge stability and disposal, and selection of sludge age.
DP requirements: At least two thirds of class average for two tests. Submission of all completed assignments in professional style by due date.
Assessment: Examination (two thirds), class tests (2 tests – 2 hours each and one third) of final mark. A minimum exam mark of 50% and a final mark greater than 50% are required to pass the course. June examination 3 hours.

CIV4044F/S   RESEARCH PROJECT
48 NQF credits at HEQSF level 8
Convener: Associate Professor R Behrens
Course entry requirements: No simultaneous registration of more than one additional course (besides CIV4035C). Students will not be permitted to undertake a research topic in a field for which they have not successfully completed the relevant core courses.
Course outline:
This course is an individual investigation into an assigned problem in civil engineering culminating in a formal written project report and a poster.
DP requirements: Submission of all interim reports, final report and poster. Satisfy all the critical course outcomes for the course to the satisfaction of both the internal and external examiners.
Assessment: Research proposal (15%), Poster (10%), Final report (75%).

CIV4045F   STRUCTURAL DESIGN II
18 NQF credits at HEQSF level 8
Convener: Professor P Moyo
Course entry requirements: CIV3048F and CIV3049S (DP)
Co-requisites: n/a
Course outline:
This advanced course introduces the full structural design process including conceptualisation, development of alternative schemes, sizing and detailing of structural elements. The course also aims to develop an understanding of the design of prestressed concrete elements and plastic design of steel elements. Topics include: introduction to conceptual design of structures including stability and robustness, design of pre-stressed beams, plastic analysis of steel beams and frames. The course includes a major design project.
DP requirements: At least two thirds of the class average for the class tests; satisfactory submission of all assignments.
Assessment: Examination (50%).Two class tests (20%); Design project (30%); June examination 4 hours.

CIV4046F   TRANSPORTATION ENGINEERING
18 NQF credits at HEQSF level 8
Convener: Professor M Zuidgeest
Course entry requirements: None
Course outline:
This course aims to provide students with an understanding of the fundamentals of road engineering and traffic analysis by providing a grounding in techniques for: (1) the geometric design of roads, freeways and intersections, including road drainage; (2) the design of pavements; (3) analysing (multi-modal) capacity of traffic facilities, including for public transport and Non-Motorized

Transportation (NMT); and (4) management and control of traffic flows (urban roads, rural roads and highways), including road pricing. The course includes a 4-credit transportation engineering design project.

DP requirements: At least two thirds of the class average for each of the class tests as well as a mark of 50% or more for the group project (after peer review).

Assessment: Examination (50%); two course tests (10% and 15%); group project (25%).   June examination 3 hours.

CONSTRUCTION ECONOMICS AND MANAGEMENT

The Department offers the following undergraduate degree programmes:

BSc in Construction Studies
BSc in Property Studies

The Department is housed on Level 5 of the Snape Building, opposite Engineering Mall, off Madiba Circle, Upper Campus.

Staff

Associate Professor and Head of Department
KA Michell, BSc(QS) MPhil *Cape Town* PhD *Salford* PrQS PMAQS MRICS MSAFMA

Professors
KS Cattell, BSc(QS) *UPE* MPhil *Cape Town* PrQS PMAQS MRICS MSAPCI MSAFMA

Associate Professors
MM Mooya, BSc(Land Economy) *Copperbelt* MPhil(Land Economy) *Cantab* PhD(Real Estate) *Pret*
F Viruly, BA(Hons) *Witwatersrand* MA(Dev Econ) *Kent* FRICS
A Windapo, BSc(Building*) IfE* MSc(Construction Management) PhD *Lagos* FNIOB PrCPM

Emeritus Professors
BG Boaden, BSc(QS) *Witwatersrand* MBA *British Columbia* PhD *Witwatersrand*
PA Bowen, BSc(QS) BCom *Natal* MSc(Construction Management) *Heriot-Watt* PhD *UPE* PrQS PMAQS FRICS FCIOB PrCM PrCPM PrValuer
AJ Stevens, MSc(Building) *Cape Town* PhD *UPE*

Senior Lecturers
E Edwardes, BSc BSc(QS) MSc(Project Management) *Pret* PrQS PMAQS
CI Jay, BSc(Hons)(Geology) *Cardiff* MBL *UNISA* PMP(PMI)
K Le Jeune, BSc(QS) MSc(Property Studies) *Cape Town* PrQS PMAQS MRICS
MW Massyn, BSc(Building) *UPE* FCIOB
RPT McGaffin, BSocSc *Cape Town* MCRP *Cape Town* MPhil *Cantab*
SD Nurick, BCom BSc(Hons)(Property Studies), MPhil *Cape Town* MRICS
N-T Tuan, BSc(Eng) *Chung Cheng Institute of Technology* MEng *Pret* PhD *Cape Town* INFORMS *Taiwan Chapter*

Lecturers
A Mtya,BSc Hons (CM) *Cape Town* Candidate CPM SACPCMP
U Ordor BSc(Architecture) *Jos* MSc (Architecture) Jos MNIA MSc (Property Studies) *Cape Town*

Academic Development Lecturer
A Street BSc (QS)(Hons) *Cape Town* PrQS PMAQS

Contract Lecturer
Mochelo Lefoka**,** BSc (CS), *Cape Town*, BSc (Hons) (CM) *Cape Town*

Honorary Research Associate
C Kariuki, BA (Land Economics) MA (Housing Administration) *Nairobi*

Junior Research Fellow
L Boyle, BSc (Construction Studies) BScHons (Quantity Surveying) M Phil (Urban Sustainability) *Cape Town*

Departmental Manager
JM Thompsett

Administrative Officers
M Fagodien (Postgraduate)
W Samaai BA *Cape Town* (Undergraduate and Honours)

Administrative Assistants
J Breda (Finance)

Reception and General Administration
V Daries

Departmental Assistant
M Neutt

Course Outlines

CON1004W   CONSTRUCTION TECHNOLOGY I
32 NQF credits at HEQSF level 5; 4 lectures per week, seminars, 1 studio session per week, field trip(s).
Convener: Ms E Edwardes/TBC
Course outline:
This course aims to develop an understanding of the building as a System; the site including site/soil investigation, setting-out of a building etc.; Construction Technology appropriate for assembly of a double-storey house, including: manufacture and performance of materials and components used; construction of such dwelling; and preparation of a report concerning the temporary facilities, plant and equipment used, specialists used, sequence of building and comparison of the requirements of good practice; and the National Building Regulations and the Occupational Health and Safety Act.
DP requirements: 50% sub-course work, 40% sub-exams.
Assessment: Year mark 65%; November examination 3 hours 35%

CON1007X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 5
Convener: Ms K Le Jeune
Course outline:
Practical training takes the form of 120 hours (3 weeks) of approved employment experience in any of the built environment disciplines (construction; engineering; housing; property development and management; quantity surveying; relevant local authority, provincial and national government departments) and 40 hours (1 week) on a community build organised by the Department.
DP requirements: Complete practical training and complete report.

CON1010S   CONSTRUCTION INFORMATION SYSTEMS
8 NQF credits at HEQSF level 5; 2 lectures per week, tutorials, practicals.
Convener: Ms A Street
Course outline:
This course aims to provide an introduction to computers, networks, data storage, manipulation/analysis and reporting using spreadsheets (MS Excel) and relational databases (MS Access). Solving problems using spreadsheets and databases is also covered.

DP requirements: 40% subminimum in both course work and examination
Assessment: Coursework 50% ; November examination 2 hours 50%.

CON1011F PROPERTY STUDIES IA
16 NQF credits at HEQSF level 5; 4 lectures per week, tutorials, practicals.
Convener: Associate Professor K Michell/Associate Professor F Viruly
Course outline:
This course aims to develop an understanding of Property Development and includes: a study of the principles of property development including the relevant statutes and ordinances: urban development; control of land in South Africa; town planning; overview of property development; the establishment of townships; types of dwelling units and housing types; principles of medium and high density residential developments; sectional title and group housing; development of retirement centres; introduction to commercial property development; development of: office buildings, parking garages, shopping centres, industrial parks; and rehabilitation and conversion of buildings.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50%; June examination 2 hours 50%.

CON1012S PROPERTY STUDIES IB
16 NQF credits at HEQSF level 5; 4 lectures per week, tutorials.
Convener: Associate Professor F Viruly
Course outline:
This course aims to develop an understanding of welfare and economic efficiency and includes: economic efficiency through the price system. Real property: characteristics and functions of the real property market; pricing of land and resources. Development: the development process; timing and rate of development; finance for development; redevelopment; public sector development; economics of planning controls; the construction industry. Urban land use: land use and land values; pattern of urban land use; growth of urban areas; quality of urban environment; housing; regional policy. The government and land resources: impact of government economic policy on land resources; theory of urban public finance; taxation and land resources; and recent developments.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50%; November examination 2 hours 50%.

CON1015S PROPERTY INFORMATION SYSTEMS
8 NQF credits at HEQSF level 5; 2 lectures per week, tutorials and practicals.
Convener: Ms A Street
Course outline:
This course is an introduction to computers, networks, data storage, manipulation/analysis and reporting using spreadsheets (MS Excel), relational databases (MS Access); and problem-solving with spreadsheets and databases.
DP requirements: 40% subminimum in both course work and examination
Assessment: Year mark 50% ; November examination 2 hours 50%.

CON1017S PROPERTY INVESTMENT MATHEMATICS I
8 NQF credits at HEQSF level 5; 1 lecture per week, 2 tutorials per week.
Convener: Mr M Lefoka
Course outline:
This course aims to develop an understanding of simple interest, equivalence, compound interest, present value, annuities, general annuities, sinking funds and amortization.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 30%; November examination 2 hours 70%.

CON1018W   BUILDING TECHNOLOGY I T

16 NQF credits at HEQSF level 5; 2 lectures per week, 1 studio session per week.
Convener: Mr U Ordor
Course outline:
This course aims to develop and appreciation of the construction industry and its size and role in the economy. Topics include: an overview of the construction industry's structure; its participants and their roles and responsibilities; an understanding of the construction assembly process associated with simple buildings, together with an appreciation of the relationship between design, technology and assembly; basic architectural drawing directed to the understanding and transmission of graphic information and an introduction to site surveying including measurement, levelling, etc.
DP requirements: 40% subminimum in both course work and examinations
Assessment: Year mark 50% ; June examination 2 hours 25%, November examination 2 hours 25%.

CON1019F   PROFESSIONAL COMMUNICATION

16 NQF credits at HEQSF level 5; 2 lectures per week, tutorials.
Convener: Associate Professor J English
Course outline:
This course aims to equip students with practical skills to enable them to plan and present persuasive oral presentations and oral reports; to function effectively in small-group activities; and to prepare and write business and technical reports.
DP requirements: 100% attendance and 50% minimum class test average
Assessment: Written assignments and test 35%, oral examination 35%, written examination 30%.

CON1019S   PROFESSIONAL COMMUNICATION

16 NQF credits at HEQSF level 5; 2 lectures per week, tutorials.
Convener: Associate Professor J English
Course outline:
This course aims to equip students with practical skills to enable them to plan and present persuasive oral presentations and oral reports; to function effectively in small-group activities; and to prepare and write business and technical reports.
DP requirements: 100% attendance and 50% minimum class test average
Assessment: Written assignments and test 35%, oral examination 35%, written examination 30%.

CON2006W   CONSTRUCTION TECHNOLOGY II

32 NQF credits at HEQSF level 6; 4 lectures per week, seminars, 1 studio session per week.
Convener: Mr U Ordor/Mr M Lefoka
Course entry requirements: CON1004W
Course outline:
This course aims to develop an understanding of construction technology appropriate for assembly of light weight long span structures and multi-storey buildings, including: assembly and performance, reinforced concrete, steel and timber, materials, components, plant and equipment required: such as formwork, concrete, steel including reinforcing, roofing systems (including flat roof waterproofing); cladding systems; windows and doors, ceilings and partitions, access flooring, finishes; services requirements and services spaces; and fire and other regulations.
DP requirements: 40% subminimum in both course work and examinations
Assessment: Year mark 65% ; November examination 3 hours 35%.

CON2013X   PRACTICAL TRAINING

0 NQF credits at HEQSF level 6
Convener: Ms K Le Jeune
Course entry requirements: CON1007X

Course outline:
This practical training takes the form of 160 hours (4 weeks) of approved experience employed in any of the built environment disciplines: construction, engineering, housing, property development and management, quantity surveying, relevant local authority, and provincial and national government departments).
DP requirements: Complete practical training and complete report.

CON2020S   CONSTRUCTION MANAGEMENT I
16 NQF credits at HEQSF level 6; 4 lectures per week, tutorials.
Convener: Associate Professor A Windapo/Ms A Mtya
Course entry requirements: BUS1036F/S and CON1004W.
Course outline:
This course aims to develop an understanding of the principles of management and includes: the main schools of management and their history and developments; scientific management; human relations school; systems thinking; contingency theory and operations research/theory. The construction enterprise and its environment: customer profile; patterns of demand; types of service or product provided; common organisational structures; the construction firm as a complex system. The construction project and its environment; construction management processes and practices applicable to small projects. Project processes to include: the project delivery process; the production process and the traditional procurement process. Construction management practice to include site layout and management, plant management, materials management, health and safety regulation, waste management, financial management and risk management.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; November examination 2 hours 50%.

CON2022W   MEASUREMENT & DESIGN APPRAISAL I
16 NQF credits at HEQSF level 6; 2 lectures per week, 1 studio session per week.
Convener: Ms E Edwardes
Course entry requirements: CON1004W, MEC1002W
Course outline:
This course aims to develop and understanding of the principles of measurement and the documentation thereof; and a detailed analysis of the clauses contained in the Standard System of Measuring Building Work. The practical component of the course entails the measurement, abstraction and billing of the following elements: foundations, superstructure brickwork, roofs; eaves and rainwater goods, internal and external finishes, ceilings, floors; and doors, windows and opening adjustments.
DP requirements: 40% subminimum in both course work and examinations.
Assessment: Year mark 50%; November examination 4 hours 50%.

CON2024S   PROPERTY STUDIES IIA
16 NQF credits at HEQSF level 6; 4 lectures per week, 8 tutorials.
Convener: Mr S Nurick
Course entry requirements: CON1011F, CON1012S, CON2030F, BUS2020F/FTX2020F.
Co-requisites: CON2029S
Course outline:
This course aims to develop an understanding of the nature and scope of investment. Topics include: the nature and scope of property investment, the investment decision process, the property development process, the decision making among alternatives, property evaluation: principles of feasibility studies, feasibility studies for residential, commercial and industrial developments; principles of economic viability studies: townships, sectional title, retirement villages, office, shopping centre, and industrial developments; whole life appraisal and risk management: the nature of risk; risk analysis; and risk management and control.
DP requirements: 40% subminimum in both course work and examination.

Assessment: Year mark 50%; November examination 3 hours 50%.

CON2027F   REAL PROPERTY LAW I

16 NQF credits at HEQSF level 6; 4 lectures per week, tutorials.
Convener: Ms L van Schalkwyk
Co-requisites: CML1001F or CML1001L or CML1004S
Course outline:
This course aims to develop an understanding of South African Law of Property and statutes relating to immovable and real rights; the acquisition of rights over land in South Africa; forms of land tenure; possession and occupation of immovable property; servitudes; mineral rights; real and personal securities; survey of land; registration of rights over immovable property; erection of buildings; subdivision of land; agricultural land; and fencing.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; June examination 2 hours 50%.

CON2029S   MEASUREMENT

8 NQF credits at HEQSF level 6; 2 lectures per week.
Convener: Ms E Edwardes
Course entry requirements: CON1018W
Course outline:
This course is an introduction to measurement in the property and construction industry, including: the SAPOA method and the application thereof; the guide to elemental cost estimating and analysis for building works and the application thereof; an overview of the standard system of measuring building work; and the compilation and purpose of the Bills of Quantities.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; November examination 2 hours 50%.

CON2030F   PROPERTY INVESTMENT MATHS II

8 NQF credits at HEQSF level 6; 2 lectures per week, tutorials.
Convener: Mr M Lefoka
Course entry requirements: CON1017S
Course outline:
This course aims to develop evaluation techniques for property development and investment decisions: these include rate of return, simple payback, discounted payback and discounted cash flow (NPV and IRR).
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 30%.; June examination 2 hours 70%.

CON2031S   PROPERTY STUDIES IIB

16 NQF credits at HEQSF level 6; 4 lectures per week, tutorials.
Convener: Associate Professor M Mooya/Mr S Nurick
Course entry requirements: CON1011F, CON1012S, STA1000S, ECO1010F
Course outline:
This course aims to develop an understanding of the Valuation Profession and includes: The Property Valuers Profession Act (47 of 2000). Functions and responsibilities of the Valuer. An Introduction to the Statutes and Ordinances (relevant sections) affecting valuation (all as amended): Transfer Duty Act 40 of 1949; Estate Duty Act 45 of 1955; Removal of Restrictions Act 84 of 1967; Immovable Property (Removal or Modification of Restriction) Act 94 of 1965; Administration of Estates Act 66 of 1965; Stamp Duties Act 77 of 1968; Expropriation Act 63 of 1975; Land Affairs Act 101 of 1987; Physical Planning Act 125 of 1991; Housing Act 107 of 1997; Environment Conservation Act 73 of 1989; National Environmental Management Act 107 of 1998; Development Facilitation Act 67 of 1995; Less Formal Township Establishment Act 113 of 1991; Land Survey Act 8 of 1997; Prevention of Illegal Eviction from and Unlawful Occupation of Land Act 19 of

1998; Water Act No 54 of 1956 / National Water Act 36 of 1998; Rental Housing Act 50 of 1999 / Rent Control Act 80 of 1976; Upgrading of Land Tenure Rights Act 112 of 1991; Value-Added Tax Act 89 of 1991; Municipal Ordinance 20 of 1974 (rating sections); Land Use Planning Ordinance (WC) 15 of 1985; Western Cape Planning and Development Act 7 of 1999; Property Valuation Ordinance (WC)1993; Valuation Ordinances of all other provinces. Property Valuation: Purposes for which valuations are required; Concepts of value (personal, exchange and market value); Classification of value and accuracy of valuations; The Surveyor-General; The Registrar of Deeds; The Valuer's records; Factors influencing supply and demand in the property market; Types of fixed property; Factors influencing the value of property; Appreciation and depreciation; Relationship between land and improvements; Value of improvements; Valuation of Residential properties; and The Valuation Report.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% November examination 2 hours 50%.

CON3012W   CONSTRUCTION TECHNOLOGY III
32 NQF credits at HEQSF level 7; 2 lectures per week, seminars, 1 studio session per week, field trip(s)..
Convener: TBC
Course entry requirements: CON2006W
Course outline:
This course aims to develop the understanding of Construction Technology and services appropriate to the assembly of light weight long span structures and multi-storey buildings, including: plumbing and drainage of water supply (hot and cold); drainage; waste disposal; electrical installation; air-conditioning systems; communication systems; lifts, hoists and escalators. Basements, soil stabilization, rock-anchoring and retaining structures. Piling and special foundations. Civil engineering construction. Sustainable technology. Theory of structures.
DP requirements: 40% subminimum in both course work and examination
Assessment: Year mark 50% ; June examination 2 hours 25%, November examination 2 hours 25%.

CON3023X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 7
Convener: Ms K Le Jeune
Course outline:
This practical training takes the form of 160 hours (4 weeks) of approved experience employed in any of the built environment disciplines (construction; engineering; housing; property development and management; quantity surveying; relevant local authority, provincial and national government departments).
DP requirements: Complete practical training and complete report.

CON3030S   CONSTRUCTION COSTING
16 NQF credits at HEQSF level 7; 2 lectures per week, 1 studio session per week.
Convener: Professor K Cattell
Course entry requirements: CON1010F or CON1015F, CON1004W or CON1018W, CON2022W or CON2029S
Co-requisites: CON3043W
Course outline:
This course aims to develop an understanding of construction costing and includes: computation of labour costs; synthesis of labour; material and plant costs for Bills of Quantities item rates; pricing approximate quantities of elemental estimates; pricing subcontracts; and pricing preliminaries.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; November examination 3 hours 50%.

CON3031W   MEASUREMENT & DESIGN APPRAISAL II
32 NQF credits at HEQSF level 7; 4 lectures per week, 1 studio session as required..
Convener: Ms E Edwardes
Course entry requirements: CON2006W and CON2022W
Co-requisites: CON3012W, CON3030S and CON3043W
Course outline:
This course aims to develop the understanding of measurement and design appraisal. The theoretical aspects of the course are covered in lectures and includes detailed studies on: principles of measurement and documentation used in measurement and descriptive clauses in the Standard System of Measuring Building Work (6th ed.) The practical component of the syllabus is a progression from Measurement and Design Appraisal 1. The principles of measurement are applied to advanced projects with particular emphasis on simple framed and load-bearing multi-storey buildings by means of elemental quantification, covering: foundations; reinforced concrete structures; plumbing and drainage; architectural metalwork; structural steelwork; Specialist work; and external works. The practicals require complete computerised documentation with competence in the WinQS and/or QSPlus software package(s). Students measure all elements of a small commercial structure.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50%; November examination 4 hours 50%.

CON3032W   APPLIED CONTRACT LAW I
12 NQF credits at HEQSF level 7; 2 lectures per week, seminars.
Convener: Mr T Boxall
Course entry requirements: CML1001F or CML1004S or CML1001L
Course outline:
This course aims to develop an understanding of the JBCC Principle Building Agreement; the Arbitration Act and includes case studies.
DP requirements: 40% subminimum in both course work and examination.
Assessment: November examination 2 hours 50%, year mark 50%.

CON3033F   PROPERTY STUDIES I
16 NQF credits at HEQSF level 7; 4 lectures per week, 1 tutorial session per week.
Convener: Ms A Street
Course entry requirements: MAM1010F/S
Course outline:
This course aims to develop an understanding of Investment. Topics include: characteristics of property as an investment; financial mathematics for cost engineering and property development decisions and evaluation techniques for property development and investment decision.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; (June examination 2 hours 50%.

CON3034F   PROPERTY STUDIES IIIA
16 NQF credits at HEQSF level 7; 4 lectures per week, tutorials.
Convener: Mr S Nurick
Course entry requirements: CON2024S, CON2030F, CON2031S, ECO1010F/S, ECO1011F/S.
Course outline:
This course aims to develop an understanding of property economics. Topics include property values; supply and demand; the economics of developments. Property finance: personal portfolio planning; institutional portfolio planning; urban finances; sources and forms of property finance. Taxation: income taxation; property taxation; and Value Added Tax.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; June examination 2 hours 50%.

CON3035S PROPERTY STUDIES IIIB

16 NQF credits at HEQSF level 7; 4 lectures per week, tutorials.
Convener: Ms A Street
Course entry requirements: CON2024S, CON2031S, MAM1010F/S,ACC1006F/S, ECO1010F/S, ECO1011F/S.
Course outline:
This course aims to develop an understanding of the management of building design and construction. Topics include: general contracting; construction and project management; architectural design; specification of operating systems; upgrade programmes; estimating; preparation of contracts, drawings and specifications; preparation of tender packages; tendering processes and award. Value Management: the concept of value management. Property marketing: concept of marketing; marketing management; marketing management philosophies, marketing of residential properties; and marketing of commercial and industrial properties.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50%; November examination 2 hours 50%.

CON3036W PROPERTY & CONTRACT LAW

16 NQF credits at HEQSF level 7; 2 lectures per week, seminars and tutorials.
Convener: Mr T Boxall
Course entry requirements: CML1001F or CML1004S or CML1001L; CON2027F.
Course outline:
This course develops an understanding of the JBCC Principal Building Agreement; Arbitration Act; Alternative dispute resolution; and Case law.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% November examination 2 hours 50%.

CON3038W CONSTRUCTION MANAGEMENT II

32 NQF credits at HEQSF level 7; 4 lectures per week , seminars, tutorials, field trip(s), computer laboratory sessions..
Convener: Mr M Massyn/Ms A Mtya
Course entry requirements: CON2020S or CON3039S
Course outline:
This course aims to develop an understanding of production management theory and practice by considering: typical business and project objectives; the need to achieve high productivity; the impact of method and layout on production; planning for production. Techniques such as: Gantt charts; critical path networks, precedence diagrams; computer applications; short term planning systems; progress recording; and work study. Construction procurement systems. Management accounting in construction. Industry structures and development. Health, and safety issues surrounding production management.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50%; June examination 2 hours 25%, November examination 2 hours 25%.

CON3039S CONSTRUCTION MANAGEMENT I T

16 NQF credits at HEQSF level 7; 4 lectures per week, tutorials.
Convener: Associate Professor A Windapo/Ms A Mtya
Course entry requirements: BUS1036F/S and CON1018W.
Course outline:
This course aims to develop the understanding of the principles of management and includes: the main schools of management and their history and developments; scientific management; human relations school; systems thinking; contingency theory and operations research/theory. The construction enterprise and its environment: customer profile; patterns of demand; types of service or product provided; common organisational structures; the construction firm as a complex system. The construction project and its environment; construction management processes and practices

applicable to small projects. Project processes to include: the project delivery process; the production process and the traditional procurement process. Construction management practice to include site layout and management, plant management, materials management, health and safety regulation, waste management, financial management and risk management.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% ; November examination 2 hours 50%.

CON3040W   COST ENGINEERING I T
16 NQF credits at HEQSF level 7; 2 lectures per week, seminars and tutorials.
Convener: Professor K Cattell
Course entry requirements: CON1018W and CON2029S
Course outline:
This course aims to develop an appreciation of client/developer motivation and needs. Topics include: The client briefing process. An understanding of the theory of construction cost planning and cost control. An understanding of design economics, elemental cost analysis of buildings; cost studies/cost comparisons. Consideration of cost and price indices. Utilising the outputs of cost planning and cost control, and of approximate estimates. Communication applied to the cost planning and control environment. Consideration of current research being conducted on the practice of cost planning and cost control in South Africa.
DP requirements: 40% subminimum in both course work and examinations.
Assessment: Year mark 50% ; June examination 2 hours 25%; November examination 2 hours 25%.

CON3041F   PROPERTY STUDIES IIIC
16 NQF credits at HEQSF level 7; 4 lectures per week, tutorials.
Convener: Associate Professor M Mooya
Course entry requirements: CON2024S or CON2030F, CON2031S, CON1017S, CON1018W, MAM1010F/S, ECO1010F/S
Course outline:
This course is an introduction to case law relating to the valuation of fixed property; property valuation; highest and best use of property; influence of the 'wrong' development on market value; influences of leases on values; leases and rentals; theory of the income, residual, cost and accounts methods of valuation; valuation of leasehold interests; valuation for insurance purposes; valuation of income-producing properties; mass valuations; and the valuation report.
DP requirements: 40% subminimum in both course work and examination.
Assessment: Year mark 50% June examination 2 hours 50%.

CON3043W   COST ENGINEERING UNDER UNCERTAINTY
16 NQF credits at HEQSF level 7; 2 lectures per week, seminars and tutorials.
Convener: Professor K Cattell
Course entry requirements: CON2006W and CON2022W
Course outline:
This course aims to develop an understanding of cost engineering under uncertainty. Topics include: consideration of client/developer motivation and needs; the client briefing process; the theory of construction cost planning and cost control; design economics, elemental cost analyses of buildings; and cost studies/cost comparisons. Consideration of cost and price indices. Techniques for cost planning and cost control, and the preparation of approximate estimates. Communication applied to the cost planning and control environment. Consideration of current research being conducted on the practice of cost planning and cost control in South Africa.
DP requirements: 40% subminimum in both course work and examinations.
Assessment: Year mark 50% ; June examination 2 hours 25%; November examination 2 hours 25%.

ELECTRICAL ENGINEERING

The Department offers the following undergraduate degree programmes:

Bachelor of Science in Engineering in:
Electrical Engineering
Electrical and Computer Engineering
Mechatronics

The Department of Electrical Engineering is located on the 4th floor of the Menzies Building, Library Road, Upper Campus, Rondebosch.

Website: www.ee.uct.ac.za
Email address: eleceng@uct.ac.za
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Staff

Professor and Head of Department
ES Boje, PrEng BSc(Eng) *Wits* MSc(Eng) PhD *Natal* FSAAE SMSAIMC MIEEE

Professors
P Barendse, MSc(Eng) PhD *Cape Town* MIEEE
KA Folly, MSc(Eng) *Beijing* PhD *Hiroshima* MIEEJ SMIEEE
MA Khan, MSc(Eng) PhD *Cape Town* SMIEEE

Emeritus Professors
A Baghai-Wadji, MSc(Eng) PhD DSc *Vienna* FEMA SMIEEE
M Braae, MSc(Eng) *Cape Town* PhD *UMIST* MIEEE
BJ Downing, MSc *Bradford* PhD *Sheffield*
G de Jager, MSc *Rhodes* PhD *Manchester* MBL *SA* MIEEE
CT Gaunt, BSc(Eng) *Natal* MBL SA PhD *Cape Town* FIET FSAIEE
MR Inggs, BSc(Hons) Rhodes PhD *London* SMIEEE
A Petroianu, Dipl Ing *USSR* Dr Ing *Bucharest* FIEEE VDE CIGRÉ
KM Reineck, CEng Dip Eng *Cologne* DipEIEng *Dunelm* PhD *Newcastle* VDE FIET

Honorary Professor
P Pillay, CEng BSEng *UDW* MSc(Eng) *Natal* PhD *Virginia Tech* FIET FIEEE

Associate Professors
S Chowdhury, PrEng BEE(Hons) PhD (Eng) *Kolkata* MIET SMIEEE MIE SMSAIEE
OE Falowo, BEng MEng *Akure* PhD *Cape Town* SMIEEE
A Mishra, BE *REC India* PhD *Edinburgh* SMIEEE
F Nicolls, MSc(Eng) PhD *Cape Town*
AJ Wilkinson, BSc(Eng) *Cape Town* PhD *London*

Emeritus Associate Professors
ME Dlodlo, BSEE Geneva MSEE *Kansas State* PhD *Delft* MIEEE F'ZweIE Pr.Eng.(ECZ)
JR Greene, MSc(Eng) *Cape Town* MIEEE
M Malengret, MSc(Eng), PhD *Cape Town*

Honorary Associate Professor
R Laufer, Dipl.-Ing *TU Berlin* Dr.-Ing. *Stuttgart* IAA

Senior Lecturers
K Awodele, Reg Eng, BSc(Eng) *Ife* MSc(Eng) *Abu* PGDM MNSE MIEEE
MY Abdul Gaffar, BSc(Eng) MSc(Eng) *Natal* PhD *Cape Town*
A Murgu, MSc(Eng) *Bucharest* Ph Lic (Comp Sci) PhD *Jyväskylä* MIEEE
D Oyedokun, MSc(Eng) PhD *Cape Town* MIEEE SAIEE
A Patel, MSc(Eng) PhD *Cape Town* MIEEE
MS Tsoeu, MSc(Eng) PhD *Cape Town* MIEEE
RA Verrinder, MSc(Eng) *Cape Town* MIEEE
S Winberg, BSc(Hons) *Cape Town* MSc *UTK* PhD *Cape Town*

Academic Development Senior Lecturer
R Smit, MSc(ScEd) *Witwatersrand* PhD *(Cape Town)*

Honorary Adjunct Senior Lecturer
Froehlich A, LL.M.MAS Maître en Droit *France*, Dr jur *Vienna*, IISL

Lecturers
J Mwangama, MSc(Eng) PhD *Cape Town* MIEEE
WPF Schonken BEng MSc(Eng) PhD *Stellenbosch* SMIEEE

Senior Scholar
MJE Ventura, PrEng BSc(Maths, Physics) BSc(Eng) *Cape Town* BSc(Hons) *Pretoria* MIEEE
MSAIEE

Chief Technical Officers
D De Maar, BEd(Hons) *Cape Town*
J Pead, BSc(Eng) MSc(Eng) *Cape Town*
M Soltanian, BSc(Eng) MSc(Eng) *Iran*

Senior Technical Officers
P Bizimana
P Titus

Technical Officer
B Daniels

Departmental Manager
J Buxey

Finance Officer
C Koonin

Administrative Officer (Undergraduate)
M van der Westhuizen BA PGDip(LIS) *Cape Town*

Administrative Assistants
R Harris (General)
N Moodley (Postgraduate)
S Sabodien (AMES Research Group)
D Singh (Space and Radar Masters)

Receptionist
L Johannes

The activities of the Department cover a wide field both at undergraduate and postgraduate level. The Department regards laboratory work as critically important and a range of dedicated laboratories exist. These are in the fields of: Control; Process Control and Instrumentation; Robotics; Data Communications; Telecommunications; Digital Systems and Computers; Digital and Analogue Electronics; Electrical Machines, Drives and Power Electronics; Power System Engineering; Image and Signal Processing; Microwave Engineering; Radar Systems.

The undergraduate programmes endeavour to provide the student with an education in *Electrical Engineering* with a range of specialisations, in *Electrical Engineering, Electrical and Computer Engineering* and in *Mechatronics.*

Course Outlines

EEE1000X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 5
Convener: Mr D de Maar
Course outline:
This opportunity for practical experience culminates in a certificate showing evidence of completion of suitable work in the basic workshop processes to the satisfaction of the Head of Department, during a period of at least six weeks in an approved workshop, either before registration or during the long vacation following the year of first registration in the faculty (due by 31 March of the following year). Alternatively students may produce a certificate showing evidence of completion of an approved structured intensive practical training course of at least 3 weeks duration.
DP requirements: Not applicable.

EEE1006F   INTRODUCTION TO ELECTRONIC ENGINEERING
12 NQF credits at HEQSF level 5
Convener: Dr R Smit
Course outline:
This course aims to motivate and help students understand the nature and scope of electronic engineering by providing an introduction to the content, methods and modes of thinking. A further aim is to develop students' confidence in rational problem-solving approaches and to introduce students to the design process. Topics include: Current, Voltage and Power, Resistors, Kirchhoff's Laws, Resistors used for Sensing, Capacitors, Capacitors as Sensors, Diodes, The Bipolar Junction Transistor (BJT) and BJT circuits, Metal Oxide Semiconductor Field Effect Transistors (MOSFETs), Digital Integrated Circuits, gates, flip flops and counters, Analog Integrated Circuits, operational amplifier and comparator circuits, Mixed Signal Integrated Circuit, the NE555.
Lecture times: Mon, Tues, Wed, Thurs 3rd period
DP requirements: 80% Lab and tutorial attendance; 100 % attendance at all class tests
Assessment: Labs: 5% Tests: 25%, June Examination: 70%

EEE1007S   INTRODUCTION TO ELECTRICAL ENGINEERING
12 NQF credits at HEQSF level 5
Convener: Dr R Smit
Course outline:
This course aims to motivate and help students understand the basic concepts of power generation, transmission, distribution, nuclear energy and renewable energy, power utilization in common electric appliances and basic principles of electric circuits and networks. A further aim is to develop students' confidence in rational problem-solving approaches, in performing laboratory exercises and to introduce students to the design process. Topics include power generation, transmission, distribution and utilization, DC networks, inductance and capacitance, circuit transients, fundamentals of AC and single phase AC circuits

Lecture times: Mon, Tues, Wed, Thurs, 3rd period
DP requirements: 80% Lab and tutorial attendance; 100% attendance test attendance
Assessment: Design Project: 10%, Lab Test 5%, Tests: 20%, November Examination: 65%

EEE2041F   INTRODUCTION TO ELECTRICAL ENGINEERING & POWER UTILISATION

For students in the Mechanical Engineering and Mechanical & Mechatronic Engineering programmes.
16 NQF credits at HEQSF level 6
Convener: Associate Professor S Chowdhury
Course entry requirements: PHY1013F/S, MAM1021S
Course outline:
The course aims to help students understand: (a) DC Networks including DC circuits, series and parallel connection, Kirchhoff's laws, Mesh Analysis, DC Network theorems (Thevenin, Norton, etc); (b) Fundamentals of AC including generation, concepts of waveform, period, frequency, angular velocity, phase etc., average, peak and RMS values; (c) Single Phase AC Circuit including AC through resistance (R), inductance (L) and capacitance (C), concept of reactance and impedance, phasors, single-phase AC series and parallel circuits, concept of active power, reactive power, apparent power and power factor; (d) Simple Magnetic Circuits including definition of magnetic circuits, simple and composite magnetic circuits, magnetic circuit calculations, magnetic hysteresis, core loss, sinusoidal excitation of magnetic circuits and induced voltage; (e) Single-phase Transformers including core construction, principle of operation, e.m.f. equation and transformation ratio, no-load and on-load operation, phasor diagram under no-load and full-load operation with lagging and leading loads, exact and approximate equivalent circuits, open and short circuit tests, losses and efficiency, voltage regulation. (f) Three-phase systems (g) electrical loads and tariffs; (h) DC machines including motors and generators briefly.
Lecture times: Mon, Wed, Thurs, Fri, 5th period
DP requirements: 100% Laboratory attendance. 80% tutorial attendance and 50% mark for laboratories.
Assessment: Lab (10%), Class Test (30%), June Examination (60%)

EEE2042S   INTRODUCTION TO ANALOGUE AND DIGITAL ELECTRONICS

For students in the Mechanical Engineering and Mechanical & Mechatronic programmes.
8 NQF credits at HEQSF level 6
Convener: Associate Professor O Falowo
Course entry requirements: MAM1021F/S, PHY1013F/S, DP for EEE2041F.
Course outline:
The course aims to help students understand the following concepts: (a) Introduction to Semiconductor Physics and Diode basics. (b) Diode circuit model, applications and LEDs (c) Introduction to BJTs and basic models (d) BJT amplifier circuit (only focus on common-emitter) (e) Introduction to Op Amps, op-amp ideal and practical models (f) Opamp inverting and non-inverting applications (g) Introduction to FETs, FET analogue applications (h) Simple H-bridge circuits (i) Difference between analogue and digital applications, intro into digital electronics (j) Digital electronic continued (Boolean algebra, logic gates) (k) FET digital applications, introduction to Flip Flops (l) Basics of state machines and electronic instruments.
Lecture times: Mon, Tues 5th period
DP requirements: DP requirements: 80% tutorial attendance, 100% lab attendance
Assessment: Coursework (40%), Exam (60%)

EEE2044S   INTRODUCTION TO POWER ENGINEERING

16 NQF credits at HEQSF level 6
Convener: Professor P Barendse
Course entry requirements: MAM1020F/S, PHY1013F/S and EEE1007S

Course outline:
This course aims to help students understand the basic concepts of (a) three-phase AC power generation, voltage, current and power calculations, concepts of balanced and unbalanced systems, measurement of active power by two-wattmeter method, (b) definitions and principles of simple and composite magnetic circuits, magnetic hysteresis, (c) basic principles of operation of electric machines, transformer material; (d) basic principles of operation, construction, operating characteristics, modelling and performance analysis of DC generators, DC motors and BLDC motors, (e) single phase transformers. The course will prepare students to apply engineering and scientific knowledge in carrying out analysis, problem solving and design projects.
Lecture times: Mon, Tues, Wed, Fri, 3rd period
DP requirements: 100% Lab attendance
Assessment: Labs (2%), Project (8%), Tests (30%), Exam (60%)

EEE2045F   ANALOGUE ELECTRONICS
16 NQF credits at HEQSF level 6
Convener: Dr J Mwangama
Course entry requirements: EEE1006F
Course outline:
This course aims to give students a sound background in analog electronics design which will help them to understand, analyse and design circuits involving analog electronic components and parts. Topics include: Diodes: Basic Diode Concepts. Load-Line Analysis of Diode Circuits. Zener-Diode Voltage-Regulator Circuits. Ideal-Diode Model. Piecewise-Linear Diode Models. Rectifier Circuits. Wave-Shaping Circuits. Linear Small-Signal Equivalent Circuits Bipolar Junction Transistors: Current and Voltage Relationships (Ebers-Moll model). Common-Emitter Characteristics. Load-Line Analysis of a Common-Emitter Amplifier. pnp-Bipolar Junction Transistors. Large-Signal DC Circuit Models. Large-Signal DC Analysis of BJT Circuits. Small-Signal Equivalent Circuits. Common-Emitter Amplifiers. Emitter Followers Field-Effect Transistors: NMOS and PMOS Transistors. Load-Line Analysis of a Simple NMOS Amplifier. Bias Circuits. Small-Signal Equivalent Circuits. Common-Source Amplifiers. Source Followers. CMOS Logic Gates Amplifiers: Specifications and External Characteristics Basic Amplifier Concepts. Cascaded Amplifiers. Power Supplies and Efficiency.Operational Amplifiers: Ideal Operational Amplifiers. Inverting Amplifiers. Non-inverting Amplifiers. Design of Simple Amplifiers. Op-Amp Imperfections in the Linear Range of Operation. Nonlinear Limitations. DC Imperfections. Differential and Instrumentation Amplifiers. Integrators and Differentiators. Wheatstone Bridge.Frequency Response & Active Filters RLC Circuits and their steady state analysis. Frequency response of single pole RLC circuits. Ideal filter frequency characteristics. Butterworth filter design. Filter design using OpAmps.
Lecture times: Mon, Tues, Thurs, 3rd period
DP requirements: Must finish all the lab modules.
Assessment: Assignments / Tests (20%), Lab (15%), Assignments (5%), Exam (60%)

EEE2046F   EMBEDDED SYSTEMS I
16 NQF credits at HEQSF level 6
Convener: Ms RA Verrinder
Course entry requirements: (EEE1006F or EEE2042S) and (CSC1015F or CSC1017F)
Course outline:
This course aims to give students a strong foundation in embedded systems by introducing them to digital system fundamentals, including: information representation, Boolean algebra, logic gate behaviour, combinational and sequential digital circuits, digital building blocks and algorithmic state machines; C programming with a focus on microcontroller applications; basic microcontroller usage, including an introduction to computer architecture, general purpose input/outputs, analogue to digital convertors and basic timers.
Lecture times: Mon, Tues, Wed, Thurs, 4th period
DP requirements: 100% practical attendance and submission

Assessment: Practicals (15%), Tests (25%), Exam (60%)

EEE2047S   SIGNALS AND SYSTEMS I
16 NQF credits at HEQSF level 6
Convener: Associate Professor F Nicolls
Course entry requirements: MAM1021S
Course outline:
This course provides students with the basic tools required for understanding linear systems, and the effect that such systems have on deterministic signals. Upon completion, students will be able to characterise and manipulate linear time-invariant systems in terms of input-output relationships, using both time and frequency domain methods. The course includes concepts related to signal representation, linear convolution, Fourier analysis, sampling of continuous-time signals, and Laplace transforms.
Lecture times: Mon, Tues, Wed, Thurs, 4th period
DP requirements: 100% practical and tutorial submission
Assessment: Homework (10%), Labs (10%), Tests (20%), Exam (60%)

EEE2048F   PROFESSIONAL COMMUNICATION FOR ELECTRICAL ENGINEERING
8 NQF credits at HEQSF level 6
Convener: Associate Professor J English
Course entry requirements: None
Course outline:
This course aims to develop an understanding of effective reporting. Students learn the requirements for written reports and correspondence in terms of planning, organisation and selection of information. In addition, the students are taught to operate as professionals and to manage social media and exposure.
Lecture times: Mon, Wed, 2nd period
DP requirements: 80% attendance at all lectures and tutorials. Achieve a minimum average of 50% for the combined marks of all the class exercises and mid-course test.
Assessment: Classwork comprising exercises, assignments and a mid course test carries 75% weighting of final mark. Written examination carries 25% weighting of final mark

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EEE2049W   INTRO TO ELECTRICAL AND ELECTRONIC ENGINEERING: SCIENCE STUDENTS
24 NQF credits at HEQSF level 6
Convener: Associate Professor S Chowdhury
Course entry requirements: PHY1013F/S, MAM1021F/S
Course outline:
This course aims to prepare Science students majoring in Computer Engineering to apply engineering and scientific knowledge in carrying out analysis, problem solving and design projects. The Electrical Engineering component will cover DC Networks; (b) Fundamentals of AC; (c) Single Phase AC Circuit; (d) Magnetic Circuits; (e) Single-phase Transformers. The students will acquire an understanding of DC circuits and networks, step and sinusoidal excitation of inductive and capacitive circuits, fundamentals of AC quantities and waveforms, phasor diagrams, behaviours of AC through resistance, inductance and capacitance, single phase series and parallel AC circuits, complex power and power factor, magnetic circuits and single phase transformers. The Electronic Engineering component of the course will cover (a) Basic semiconductor physics; (b) rectifier diodes. The students will acquire an appreciation of how diodes are useful and widespread in electronic circuitry such as power supplies; (c) Bipolar Junction Transistors and how these are used in switching and amplifications applications. (d) FETs will similarly be studied and students will learn of their prevelance in modern electronics. The basics of digital electronics such as logic gates

boolean logic will be developed. The basics of CMOS logic operations using transistors is also included.
Lecture times: Mon, Wed, Fri 5th period (1st Semester), Mon, Tues 5th period (2nd Semester)
DP requirements: 1st semester: 100% Laboratory attendance, 80% tutorial attendance, 50% mark for laboratories. 2nd semester: 80% tutorial attendance, 100% lab attendance
Assessment: 1st semester – Lab 10%, Class Test, 30% June Exam 60%.   2nd semester – Coursework, 40% , November Exam 60%

EEE2050F   EMBEDDED SYSTEMS I FOR SCIENCE STUDENTS
18 NQF credits at HEQSF level 6
Convener: Ms RA Verrinder
Course entry requirements: EEE2042S, CSC1015F
Course outline:
This course aims to give Science students majoring in Computer Engineering a strong foundation in embedded systems by introducing them to digital system fundamentals, including: information representation, Boolean algebra, logic gate behaviour, combinational and sequential digital circuits, digital building blocks and algorithmic state machines; C programming with a focus on microcontroller applications; basic microcontroller usage, including an introduction to computer architecture, general purpose input/outputs, analogue to digital convertors and basic timers.
Lecture times: Mon, Tues, Wed, Thurs, 4th period
DP requirements: 100% practical attendance and submission
Assessment: Practicals (15%), Tests (20%), Assignment (5%), Exam (60%)

EEE2051L   PRACTICAL ELECTRONICS: COMPONENTS, MODULES AND DESIGN
8 NQF credits at HEQSF level 6
Convener: Mr J Pead
Course entry requirements:
Course outline:
This elective course aims to augment theory with supplementary practical materials and technologies. Fundamental material is re-presented in a practical way, to reinforce the foundation in electronic components like passive devices, diodes, BJT and MOSFET transistors, operational amplifiers, CMOS discrete combinational and sequential logic, and microcontrollers. The course also aims to enable students to do fundamental design work, be familiar with how to read and interpret data sheets and how to think laterally, in order to come up with solutions to a design problem.
Lecture times: Winter term
DP requirements: None
Assessment: Practical Assessment (50%), Examination (50%)

EEE3000X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 7
Convener: Mr D de Maar
Course outline:
This second opportunity for the student engineer to consolidate through practical experience, culminates in a technical report and certificate showing to the satisfaction of the head of department, evidence of completion of suitable work for a minimum period of six weeks in engineering employment at the end of the third year. The report and certificate is to be submitted by the end of the fourth week of the term immediately following the period of employment. Students who submit evidence of having obtained suitable practical experience prior to their registration may be exempted from EEE3000X. The employer must certify that the student completed the work.
DP requirements: Not applicable.
Assessment: Report

EEE3044S   ENERGY CONVERSION & UTILISATION
For Electro-Mechanical and Mechanical Engineering students only.
8 NQF credits at HEQSF level 7
Convener: Mrs K Awodele
Course entry requirements: EEE2031S or EEE2026S or EEE2041F
Course outline:
This course builds on the understanding of AC power theory; three-phase systems, electrical loads and tariffs; DC machines; AC machines, heating and lighting.
Lecture times: Mon, Wed, 4th period, **Tutorial**: Thurs 4th period.
DP requirements: 100% Laboratory attendance and submission and 50% mark for laboratories
Assessment: Laboratory & Assignments (12%), Class Tests (28%), November Examination (60%).

EEE3061W   MECHATRONICS DESIGN I
For Electro-Mechanical Engineering students only.
12 NQF credits at HEQSF level 7
Convener: Dr A Patel
Course entry requirements: EEE2041F, EEE2042S
Course outline:
This course aims to develop an advanced understanding of mechatronic design. Topics include: top-down and bottom-up design strategies; applications of electromechanical systems, sensors, power electronics, and actuators to mechatronic design. Computing platforms: embedded micro-controllers and programmable logic controllers (PLCs), and case histories in mechatronic design are also covered.
Lecture times: Semester 1: Tues meridian. Semester 2: TBA
DP requirements: Completion of projects
Assessment: Projects (70%), Class Test (30%)

EEE3088F   ELECTRICAL ENGINEERING DESIGN PRINCIPLES
8 NQF credits at HEQSF level 7
Convener: Dr A Patel
Course entry requirements: EEE2045F , EEE2047S
Course outline:
This course aims to equip students with the skills required to undertake engineering design and synthesis at sub-system level. Design methodology and various approaches to procedural design are introduced. Exposure to various simulation tools is provided to ensure that students are able to evaluate first phase designs systematically. Modelling and measurement error analysis are introduced and statistical modelling of engineering designs is emphasized. Optimization using both gradient and soft computing methods is introduced as an invaluable tool in modern, multi-constraint based design and synthesis. The course will include assignments developing from component level to sub-system level problems. These assignments will focus on the skills required for practical engineering design.
Lecture times: Mon 6th, 7th period
DP requirements: Submission of all assignments
Assessment: Assignments (50%); Exam (50%)

EEE3089F   ELECTROMAGNETIC ENGINEERING
16 NQF credits at HEQSF level 7
Convener: Dr W F Schonken
Course entry requirements: PHY2010S, MAM2083F/S
Course outline:
This course aims to introduce the electrical engineering student to the mechanism of electromagnetic radiation by antennas and the nature of fields produced by antennas. The propagation of plane waves in space and in lossy media is studied and applications are presented. One-dimensional models for

TEM transmission lines are constructed. These models are often used as basic elements in design of antennas and other components. Simplication to very short lines such as power lines are discussed. A selection of conventional and modern waveguide structures are considered. Finally, an overview of computational methods for the solution of realistic electromagnetic problems are presented.

Lecture times: Mon, Tue, Wed, Thu 4th period, compulsory interactive sessions Friday 7th and 8th periods

DP requirements: Interactive session participation and submission of all assignments.

Assessment: Practical Assignment (20%); Tutorial Tests (30%); Exam (50%)

EEE3090F   ELECTRONIC DEVICES & CIRCUITS
16 NQF credits at HEQSF level 7
Convener: Dr MY Abdul Gaffar
Course entry requirements: EEE2045F, EEE2047S
Course outline:
Recap of fundamental concepts – resistors, capacitors, inductors, diodes, bipolar transistors, op-amps, filters Active Filters – Second order and higher order filters, standard filter responses, design of low-pass, high-pass and band-pass filters, transfer function of Sallen and Key.Op-amps – Building blocks of internal circuitry, parameters and non-ideal effects, impact of DC non-ideal effects and compensation, effect of negative feedback on input impedance, output impedance and bandwidth of op-amps, identifying circuit parameters for various applications.Practical circuits – Difference and instrumentation amplifiers, practical integrators, practical differentiators.Voltage Regulation - line & load regulation.Linear Voltage Regulators – series regulators, standard circuits, overcurrent protection, overvoltage protection, selection of pass transistor elements, standard integrated circuits.Oscillators - Barkhausen criteria, Phase-shift oscillators, Wein-bridge oscillators, Relaxation oscillators, Hartley, Colpitts & Pierce oscillators.Current Sources - BJT and FET based, Basic two-transistor, Three-transistor, Cascode, Wilson and Widlar configurations. Differential Amplifiers - Basic BJT differential pair, DC analysis, AC analysis, Common Mode Rejection Ratio, FET implementations. Linear Power Amplifiers - Class, A, B, AB, efficiency, power output constraints, heatsink design.Switched Mode Power Supplies - buck, boost, inverting, switched capacitor, gate driver circuits.Noise – Amplifier noise, noise measurements and noise sources. SPICE based simulations.
Lecture times: Mon, Tue, Wed, Thu 3rd period
DP requirements: Completion of all laboratory experiments and tutorials
Assessment: 2 Class tests: (30%); 3 hour exam: (50%); Tutorials: (16%); Practicals: (4%)

EEE3091F   ENERGY CONVERSION
16 NQF credits at HEQSF level 7
Convener: Professor MA Khan
Course entry requirements: EEE2044S
Course outline:
This course aims to introduce students to the fundamentals of AC Electrical Machines and Power Electronics. Several machine types are studied, which include: induction, synchronous and other modern AC machines. The features, characteristics and performance of each machine type are studied. Uncontrolled and controlled rectifier circuits are introduced and analysed in detail. DC-DC converters are also be introduced. Topical industrial applications of AC machines and Power Electronics are also discussed.
Lecture times: Mon, Tue, Wed, Thu 2nd period
DP requirements: 100% Laboratory attendance and 50% mark for laboratories and submission of project
Assessment: Project: 5%; Tests: 35%; Exam: 60%

EEE3092F   SIGNALS & SYSTEMS II

16 NQF credits at HEQSF level 7
Convener: Associate Professor AJ Wilkinson
Course entry requirements: EEE2047S, MAM2083F/S
Course outline:
This course aims to develop the understanding of: Random signals and processes in continuous /discrete time, probability distribution/density functions, random signals calculus (mean, variance, moment generation function), transforms of random signals, Bayesian Theorem, covariance and correlation, Central Limit theorem, Gaussian processes, random signals spectrum and bandwidth, power spectral density (PSD), Wiener-Khinchine Theorem, entropy function, estimation/filtering of random signals. Additionally this course aims to develop the understanding of: Time and frequency domain signal processing for electronic systems (carrier-wave radio and instrumentation), continuous-time Fourier theory, sampled signals and use of the discrete Fourier transform, propagation of signals and noise through linear systems, complex analytic signal representation, power calculations using PSD functions, pulse detection using correlation and the matched filter, analog carrier-wave modulation/demodulation, amplitude modulation (double sideband and single sideband; suppressed carrier and large carrier), heterodyning, angle modulation (frequency and phase modulation), signal-to-noise ratio calculations.
Lecture times: Mon, Tue, Wed, Thu 5th period
DP requirements: Attendance at tutorials, attendance at 80% of lectures, completion and submission of all assignments, laboratory work and class tests.
Assessment: Tuts 5%,; Labs 10%,; Tests 20%,; Exam 65%

EEE3093S   COMMUNICATION AND NETWORK ENGINEERING

16 NQF credits at HEQSF level 7
Convener: Dr J Mwangama
Course entry requirements: EEE2046F
Course outline:
This course aims to develop the understanding of Computer Networks and the Internet: Internet, network edge, network core, network performance metrics, protocol layers and service models, LAN topology, Physical media, OSI reference model and TCP/IP reference model, network standardization, computer network attacks and prevention, history of computer networking and the Internet. Application and Transport Layers: Principle of network applications, socket programming, transport layer services, multiplexing/demultiplexing, connectionless transport, connection-oriented transport (TCP), TCP congestion control and performance issues. Network Layer: Network layer design issues, forwarding and routing, virtual circuit and datagram networks, router architecture, Internet protocol, routing algorithms, routing in the Internet, integrated and differentiated services. Data Link Layer: Data link design issues, error detection and correction, multiple access links and protocols, switched local area networks, IEEE 802 family, link virtualization, MPLS, data centre networking. Physical Layer: Baseband systems, formatting textual data, formatting analogue information, sources of corruption, pulse code modulation, quantization, baseband modulation and demodulation/detection, inter-symbol interference, equalization, bandpass modulation and demodulation/detection amplitude. Emerging Communication Networks: Fundamentals of mobile networks, fundamentals of smart grid communication networks.
Lecture times: Mon, Tue, Wed, Thu 3rd period
DP requirements: 100% completion of laboratory assignments and tutorials; minimum of 50% for laboratory assignments
Assessment: Tutorials & Laboratories (15%); Class Tests (25 %); Examination (60%)

EEE3094S   CONTROL SYSTEMS ENGINEERING

16 NQF credits at HEQSF level 7
Convener: Dr MS Tsoeu
Course entry requirements: EEE2047S, MAM2084F, EEE2045F

Course outline:
This course aims to develop the understanding of open and closed loop configurations, block diagrams, dynamic system modelling, transient response, steady state error criterion. System stability: Routh Hurwitz criterion, Root Locus. Frequency responses. Nyquist plots, Bode diagrams, Nichols Charts. Compensation: Lead-lag circuits, minor loops, feedforward and three-term controllers. Sensitivity functions, minimum prototype response controllers, bilinear transformation, frequency response methods. State variables, state space models and design methods. Robustness, observability controllability, stability and performance.
Lecture times: Mon, Tue, Wed, Thu 4th period
DP requirements: 100% Laboratory attendance, completion of all assigned class work
Assessment: 60% November Exam; 20% project; 10% Class Test(s); 10% Assignments/Tutorial Tests

EEE3095S   EMBEDDED SYSTEMS II FOR SCIENCE STUDENTS
18 NQF credits at HEQSF level 7
Convener: Dr Y Abdul Gaffar
Course entry requirements: EEE2050F
Course outline:
This course focuses on embedded systems and computer architecture, covering the theory and practices for the design and analysis of embedded systems, embedded operating systems, modelling and simulation of embedded systems, and an introduction to Hardware Description Language (HDL) programming. This course builds on the Embedded Systems I course. The course is split into two parts. Part 1 (10 credits) concerns the design process, modelling and analysis of embedded systems designs, the structure of an operating systems, cross-compiling toolchains, and relevant related theories. Techniques for execution time analysis, resource control protocols, and methods for modelling and simulation of computer systems are studied. Practicals concern using and embedded operating system, building applications using a cross-compiler, hardware/software interfacing, and using a single board computer embedded platform. Part 2 (6 credits) introduces HDL programming and techniques and tools for developing gateware and simulating HDL designs. A miniproject (Project A) is performed which involves implementing a state machine and performing thorough analysis of its design and performance. A more significant computer system design project (Project B), that counts 2 credits, is to be completed by computer science students.
Lecture times: Mon, Tue, Wed, Thu 5th period
DP requirements: Completion of all practical assignments as well as both projects. Minimum 50% for the weighted sum of practicals and project marks.
Assessment: Practicals (14%); ProjectA (10%); ProjectB (11%); Tests (15%); Exam (50%)

EEE3096S   EMBEDDED SYSTEMS II
16 NQF credits at HEQSF level 7
Convener: Dr Y Abdul Gaffar
Course entry requirements: EEE2046F
Course outline:
This course focuses on embedded systems and computer architecture, covering embedded operating systems, theory and practices for the design and analysis of computer architecture and an introduction to Hardware Description Language (HDL) programming. This course builds on Embedded Systems I course. The course is split into two parts. Part 1 (10 credits) concerns the design process, modelling and analysis of embedded systems designs, the structure of an operating systems, cross-compiling toolchains, and relevant related theories. Techniques for execution time analysis, resource control protocols, and methods for modelling and simulation of computer systems are studied. Practicals concern using and embedded operating system, cross-compiling applications, and using a single board computer embedded platform. Part 2 (6 credits) introduces HDL programming and techniques and tools for developing gateware and simulating designs. A mini-project is performed which involves implementing a state machine and performing thorough analysis of its design and performance.

Lecture times: Mon, Tue, Wed, Thu 5th period
DP requirements: Completion of all practical assignments and project. Minimum 50% for the weighted sum of practicals and project marks.
Assessment: Practicals (20%); Project (10%); Tests (20%); Exam (50%)

EEE3097S   ENGINEERING DESIGN: ELECTRICAL AND COMPUTER ENGINEERING
8 NQF credits at HEQSF level 7
Convener: Associate Professor AJ Wilkinson
Course entry requirements: EEE2045F, EEE2047S
Course outline:
In this course students will be assigned a design problem relevant to the Electrical & Computer Engineering discipline within which they will need to design a prototype and test a sub-system. This will provide insight to understand the intricacies of real-life complex sub system design. Students will be expected to solve it methodically using the skills they have gathered over the previous semesters of the curriculum, especially from the Design Principles course.
Lecture times: No lectures, project work only
DP requirements: 80% participation in all components of the course
Assessment: Continuous assessment: this will be assessed based on two to three well-defined deliverables over the semester) (50%); Demonstration and report on the design process and choices (50%).

EEE3098S   ENGINEERING DESIGN: ELECTRICAL ENGINEERING
8 NQF credits at HEQSF level 7
Convener: Dr D Oyedokun
Course entry requirements: EEE2045F, EEE2047S
Course outline:
In this course students will be assigned a design problem relevant to the Electrical Engineering discipline within which they will need to design a prototype and test a sub-system. This will provide insight to understand the intricacies of real-life complex sub system design. Students will be expected to solve a problem methodically using the skills they have gathered over the previous semesters of the curriculum, especially from the Design Principles course.
Lecture times: Ad-hoc lectures, project work.
DP requirements: 80% participation in all components of the course
Assessment: Continuous assessment: this will be assessed based on two to three well-defined deliverables over the semester) (50%); Demonstration and report on the design process and choices (50%).

EEE3099S   ENGINEERING DESIGN: MECHATRONICS
8 NQF credits at HEQSF level 7
Convener: Dr A Patel
Course entry requirements: EEE2045F, EEE2047S
Course outline:
In this course students will be assigned a design problem relevant to the Mechatronics discipline within which they will need to design a prototype and test a sub-system. This will provide insight to understand the intricacies of real-life complex sub system design. Students will be expected to solve a problem methodically using the skills they have gathered over the previous semesters of the curriculum, especially from the Design Principles course.
Lecture times: No lectures, project work only
DP requirements: 80% participation in all components of the course
Assessment: Continuous assessment: this will be assessed based on two to three well-defined deliverables over the semester) (50%); Demonstration and report on the design process and choices (50%).

EEE3100S   POWER SYSTEMS ENGINEERING

16 NQF credits at HEQSF level 7
Convener: Professor KA Folly
Course entry requirements: EEE2044S
Course outline:
This course aims to develop further skills and knowledge in power systems engineering, power systems network models, per-unit, load flow and balanced fault calculations, transformers, protection principles, electrical loads and tariffs and electricity market
Lecture times: Mon, Tue, Wed, Thu 5th period
DP requirements: 100% completion of laboratory assignments and tutorials. Obtain 50% mark for laboratories, 100% attendance of site visits, pass ECSA ELO 5 evaluations.
Assessment: Practicals (6 %); Assignment /Site visit (6 %); Tests (28%); Exam (60%)

EEE4006C   PROFESSIONAL COMMUNICATION STUDIES

8 NQF credits at HEQSF level 8
Convener: Associate Professor J English
Course entry requirements: EEE3073S orEEE2048F
Co-requisites: EEE4051C
Course outline:
This advanced course in professional communication aims to develop an understanding of: professional writing including business proposals, graphic communication, CVs, posters, readability, and group presentations using PowerPoint, to an audience drawn from industry.
Lecture times: Tues 4th & 5th period
DP requirements: (1) 80% attendance (2) 100% hand-in of assignment (3) Satisfactory demonstration of required components of ELO 6 and 10
Assessment: Tutorials & Group Work (6%), Projects (50%), Class Test (4%), Presentation Examination (40%).

EEE4022S   RESEARCH PROJECT

This course is also available in the first semester as EEE4022F
40 NQF credits at HEQSF level 8
Convener: Dr R Smit
Course entry requirements: All 1st, 2nd, 3rd year core courses and specific, individual, requirements depending on the topic selected. A maximum of 32 credits of coursework can be taken at the same time as the final year project.
Course outline:
The final year research project is an important opportunity, at the end of the degree programme, to tackle a real engineering project that involves the creative application of scientific principles to the solution of problems in society. The student is expected to work on the project both individually and under the guidance of a supervisor. The project involves: a problem description or research hypothesis developed in consultation with a supervisor; reviewing the topic in detail and defining the boundaries (scope) carefully, to confirm an understanding of the requirements of the project; searching for, and critically engaging the relevant literature, selecting and justifying the most appropriate approaches to solving the problem or testing the hypothesis; analysis, simulation, designing, building, integrating and testing as appropriate, hardware and software; evaluating the project against the success criteria and design objectives; writing a report about the project, the findings, and any recommendations. An oral presentation and the preparation of an exhibit of the project is also required.
DP requirements: Meetings with supervisor to discuss progress towards satisfying all the Exit Level Outcomes. Oral presentation and Open Day exhibition of project. Timeous hand-in of final project.
Assessment: Oral (10%), Project Report (90%)

EEE4051C   NEW VENTURE PLANNING

8 NQF credits at HEQSF level 8
Convener: TBC
Course entry requirements: EEE2038W, EE2039W or equivalent, EEE3073S, MAM2084S
Co-requisites: EEE4006C
Course outline:
This advanced course in new venture planning aims to develop an understanding of: the entrepreneurial perspective; developing a new venture; feasibility studies; product concept and description; market assessment; industrial analysis; regulatory aspects; marketing plans; operations, development plans and management; staffing and labour issues; financial projections; and intellectual property.
Lecture times: Tues 6th period; Wed 7th period
DP requirements: Satisfactory demonstration of required components of Exit Level Outcome 11.
Assessment: Test (10%), Business Plan (60%), Two-hour exam (30%).

EEE4086F   MICROWAVE ENGINEERING

16 NQF credits at HEQSF level 8
Convener: TBC
Course entry requirements: Students with the Computer and Electrical Engineering and Electrical Engineering Programmes and with a pass result for EEE3089F.
Course outline:
This course focuses on aspects related to systems operating at RF (radio frequency), microwave and millimetre wave frequencies, such as communication systems, radar systems and radio-astronomy receivers. It includes antennas and antenna array theory, propagation in space and urban environments and the variations at different frequencies, high frequency measurement techniques and accuracy of measurements, origin of non-linearity in systems and a functional overview of typical components used in these systems. A selection of Radar, Radio Astronomy and Communications system architecture are studied in detail. System design principles and practical computational EM (electro-magnetic) modelling are an integrated part of the course.
Lecture times: Tue, Thu 7th and 8th period, practical/visualization Fridays 3rd and 4th period.
DP requirements: 100% completion of laboratory sessions and tutorials; minimum mark of 50% for the assignment.
Assessment: Design task (20%); Two tests (30%); Exam (50%).

EEE4113F   ENGINEERING SYSTEM DESIGN

16 NQF credits at HEQSF level 8
Convener: Associate Professor AK Mishra
Course entry requirements: In the 4th academic year of study (AYOS4)
Course outline:
This course aims to consolidate prior material in the context of professional project and design work. Students working individually as well as in groups will tackle a design assignment, leading to submission of a technical report. Topics include: Various models for the stages of formal design methodologies, divergent and convergent thinking, South African industrial design case studies, context analysis (STEEPLE), idea generation, creative methods to organise thinking and planning, user requirements and specifications, project clarification and scope, design standards and codes, systems engineering approach, detail aspects and checklists related to concept, embodiment and final designs, redundancy in systems, worst-case design, sensitivity analysis and cost and project life-time estimation as well as design-thinking applied to final-year projects.
Lecture times: Mon, Tue, 3rd, 4th, 5th period
DP requirements: Pass ELO's 3 and 8 (team work)
Assessment: Design Project 50%, Final Examination 50%

EEE4114F   DIGITAL SIGNAL PROCESSING

16 NQF credits at HEQSF level 8
Convener: Associate Professor F Nicolls
Course entry requirements: EEE3086F or EEE3069W; EEE3092F or EEE3094S; or equivalent
Course outline:
This course aims to develop an advanced understanding of digital signal processing. Topics include: discrete time signals and systems; the discrete fourier transform properties and fast algorithms; the z-transform; frequency response from z-plane; FIR and IIR filter design and structures for digital filters. The course includes a specialist component in an applied or advanced signal processing application area.
Lecture times: Mon, Wed, 6th, 7th period
DP requirements: None
Assessment: Project and assignments (20%), class test (20%), June examination (60%)

EEE4115F   POWER DISTRIBUTION AND TRANSMISSION NETWORKS

16 NQF credits at HEQSF level 8
Convener: Mrs K Awodele
Course entry requirements: EEE3091F, EEE3100S
Course outline:
This course aims to develop an advanced understanding of power distribution and transmission networks. Topics include: transmission and distribution, electrical loads and load forecasting, overhead lines and cables, substations, renewable energy generation, distributed generation, smart grids, power system protection, high voltage engineering, and power system reliability and power quality, electrification, delivery process and pricing.
Lecture times: Mon, Tues, 2nd, 3rd period
DP requirements: 1) 100% Lab Attendance and submission, 2) At least 50% marks for labs, 3) Pass ECSA ELO evaluation, 4) 100% attendance of site visits.
Assessment: Lab Assignments (10%), Project and Site visits (10%), Class Tests (20%), June Exam (60%)

EEE4116F   POWER SYSTEMS ANALYSIS, OPERATION & CONTROL

16 NQF credits at HEQSF level 8
Convener: Professor KA Folly
Course entry requirements: EEE3091F, EEE3100S
Course outline:
This course aims to develop an advanced understanding of various topics in the analysis, operation and control of electric power systems, and their practical applications. Topics include: Graph theory, admittance and impedance matrices, power flow studies, symmetrical components, fault calculation, power system security states, optimisation of power system operations, power system stability and control, dynamic security analysis, grid operations, control centres, HVDC systems and geomagnetic induced currents (GIC)
Lecture times: Wed, Thurs, 2nd, 3rd period
DP requirements: 1) 100% Lab attendance and submission, 2) At least 50% marks for labs
Assessment: Labs, projects and assignments (20%), Class Tests (20%), June Exam (60%)

EEE4117F   ELECTRICAL MACHINES AND POWER ELECTRONICS

16 NQF credits at HEQSF level 8
Convener: Professor MA Khan
Course entry requirements: EEE3091F or equivalent
Course outline:
This course aims to develop an advanced understanding of speed control of electrical machines and power electronic circuits. In particular, the analytical models of DC and AC machines are

manipulated to achieve speed control of these machines. Furthermore, circuit topologies, switching patterns and waveforms of DC-DC converters and DC-AC inverters are studied.
Lecture times: Mon; Tues, 4th & 5th period
DP requirements: 100% Lab attendance and 50% mark for labs and submissions of project/s
Assessment: Project/s (10%), Class Tests (30%), June Exam (60%)

EEE4118F   PROCESS CONTROL AND INSTRUMENTATION
16 NQF credits at HEQSF level 8
Convener: Dr M Tsoeu
Course entry requirements: EEE3094S
Course outline:
This course aims to present a unified and holistic view of industrial control, automation and instrumentation. It covers topics on industrial automation, measurements and instrumentation, and introduces advanced control methods. Specific topics are: the industrial automation hierarchy; automation drawings – P&ID diagrams; Programmable Logic Controllers; Supervisory Control and Data Acquisition; Distributed Control Systems; Sensing and Measurement Techniques; Batch Processes; Automation Networks; Safety Systems; and a selection of Advanced Control topics such as Nonlinear, Quantitative Feedback Theory, H-infinity and Model Predictive Control. The course aims to develop knowledge, skills and values through a balanced integration of lecturers, tutorials, laboratory and project work.
Lecture times: Wed, Thurs, 4th, 5th period
DP requirements: 100% attendance of labs, completion of all assigned class work, pass all ECSA Exit Level Outcomes assigned to the course.
Assessment: Class Tests and Assignments (20%), Class Project (20%), June Exam (60%)

EEE4119F   MECHATRONICS II
16 NQF credits at HEQSF level 8
Convener: Dr A Patel
Course entry requirements: MEC2047F, MEC2045S
Course outline:
The course aims to provide a unified and holistic view of automation of mechanical systems. Specific topics are: Multibody Kinematics (2D&3D), Inverse Kinematics, Euler-Lagrange Mechanics, Numerical Simulation, Friction modelling and a selection of nonlinear control topics from: Feedback Linearisation, Lyapunov Stability, Sliding Control, Gain Scheduling, Manipulator control and Trajectory Optimisation. Applications of techniques will be tailored towards terrestrial, sea, air as well as industrial robotic systems. The course aims to develop knowledge, skills and values through a balanced integration of lectures, tutorials, laboratory and project work.
Lecture times: Mon, Tues, 2nd, 3rd period
DP requirements: 1) 100% completion of labs, 2) Completion of all assigned class work, 3) Pass all ECSA Exit Level Outcomes assigned to the course
Assessment: Class tests and assignments (20%), Class project (20%), June Exam (60%)

EEE4120F   HIGH PERFORMANCE DIGITAL EMBEDDED SYSTEMS
16 NQF credits at HEQSF level 8
Convener: Dr S Winberg
Course entry requirements: EEE3096S
Course outline:
This course aims to consolidate an understanding of Parallel computing, with a focus on design for parallel systems. This   includes theory of parallel algorithm development, developing golden measures, performance analysis, benchmarking essentials, implementating parallel code. Topics include fundamental theories, design practices, and techniques related to the design of digital high performance embedded systems. The lectures include a number of case studies related to real systems that were developed. Additionally the course aims to consolidate an understanding of

Reconfigurable computing and the design and development of hardware description language (HDL) code for use with Field Programmable Gate Arrays (FPGAs) platforms. The latter part of the course has an emphasis on the use of FPGAs and HDL programming in relation to design and application development for ReConfigurable (RC) hardware platforms.
Lecture times: Tues, Thurs, 6th, 7th period
DP requirements: Minimum 40% overall class average to write the final exam
Assessment: Labs (10%), Project (10%), Tests (20%), June Exam (50%)

EEE4121F   MOBILE AND WIRELESS NETWORKS
16 NQF credits at HEQSF level 8
Convener: Associate Professor O Falowo
Course entry requirements: EEE3093S
Course outline:
This course aims to develop an understanding of mobile and fixed networks. Topics include: Wireless Network Fundamentals, Wireless and Wireline Access Technologies, Radio Resource Management, Mobility Management, Traffic and Congestion Control, QOS in Packet Network, IP Traffic Engineering, Network Convergence, Network Services and Applications Requirements, Data Plane and Control Plane Technologies, and Performance modeling and simulation.
Lecture times: Mon, Tues, 4th, 5th period
DP requirements: 1) 100% Tutorial submission and lab attendance, 2) Pass ELO evaluation in the project, 3) A minimum of 50% lab mark.
Assessment: Lab, Project and Tutorial (20%), Class Test (20%), June Exam (60%).

EEE4122C   COMMUNICATION ENGINEERING
8 NQF credits at HEQSF level 8
Convener: Dr A Murgu
Course entry requirements: EEE3093S
Course outline:
This course aims to develop an understanding of communication engineering. Topics include: Elements of information theory, error-control coding, source coding and baseband signalling, bandpass modulation and demodulation/detection, synchronisation, resource allocation, communication link analysis, and a system design example.
Lecture times: Mon, Tues, Wed, 5th period, **Tutorial**: Thurs, 5th period
DP requirements: 1) 100% Tutorial submission and lab attendance, 2) A minimum of 50% lab mark
Assessment: Lab and Tutorial (20%), Class Test (20%), Exam (60%)

EEE4123C   ELECTRICAL MACHINES AND DRIVES
8 NQF credits at HEQSF level 8
Convener: Professor P Barendse
Course entry requirements: EEE3091F
Course outline:
This course provides an introduction to reference frame theory; dq-machine modelling; field orientated control of a permanent magnet synchronous motor and induction motor; and an introduction to single-phase induction motors.
Lecture times: Mon, Tues, Wed, Fri, 2nd period
DP requirements: None.
Assessment: Projects (10%), Class Tests (25%), Tutorials (5%), Exam (60%)

MECHANICAL ENGINEERING

The Department offers the following undergraduate degree programmes:

Bachelor of Science in Enginering in:
Mechanical and Mechatronic Engineering
Mechanical Engineering

The Department of Mechanical Engineering is situated in the Electrical & Mechanical Engineering, McMillan and Menzies Buildings on the Groote Schuur campus, fronting onto University Avenue. It can be accessed via University Avenue and Library Road.

Staff

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Deputy Heads of Department
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RB Tait, PrEng BSc(Hons) *Rhodes* MA *Oxon* BSc(Eng) PhD *Cape Town* MSAIMechE

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Adjunct Professor
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SARChI South African Research Chair in Computational Mechanics
Professor BD Reddy, BSc(Eng) *Cape Town* PhD *Cantab*

SARChI South African Research Chair in Industrial CFD
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MN Ngoepe, BSc(Eng*) Cape Town,* DPhil *Oxon*
HT Pearce, BSc(Eng) *Cape Town* MS PhD *Illinois*
S Parker, BSc(Eng) MSc(Eng) *Cape Town*
CB Shaw, BSc(Eng) MSc(Eng) HDE MPhil(EngMan) DPhil(EngMan) PhD *Cape Town*
CD Woolard, MSc *London* PhD *Cape Town*

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Principal Technical Officers
P Smith
R Whittemore, BSc(Eng) *Cape Town*

Chief Technical Officer
D Jacobs

Senior Technical Officers
H Christians
G du Plessis

Technical Assistants
P Jacobs
W Slaverse

Departmental Manager
CMC Jonker, BCom(Hon) *UWC*

Administrative Officer (Undergraduate)
R Maree

Administrative Assistant (Postgraduate)
D Botha, BPrimEd *Witwatersrand*

Administrative Officer (Finance)
B Glass

Senior Secretary
S van Sensie

Department Assistant
G Doolings

The activities of the Department cover a wide field at both undergraduate and postgraduate level. The undergraduate programme has an annual intake of approximately 120 students who are among the best of the South African and international school leavers. Graduates are highly regarded and join a variety of industrial and commercial enterprises. Students who obtain satisfactory results at

undergraduate level are encouraged to continue studies at the postgraduate level. The postgraduate qualifications are focussed on a wide range of Departmental research activities, such as aeronautical engineering, bio-medical engineering, blast response of structures, composites, computational mechanics, energy, engineering education, fracture and fatigue, fuels, impact, management, manufacturing, materials, non-destructive testing and evaluation, refrigeration engineering, robotics and control systems.

The undergraduate Bachelor of Science in Engineering degree programmes in Mechanical and Mechatronic Engineering and Mechanical Engineering have the first two years' curricula in common.

Course Outlines

MEC1000X   PRACTICAL TRAINING I
0 NQF credits at HEQSF level 5
Convener: Associate Professor G Vicatos
Course entry requirements: None
Co-requisites: None
Course outline:
This opportunity for practical experience for Electro-Mechanical and Mechanical Engineering students culminates in a certificate showing evidence of completion of suitable work in basic workshop processes during a period of at least four weeks in an approved industrial workshop. The practical experience should be gained in the mid-year or end of year vacation following the year of first registration in the Faculty. The evidence of completion must be submitted by 31 March of the following year. Alternatively students may produce a certificate showing evidence of completion of an approved structured intensive two-week practical training course (e.g. at a University of Technology). Students are required to cover at least the following: welding, turning, and basic fitting.
Lecture times: None
DP requirements: None
Assessment: Submission of a confidential report form to the Department from the employer confirming the student's exposure to certain processes stipulated by the course convener.

MEC1002W   ENGINEERING DRAWING
16 NQF credits at HEQSF level 5; First year course..
Convener: Mrs C Findeis
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to develop the knowledge and skills for engineering drawing. Topics include: use of drawing instruments; plane geometry; principles of orthographic projection; pictorial projection; auxiliary projection; sections; intersection of solids; development; engineering drawing conventions; dimensioning; descriptive geometry of points; lines and planes in space; an introduction to the basics of CAD.
Lecture times: 1 Lecture and 1 Tutorial per week.
DP requirements: Completed portfolio.
Assessment: 3 hour examination in November (50%); CAD (10%); portfolio submissions and tests (25%); Discipline Specific Module (15%). A minimum of 50% is required to pass this course. There is no supplementary examination for this course.

MEC1003F   ENGINEERING DRAWING
8 NQF credits at HEQSF level 5; First year course..
Convener: Mrs C Findeis
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to develop the knowledge and skills for engineering drawing. Topics include: use of drawing instruments; plane geometry; principles of orthographic projection; pictorial projection; auxiliary projection; an introduction to the basics of 3D Modelling CAD; part drawings and assembly modelling.
Lecture times: 1 Lecture and 1 Tutorial per week.
DP requirements: Completed portfolio.
Assessment: 2 hour examination in June (50%); CAD (10%); Discipline Specific Module (25%); Portfolio and class tests (15%). A minimum of 50% is required to pass this course. There is no supplementary examination for this course.

MEC1005W   INTRODUCTION TO MECHANICAL ENGINEERING
24 NQF credits at HEQSF level 5; First year course.
Convener: Professor B Collier-Reed
Course entry requirements: None
Co-requisites: None
Course outline:
This course provides students with a broad introduction to mechanical engineering through a variety of activities culminating in a competitive group design challenge. Throughout the course, students will engage with classical mechanical engineering concepts, participate in experiential activities, and locate what they are learning through the use of case studies. Topics covered include what it means to be an engineer; how to use effective oral, written, and technical communication; the interrelationship between technology and society; professional ethics; the need for sustainable engineering activities; the engineering design process; forces in structures and machines; thermal and energy systems; motion and power transmission; fluids engineering; basic electrical theory and materials and stresses.
Lecture times: 3 Lectures per week; 1 afternoon session every two weeks.
DP requirements: Students must write all three class tests. Assignments, project, and report must be submitted for assessment. Attendance at all laboratory sessions.
Assessment: Tests (20%); Oral presentation (5%); Project (12%); Technical report (8%); Assignments (25%); 3 hour examination (30%).

MEC1007F   INTRODUCTION TO ENGINEERING DRAWING
8 NQF credits at HEQSF level 5
Convener: Mrs C Findeis
Course entry requirements: None
Co-requisites: None
Course outline:
This course has been structured to introduce the basic drawing principles for students who have no prior drawing experience. It also aims to provide the relevant drawing and design knowledge to enter the design stream of the Mechanical Engineering degree. Drawing equipment is used to convey the principles of descriptive geometry and drawing standards. Free hand sketching is taught to interpret orthographic and pictorial projection and basic design principles. The primary focus of the course is the generation of orthographic working drawings for the manufacturing environment.
Lecture times: 1 lecture and 1 tutorial per week
DP requirements: A completed portfolio of assignments.
Assessment: Two tests during the semester which will assess skill and interpretation of mechanical drawings in various views. The portfolio assignments will be assessed. **The class mark for the**

course will consist of the following: Tests – 30%, Portfolio – 10%, Exam – 60% (2 hour exam in June). An overall mark of 50% is required for successful completion of this course. In the event that the student does not successfully complete the course, the portfolio mark may be kept and the student may apply to register for an exam without attendance in the following year. The DP criteria mark may be considered and carried over for one year only.

MEC1008S   INTRODUCTION TO MECHANICAL DESIGN
8 NQF credits at HEQSF level 5
Convener: Mrs C Findeis
Course entry requirements: DP Requirement for Introduction to Engineering Drawing (MEC1007F).
Co-requisites: None
Course outline:
This course aims to form a foundation of drawing and design using 3D Computer Aided Drawing software. The software will be a used as a tool to generate and interpret drawings for a manufacturing environment. Basic fundamentals of mechanical engineering design will be applied using free hand sketching skills and 3D CAD. Topics include: Solid modelling applications with design intent; fits and tolerances; detailing for manufacturing; interpretation of drawings; and assembly design for manufacturing.
Lecture times: 1 lecture and 1 tutorial per week.
DP requirements: A minimum of 40% for both tests.
Assessment: 1 Theory Test, 1 CAD Test, assessed CAD assignments. **The class mark for the course will consist of the following:** Tests – 25%, CAD assignments – 15%, Exam – 60% (2 hour exam in November), An overall mark of 50% is required for successful completion of this course. In the event that the student does not successfully complete the course, the DP criteria mark may be kept and the student may apply to register for an EXAM WITHOUT ATTENDANCE in the following year. The DP criteria mark may be considered and carried over for one year only.

MEC1009F   INTRODUCTION TO ENGINEERING MECHANICS
16 NQF credits at HEQSF level 5
Convener: Mr T Cloete
Course outline:
This course aims to introduce students to the concepts of engineering mechanics. It develops the concept of equilibrium of particles and rigid bodies which is a required basis for solving engineering problems in mechanical engineering and cognate disciplines. The course reviews the use of vectors for displacement, position and force. Students will learn how to represent engineering problems using free body diagrams and graphical methods. Forces considered are applied as point loads, moments and distributed loads. Internal resultant forces that occur due to axial loading, bending and torsion will be considered. Applications include statically determinate systems only: basic trusses, beams, frames and machines. Concepts of centroids, second moment of area, parallel axis theorem and mass moment of inertia are covered. Elementary solid mechanics ideas such as stress, strain and simple mechanical properties of materials are also introduced.
Lecture times: 4 lectures and 1 tutorial per week.
DP requirements: 40% average for class tests; attendance at all tutorials and class tests required.
Assessment: Examination 60%, class tests 40%, November examination 3 hours.

MEC1009S   INTRODUCTION TO ENGINEERING MECHANICS
16 NQF credits at HEQSF level 5
Convener: Mr S Parker
Course outline:
This course aims to introduce students to the concepts of engineering mechanics. It develops the concept of equilibrium of particles and rigid bodies which is a required basis for solving engineering problems in mechanical engineering and cognate disciplines. The course reviews the use of vectors

for displacement, position and force. Students will learn how to represent engineering problems using free body diagrams and graphical methods. Forces considered are applied as point loads, moments and distributed loads. Internal resultant forces that occur due to axial loading, bending and torsion will be considered. Applications include statically determinate systems only: basic trusses, beams, frames and machines. Concepts of centroids, second moment of area, parallel axis theorem and mass moment of inertia are covered. Elementary solid mechanics ideas such as stress, strain and simple mechanical properties of materials are also introduced.
Lecture times: 4 lectures and 1 tutorial per week.
DP requirements: 40% average for class tests; attendance at all tutorials and class tests required.
Assessment: Examination 60%, class tests 40%, November examination 3 hours.

MEC2000X   PRACTICAL TRAINING II
0 NQF credits at HEQSF level 6
Convener: Associate Professors R Kuppuswamy and G Vicatos
Course entry requirements: None
Co-requisites: None
Course outline:
This second opportunity for practical experience for Electro-Mechanical and Mechanical Engineering students, culminates in a certified employers report showing regular timekeeping and evidence of completion of suitable work in mechanical, or electro-mechanical engineering practice. It and must involve work in a registered company where a student will be exposed to "engineering activities" for a minimum period of six weeks at the end of the second year. The six weeks does not have to be continuous, however no single block may be less than three weeks. The student engineer is expected to be involved with operation and maintenance of plant, and / or to work on a design project, and to apply the knowledge gained in academic study, to the project under supervision.
Lecture times: None
DP requirements: None
Assessment: Students must submit a report to the Head of Department or his / her designee, which shall include a description of the engineering task assigned to the student, the engineering approach taken, and the learning experience of the student.

MEC2026S   PROJECT MANAGEMENT
8 NQF credits at HEQSF level 6; Second semester course.
Convener: Dr C Shaw
Course entry requirements: 3rd Year equivalent course or concession
Co-requisites: None
Course outline:
This course aims to develop the understanding that project management can be practiced as a stand-alone professional discipline or as an integral part of the delivery mechanism for engineering services. The course introduces student engineers to the discipline of project management and knowledge of the discipline, to participate meaningfully in project work. Topics include: project management theory, principles, practices, tools and techniques; project life cycles, body of knowledge, initiation, planning, scope management, human resource management, quality, cost management, specifications and standards, procurement, risk management and project safety, and completion and close out.
Lecture times: 2 Lectures and 1 Tutorial per week.
DP requirements: A weighted average of at least 40% for all marked assignments and the class test. Participation in tutorials.
Assessment: Group assignment; class tests; November examination.

MEC2045S   APPLIED ENGINEERING MECHANICS

16 NQF credits at HEQSF level 6
Convener: Mr E Ismail
Course entry requirements: MEC1009F/S and MEC2023F/S or MEC2047F/S
Course outline:
This course provides an introduction to basic materials, basic stress and strain analyses, beam deflections and stress analysis, gears and gear forces, rotating unbalance, vibrations and gyrosopic motion. Students will learn how to perform kinematic analysis of gear trains, energy storage calculations in flywheels and analyse single-degree-of-freedom models in simple free and forced vibrating systems. Students will learn to analyse rotating machinery, flywheels and gyroscopes. They will also be able to perform basic deflection and stress calculations for statically determinate beams, and understand different classes of materials and their uses in structures.
Lecture times: 4 Lectures and 1 Tutorial per week
DP requirements: 40% average for class tests; attendance at all tests required.
Assessment: Examination 60%, class tests 40%. November examination 3 hours. Class tests will be 2 x 90 minute written assessments.

MEC2046F   MATERIALS SCIENCE IN MECHANICAL ENGINEERING

12 NQF credits at HEQSF level 6
Convener: Professor R Knutsen
Course entry requirements: None.
Co-requisites: CEM1008F
Course outline:
This course includes an overview of the classification and structure-property relationships of metallic, ceramic, polymeric and composite engineering materials. Specific topics include: elastic behaviour; plastic and work-hardening behaviour of ductile materials; recovery and recrystallisation of deformed metals; microstructure, heat treatment and properties of steels; optimisation and limitations of ceramic materials; processing and manufacture of polymeric and composite materials; influence of environmental effects on the deterioration of materials. The course is concluded by applying the knowledge of material classification, structure-process-property relationships, availability, sustainability and cost, to optimum selection of materials in engineering design.
Lecture times: 3 Lectures and 1 Tutorial per week.
DP requirements: (1) 35% minimum for class record (2 tests + 1 assignment), and (2) Students must write the tests, attend all tutorials and submit the assignment by the due date in order to qualify for DP.
Assessment: Class Test 1 (45 mins) 5%, Class test 2 (1.5hrs) 15%, Assignment 15%, Written Examination 65% (3hours, sub-minimum 40%).

MEC2047F   ENGINEERING DYNAMICS

16 NQF credits at HEQSF level 6
Convener: Dr B Kloot
Course entry requirements: MAM1021F/S, PHY1012F/S and MEC1009F/S
Course outline:
This course aims to extend the fundamental principles and formulations of Newtonian mechanics by examining the motion of particles and rigid bodies. This is achieved by considering kinematics (motion without reference to forces) and kinetics (motion with reference to forces). Topics include rectilinear motion, curvilinear motion, relative motion, constrained motion, absolute motion, Newton's laws, work and energy, impulse and momentum, impact.
Lecture times: 4 Lectures and 1 Tutorial per week.
DP requirements: Attendance at Class and Tutorial tests.
Assessment: Weekly tutorial tests: 10% (30 minutes each), Class tests: 30%, Class test 1: 10% (1.5 hours), Class test 2: 10% (1.5 hours), Class test 3: 10% (2 hours), Final examination: 60% (3 hours).

MEC2047S   ENGINEERING DYNAMICS

16 NQF credits at HEQSF level 6
Convener: Dr M Ngoepe
Course entry requirements: MAM1021F/S, PHY1012F/S and MEC1009F/S
Course outline:
This course aims to extend the fundamental principles and formulations of Newtonian mechanics by examining the motion of particles and rigid bodies. This is achieved by considering kinematics (motion without reference to forces) and kinetics (motion with reference to forces). Topics include rectilinear motion, curvilinear motion, relative motion, constrained motion, absolute motion, Newton's laws, work and energy, impulse and momentum, impact.
Lecture times: 4 Lectures and 1 Tutorial per week.
DP requirements: Attendance at Class and Tutorial tests.
Assessment: Weekly tutorial tests: 10% (30 minutes each), Class tests: 30%, Class test 1: 10% (1.5 hours), Class test 2: 10% (1.5 hours), Class test 3: 10% (2 hours), Final examination: 60% (3 hours).

MEC2048S   MECHANICAL ENGINEERING DESIGN

16 NQF credits at HEQSF level 6
Convener: Dr R Govender
Course entry requirements: MEC1008S, MEC1005W, Solid Mechanics I (currently MEC2025F or MEC2045F), Materials I (currently MEC2042F) or MEC2046F
Course outline:
This course aims to provide the foundations for graduate level mechanical engineering design. Specific knowledge areas developed are selection of simple machine elements, machine assembly design and basic manufacturing technology. Skills are developed in the use of Computer Aided Design (CAD) software, to produce 3D models of parts, compose these into assemblies with appropriate constraints and produce orthographic drawings of assemblies and parts to accepted standards, suitable for manufacture. Basic product dissection skills are developed.
Lecture times: 3 Lectures and 1Tutorial per week.
DP requirements: Write all class tests, attend all practicals, submit all assignments/practical reports, sub-minimum of 40% on weighted average term mark.
Assessment: Paper 1 – Theory – 2hrs – 25%, Paper 2 – Practical/CAD – 2 hrs – 25%. Class tests: Theory Test – 12 %, Practical CAD Test – 8%. Assignments/Practicals: Assignment 1 – 12 %, Assignment 2 – 12 %. Product Dissections Labs – 2 x 2%

MEC2049F   SOLID MECHANICS 1

16 NQF credits at HEQSF level 6
Convener: Mr S Parker
Course entry requirements: MEC1009F, MAM1020F/S (or equivalent)
Course outline:
This course aims to analyse the deformation of structures loaded axially, in torsion and in bending. Combinations of these loading types will be explored with regard to stress and stress transformations. Deformation will be calculated in statically determinate and indeterminate situations. The method of solving statically indeterminate problems will include using the geometry of deformation in conjunction with static equilibrium and superposition. Strain energy, using Conservation of Energy and the Principle of Virtual Work, will be used to calculate deformation. The buckling of columns will also be examined.
Lecture times: 4 Lectures and 1 Tutorial per week.
DP requirements: Class mark (Class Tests and Tutorial Tests) > 40%, writing all class and tutorial tests, completion of assignment by writing a reading memo which demonstrates the students' active engagement with the reading material given. The reading assignment is marked pass/fail.
Assessment: Two class tests of 90 minutes each - 30%; 10 tutorial tests of 20 minutes each - 10 %; examination 3 hours - 60%.

MEC2050S   THERMOFLUIDS 1
16 NQF credits at HEQSF level 6
Convener: Mr D Findeis
Course entry requirements: CEM1008F and MAM1020F and PHY1012F
Course outline:
This course aims to introduce students to the fundamentals of thermodynamic and fluid mechanic sciences in an integrated manner. In particular students will be introduced to fundamental concepts and definitions, as well as fluid properties and their relationships. Students will furthermore be given insight into the fundamental heat transfer mechanisms and become familiar with the 4 basic conservation laws. By applying these to selected continuity problems, closed system problems, entropy problems as well as fluid statics and momentum problems, students will become familiar with the presented concepts and further their problem solving skills.
Lecture times: 4 lectures and 1 Tutorial per week.
DP requirements: 40% average for class tests. Attendance of laboratory session and 50% or more for the submitted lab report. 70% attendance of pop quizzes.
Assessment: Pop Quizzes during lectures (10%), 2 tests (20%), 1 laboratory session and report (10%), 1 3-hour final exam (60%).

MEC3023F   MECHANICS OF SOLIDS II
12 NQF credits at HEQSF level 7
Convener: Dr R Govender
Course entry requirements: MEC2025F or MEC2049F, MAM2083F/S (DP), MAM2084 F/S (DP)
Co-requisites: None
Course outline:
This course aims to develop a more advanced understanding of the mechanics of solids. Topics included are: compound stresses and theories of failure; elastic strain energy; combined loading of shafts and beams; thin and thick cylinders; compound cylinders and shrink fits; elementary plasticity; rotating discs and shafts.
Lecture times: 3 Lectures per week and 1 tutorial per week
DP requirements: Satisfactory progress in class tests & laboratory reports. Tutorial attendance.
Assessment: Class tests, laboratory reports, June examination 3 hours.

MEC3031S   DYNAMICS II
16 NQF credits at HEQSF level 7
Convener: Professor G Langdon
Course entry requirements: MEC2044S or MEC2048S or MEC2020W, MEC2023F/S or MEC2047F/S, MEC2025F or MEC2049F
Co-requisites: None
Course outline:
The aim of this course is to develop a more advanced understanding of dynamics. Topics include: kinematics and efficiency of gears and gear trains; balancing of rotating machines; crank-effort diagrams; balancing of reciprocating machinery; flywheels; vibration including single degree of freedom systems. Natural frequencies and Gyroscopic motion are also covered.
Lecture times: 4 Lectures per week, 2 practical sessions per semester.
DP requirements: Participation in all tests and assignments and submission of all hand-ins requested.
Assessment: Class tests, take home assignment, lab classes, November examination 3 hours.

MEC3033F   THERMOFLUIDS II
20 NQF credits at HEQSF level 7
Convener: Associate Professor G Vicatos
Course entry requirements: MEC2022S or MEC2050S

Course outline:
This course on thermofluids aims to develop a more advanced understanding of applications in thermodynamics and different types of fluid flow. Topics include: application of the conservation of mass, momentum and energy in fluid flow; Benoulli's equation and the one-dimensional energy equation; reaction forces due to fluid flow; Buckingham's π-theorem and the application of dimensional analysis and similarity for reduced experimentation and scaling; ; laminar and turbulent flows in pipes; the Moody diagram; turbines and pumps, Venturi meter and orifices; losses in pipes; Thermodynamics: Second Law of Thermodynamics; heat source and sink; thermal efficiency; reversible and irreversible processes; Carnot efficiency; Carnot heat engine; Carnot refrigeration cycle; entropy; isentropic processes; efficiency of compressors; steady flow devices; isothermal; polytropic and isentropic processes; isentropic efficiencies for turbines, compressors, pumps and nozzles; Gas cycles: Otto; Diesel; Stirling; Ericsson; Brayton; jet-propulsion; vapour cycles; Rankine; and refrigeration.
Lecture times: 5 lectures per week. 4 laboratory sessions.
DP requirements: Participating in all tests, attendance of all laboratory sessions and achieving a minimum average of 50% for the report writing; obtaining a minimum overall class mark of 40%.
Assessment: Class tests, laboratory assignments, June examination 2 papers: 3 hours for Thermodynamics and 2 hours for Fluids. A subminimum of 40% required for both exams.

MEC3035S   COMPUTER INTEGRATED MANUFACTURE AND ROBOTICS
For Mechanical and Mechatronic (MMT) Engineering students only.
8 NQF credits at HEQSF level 7
Convener: Ms L Raw
Course entry requirements: CSC1017F or equivalent
Co-requisites: None
Course outline:
This course aims to develop an advanced understanding of computer integrated manufacture and robotics. Topics include: computer integrated manufacturing; computer numerical control (CNC) of machine tools; flexible manufacturing systems (FMS); materials handling and robot directed transfer systems; robot kinematics; low cost automation; software control systems; and hardware interfacing.
Lecture times: 2 Lectures per week. Projects: two projects, one of which is an exit level outcome (ELO) for the Electro-Mechanical degree. Four tutorials will be run over the duration of the course
DP requirements: Attendance at all tutorials; submission of all projects; demonstration of the ELO project to an examiner; 40% class mark. A minimum of 50% for the ELO report. A minimum of "satisfactory" for the ELO must be obtained.
Assessment: One 2-hour November examination is divided into two sections held on the same day. The first hour is on the written theory and counts for 60%. The second hour is a practical examination and counts for 40% of the examination. The class mark is made up of homework and projects. The final mark is made up of 50% class mark and 50% examination mark.

MEC3037S   PROFESSIONAL COMMUNICATION
For Mechanical & Mechatronic (MMT) Engineering and Mechanical Engineering students. (Second-year students may not register)
8 NQF credits at HEQSF level 7
Convener: Associate Professor J English
Course outline:
This course equips students with the skills required for the preparation and writing of technical reports with reference to design reports. It also covers effective delivery of technical material through presentations and visual aids. Students will be assessed in terms of their ability to plan, organise and select information; write and speak in a clear and appropriate style; and present technical information in a highly readable way.
Lecture times: 2 Lectures per week.
DP requirements: 80% attendance. 50% pass for coursework.

Assessment: Class test and assignments 50%, Presentation examination and 3 hour written examination 50%.

MEC3044S   THERMOFLUIDS III
12 NQF credits at HEQSF level 7
Convener: Professor T Bello-Ochende
Course entry requirements: MEC3033F (DP)
Co-requisites: None
Course outline:
This course aims to develop an advanced understanding of thermofluids. Topics include: Boundary layer theory; forced and natural convection (laminar and turbulent flow along plates and tubes); compressible flow in pipes; rotodynamics machines. ; gas power cycles, engine cycles and measures of performance; properties of gas and vapour mixtures; air-conditioning; combustion chemistry; air/fuel ratio and stoichiometry; fuel sources and composition; energy of reacting systems; heat of combustion; adiabatic flame temperature; heat exchangers; and availability.
Lecture times: 3 Lectures per week.
DP requirements: Participation in all laboratory sessions, tests and completion of all homework. A minimum class mark of 40%.
Assessment: November examination, 3 hours. A sub-minimum of 40% required in each module. Final mark: 0.7 x Examination mark + 0.3 x Class mark.

MEC3045F   EXPERIMENTAL METHODS
12 NQF credits at HEQSF level 7
Convener: Dr SL George
Course entry requirements: None
Co-requisites: None
Course outline:
 This course aims to develop skills, based on a real-world scenarios and case studies, which will allow a student to perform successful engineering experiments, as well as data analysis and interpretation. The course covers topics such as: basic concepts in experimental methods and taking measurements; safety and risk assessment; uncertainty analysis; basic electrical measurements; sensing and data management; temperature, pressure, force, strain and flow measurement devices; basic design of experiments and orthogonal arrays; nondestructive evaluation of parts; multi-component experimental case studies.
Lecture times: 3 Lectures per week.
DP requirements: Attend all practical sessions and submit, within seven days of the session, if required, a written report; write the class tests; pass the final examination; satisfactorily achieve each of the ECSA ELO's associated with the course.
Assessment: Class test 10%; Laboratory/practical reports 20%; Assignment   15%   Examination 55%

MEC3060F   MATERIALS UNDER STRESS
8 NQF credits at HEQSF level 7
Convener: Dr SL George
Course entry requirements: MEC2042F or MEC2046F
Co-requisites: None
Course outline:
This course in materials under stress aims to develop an advanced understanding of elasticity and the importance of modulus in engineering design. Topics include: the influence of bond strength and crystal structure; plastic flow in crystals and polycrystals by dislocation movement; strengthening mechanism in metals and alloys; annealing and heat treatment procedures; design for safety; stress concentration and residual stress considerations; failure in metals; ductile and brittle fractures;

critical flaw size for crack propagation; fracture toughness of materials; stress conditions for fatigue and creep deformation; fracture mechanics; and failure analysis and failure case studies.
Lecture times: 2 Lectures per week.
DP requirements: 35% minimum for class record. Students must attend class tests. Practical must be attended, completed and handed in on time and a minimum of 50% must be achieved.
Assessment: Coursework (30%), Examination (70%).

MEC3069S   PRODUCTION PROCESSES
8 NQF credits at HEQSF level 7; Third year second semester course.
Convener: Mr DM Findeis
Course entry requirements: MEC2042F or MEC2046F
Co-requisites: MEC2050S, MEC2048S
Course outline:
This course presents a range of production processes used in the manufacturing environment, making use of thermal, mechanical and optical techniques. The manufacturing processes introduced and covered include: Solidification processes, such as casting methods and forming of plastics; bulk deformation processes, such as extrusion, drawing and rolling; powder metallurgy, sheet metal work and welding processes. At the end of the course students will be able to select a suitable manufacturing process from a number of available processes, taking into account complexity and reliability, and lot size.
Lecture times: 2 lectures per week.
DP requirements: 40% sub-minimum for homework assignment and 40% sub-minimum for class test.
Assessment: 2 hour theory examination 60%; homework assignment 20%; class test 20%

MEC3072F   MECHANICAL ENGINEERING MACHINE ELEMENT DESIGN II
8 NQF credits at HEQSF level 7
Convener: Associate Professor R Kuppuswamy
Course entry requirements: MEC2044S or MEC2048S, DP in MEC2023F/S or MEC2047F/S, MEC2025F or MEC2049F, MEC2042F or MEC2046F
Co-requisites: MEC3023F, STA1008F, MEC3045F (Mech)
Course outline:
This course aims to facilitate the development of knowledge and skills that will allow students to address design problems with both creativity and rigour, by generating concept designs, designing machine components and assemblies that will perform and can be produced in accordance with appropriately specified development requirements, and the creation of suitable engineering drawings for parts and assemblies. Topics include: Concept generation, machine component design and basic machine system design, CAD modelling and creation of part and assembly drawings including tolerances. Specific knowledge areas are static and fatigue failure theories; standard machine design for joints (welding, threaded and non-threaded fasteners), and power screws and includes basic design projects on the machine level.
DP requirements: Final class mark $\geq$ 40%, each class test $\geq$ 35%. Attendance at the Tuesday afternoon tutorial sessions is compulsory. A register will be taken each week and doctors' certificates will be required for tutorials missed on medical grounds. Satisfactory completion as outlined in the handouts of all assignments. Attendance at all class tests (doctors' certificates will be required for tests missed on medical grounds.)
Assessment: One class test (2 hours). 2 or 3 Design and / or CAD hand in Assignments (50 marks each). One examination in the June examination period (2 hours). Final mark: class mark 50% (DP requirement 40%) and exam 50% (exam sub-minimum 40%). Class mark composition: Class test 50%, design projects and assignments 50%.

MEC3073S   MECHANICAL ENGINEERING MACHINE ELEMENT DESIGN III

16 NQF credits at HEQSF level 7
Convener: Ms L Raw
Course entry requirements: DP in MEC3072F, DP in MEC3023F, DP in STA1008F, DP in MEC3045F (Mech), DP in MEC3033F, MEC2022S or MEC2050S
Co-requisites: MEC3037S, MEC2026S, MEC3031S, MEC3035S (MMT)
Course outline:
This course aims to facilitate the further development of knowledge and skills that will allow students to address complex design problems with both creativity and rigour, by generating and selecting concept designs, performing detail design of machine components and assemblies that will perform and can be produced in accordance with appropriately specified development requirements. The communication of the design process with design reports including suitable engineering drawings is also covered.
DP requirements: Final class mark $\geq$ 40%; Each class test $\geq$ 35%; Attendance at the Tuesday afternoon tutorial sessions is compulsory. A register will be taken each week and doctors' certificates will be required for tutorials missed on medical grounds. Satisfactory completion as outlined in the handouts of all assignments. Attendance at all class tests (doctors' certificates will be required for tests missed on medical grounds.)
Assessment: Two class tests (2.5 hours each); 2 or 3 Design and / or CAD hand in Assignments (~75 marks each); One examination in the November examination period (3 hours). Final Mark: Class mark 50% (DP requirement 40%) and Exam 50% (Exam Sub-minimum 40%). Class Mark Composition: Class test 50%, Design projects and Assignments 50%

MEC4045F   NUMERICAL METHODS IN COMPUTATIONAL FLUID DYNAMICS (CFD)

12 NQF credits at HEQSF level 8
Convener: Professor AG Malan
Course entry requirements: MEC3033F, MEC3044S and CSC1017F
Co-requisites: None
Course outline:
The course is primarily an introduction to the finite volume method for problems of heat conduction and viscous flows. The latter includes the full Navier-Stokes equations in two dimensions. An emphasis is placed on the implementation of the theory covered during the course. The student will be required to write a number of computer programs in a computer language of his/her choice. The capstone assignment involves the writing of an actual 2D computational fluid dynamics (CFD) code. Topics include: discretization; interpolation; boundary conditions; solution procedures; and complex geometries.
Lecture times: 3 Lectures per week.
DP requirements: Submission of all assignments, 40% term mark; attendance of all tests; 70% attendance at all tutorials.
Assessment: June examinations 3 hours

MEC4047F   MECHANICAL VIBRATIONS

12 NQF credits at HEQSF level 8
Convener: Mr EB Ismail
Course entry requirements: MEC3031S or CSC1017F or equivalent
Course outline:
This course introduces modelling of dynamical systems for vibration analysis, analytical and computational solution techniques, interpretation of these solutions, and vibration in real-world scenarios and machines. The formulation of equations of motion is presented from both Newtonian and Lagrangian (energy) perspectives. Specific applications considered include rotating unbalance, base excitation, vibration isolation and absorbers, mechanisms, and vibration measurement. Analytical solution of single degree of freedom systems is presented using trigonometric,

exponential, and complex number forms, as well as using Laplace transforms. The solution of multi-degree of freedom systems is done using a modal analysis approach. Numerical solution of systems is done using first and second order accurate schemes. Additionally, numerical estimation of modes is done using iterative techniques. Continuous systems are solved using separation of variables and the travelling wave approaches.
Lecture times: 3 lectures and 1 tutorial/computer session per week.
DP requirements: Attendance at all Laboratory sessions, submission of all Project and Laboratory reports.
Assessment: Laboratory report 5%, Computational Projects 15%, Class Tests 20%, 3-hour written examination 60%.NB - there is a sub-minimum of 45% for the written examination.

MEC4053Z   MEASUREMENT AND CONTROL IN MECHATRONICS
20 NQF credits at HEQSF level 8; Fourth year course.
Convener: Associate Professor HD Mouton
Course entry requirements: (EEE3062F and EEE3070S) or EEE2046F
Co-requisites: None
Course outline:
This course aims to bring together elements of engineering previously covered in electrical and mechanical courses in a way that is as close to what is expected in industrial practice; and to ensure that each student is equipped with the necessary skills to deal with the complexity that this integration brings. Skills include: designing and building measurement and control systems using sensors, analogue electronics, PCs, micro-processors, PWM, amplifiers, electric motors, heater elements, etc. Students on this course will have gained the knowledge to: program a micro-processor, use this micro-processor to monitor and obtain information from various kinds of sensors, (for example: temperature, shaft speed, angular position of shafts, torque, power, and strain gauges); output this information and retrieve processed information from a host PC; control speed, torque, and the angular position of the shafts on DC electric motors, and control heaters, valves, and flow rates etc. Brushed, brushless, servo and stepper motors will be covered in the lectures. Although practical work in the labs is essential in this course, a strong theoretical base is set in place so that the students can develop a thorough understanding of the material.
Lecture times: 4 lectures and 1 lab per week.
DP requirements: Attendance at 80% of the practicals, submission of the reports for the two mandatory practicals, submission of the solution for the two take-home tutorials and a minimum of 40% class mark.
Assessment: Reports for the mandatory practicals. A solution set for the two take-home tutorials. An analogue and digital class test. One 3-hour written examination and one 3-hour practical examination held in June. Class mark is made up of tutorials and practicals, and the class test. The final mark is made up of 30% class mark and 70% examination mark.

MEC4063C   INDUSTRIAL ECOLOGY
8 NQF credits at HEQSF level 8
Convener: Dr H Pearce
Course entry requirements: Must be in final year.
Co-requisites: None
Course outline:
The discipline of industrial ecology is becoming increasingly important as industry recognizes the growing need to reduce energy and materials consumption as well as the emission of waste in an attempt to minimize environmental impacts. The course situates industrial ecology within the broader framework of sustainability and deals with matters of broad principle rather than great detail. Issues discussed include: the current state of the environment and the impact industry has on it; industrial metabolism and ecosystem; life cycle assessment; design for environment; and ecological economics.
Lecture times: 3 lectures per week.
DP requirements: Completion of all quizzes and assignments.

Assessment: Quizzes, project, essays and term paper.

MEC4103F   PRODUCT DESIGN

12 NQF credits at HEQSF level 8; 2 lectures and 1 tutorial per week.
Convener: Associate Professor W Fuls
Course entry requirements: MEC3073S or MEC3050W
Co-requisites: None
Course outline:
This course will facilitate the development of knowledge and skills that will allow candidates to design a conventional mechanical or electro-mechanical device, working individually and in a team. The design is to be performed holistically, duly considering user needs, planning and managing the process, evaluating alternatives, analysing techno-economic performance, and communicating the design solution.
Lecture times: 2 Lectures and 1 Tutorial per week
DP requirements: A minimum of 50% on assignments that emphasise technical communication for ECSA ELO 6.
Assessment: Coursework 100%, Examination 0%

MEC4104F   MANUFACTURING & NANOTECHNOLOGY

8 NQF credits at HEQSF level 8; 24 lectures.
Convener: Associate Professor R Kuppuswamy
Course entry requirements: MEC2044S or MEC2048S
Co-requisites: None
Course outline:
This course will impart scientific knowledge on the following aspects of manufacturing: material removing processes, additive manufacturing, metrology in manufacturing and micro/nano manufacturing. The course is structured such that, on completion of the course, the student will understand the criteria for process selection based on part complexity, lot size, economic considerations and materials.
Lecture times: 2 Lectures per week.
DP requirements: None
Assessment: Coursework 30%, Examination 70%

MEC4105F   FINITE ELEMENT ANALYSIS

12 NQF credits at HEQSF level 8
Convener: Mr TJ Cloete
Course entry requirements: MEC3023F
Co-requisites: None
Course outline:
This course introduces the formulation and application of the finite element analysis (FEA) in the context of structural and stress analysis. The content will focus on 2-D formulations, with reference to the conceptual approach to 3-D problems. The aim is to integrate both theory and practice into a coherent whole. To this end, the fundamental theory is addressed in detail and students will be required to implement the finite element method in a spreadsheet macro and/or MATLAB programme. Topics include: Element Stiffness Matrix; Global Stiffness Matrix; Boundary Conditions; Unit Displacement Method; Principle of Minimum Potential Energy; Truss, Beam and Frame Elements in 2D; Interpolation; Constant Strain Triangle, Isoparametric Formulation; Gauss Quadrature; Quadrilateral Elements; Shear Locking.
Lecture times: 3 Lectures and 1 Tutorial per week.
DP requirements: 40% Class Test average; completion of all tutorial, tests & assignments.
Assessment: 3 hour examination 50%, class tests 40%, assignments 10%

MEC4107S   FUNDAMENTALS OF CONTROL SYSTEMS

8 NQF credits at HEQSF level 8
Convener: Associate Professor HD Mouton
Course entry requirements: MEC2023F/S or MEC2047F/S, MAM2083F/S, MAM2084F/S
Co-requisites: None
Course outline:
This course provides an introduction to basic techniques in control engineering. Topics include mathematical modelling of elementary systems; converting governing linear differential equations by means of the Laplace transform; transfer functions and block diagram algebra; the root-locus technique for stability analysis; frequency response of systems; the effect of introducing proportional and integral control; z - transform for digital control; sampling and quantization; Bode plot design of control systems.; and noise and filtering
Lecture times: 2 Lectures and 1 computer lab per week.
DP requirements: 60% for assignments and 40% for class mark including 2 tests and the assignments.
Assessment: Coursework 50%, Examination 50%

MEC4108S   SYSTEM DESIGN

12 NQF credits at HEQSF level 8; 75 hours assignments.
Convener: Associate Professor W Fuls
Course entry requirements: MEC4103F
Co-requisites: None
Course outline:
The objective of this course in system design is to enable students to structure and plan a high level system design and to generate system and subsystem development specifications. Structuring of the development process according to the life cycle model portrayed by the V-diagram. Functional decomposition and allocation to hardware. Determination of the system and subsystem requirements by means of system modelling and simulation and creation of a system verification matrix. The aim of this course is to give the student an appreciation of the effort and methodologies used when developing large and complex systems like power plants, aircraft, vehicles, space stations or even transportation networks.
Lecture times: 1 lecture and 1 tutorial per week.
DP requirements: Attendance of all tutorial sessions and submission of all assignments
Assessment: There are no examinations or tests for this course. There are, however, a number of individual and group assignments, as well as a large final hand-in. The final grade will be based on these hand-ins. Students will be graded on two levels, namely Individual 70% and Group 30%. Pass will be a combined score of 50% or above, provided a subminimum of 50% is attained for the Individual mark. A peer review will be done to indicate meeting the ECSA ELO8 for group work.

MEC4109S   ENGINEERING PROFESSIONALISM

8 NQF credits at HEQSF level 8
Convener: Dr B Kloot
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to deal practically with the graduate's transition into the workplace. The aim is to produce well-rounded mechanical engineers by exposing them to the relevant issues they would encounter in industry. Topics include: types of engineering employment; professional registration; health & safety; quality; maintenance; employment relations; engineering economics; environmental management.
Lecture times: 2 Lectures per week.
DP requirements: None
Assessment: Coursework 50%, Examination 50%.

MEC4110W   FINAL-YEAR PROJECT
46 NQF credits at HEQSF level 8
Convener: Mrs C Findeis and Dr C Shaw
Course entry requirements: MEC3050W or MEC3073S
Co-requisites: None
Course outline:
Each student engineer is required to conduct a project in their final year which is the capstone of all they have learnt so far during the course of their degree. The individual project will require the student to source new information outside of the traditional instruction mode and plan a project such that it solves a challenge from one of the areas comprising mechanical engineering. Students will be required to conduct their project, which will involve problem solving, planning, investigations and data analysis. Students must write a planning and proposal document, perform their project plan and report their results and conclusions in a main project report, a poster and orally. Independent learning, engineering professionalism, planning, communication as well as design/synthesis skills will all be required to successfully complete the course.
Lecture times: 1 Lecture per week
DP requirements: Submit a proposal/planning report; give an oral presentation; attend a safety demonstration and sign a safety declaration; produce an A1 size project poster; attend an oral examination; attend Open Day; satisfactorily achieve each of the ECSA outcomes associated with the course.
Assessment: Proposal/planning report 15%; oral presentation 5%; final report 80%.

MEC4113F   HEAT TRANSFER AND PSYCHROMETRY
12 NQF credits at HEQSF level 8
Convener: Associate Professor G Vicatos
Course entry requirements: MEC3033F and DP requirements for MEC3044S
Co-requisites: None
Course outline:
This course aims to develop the understanding of fundamental as well as advanced aspects of the three modes of heat transfer. Methods and techniques, (analytical and empirical), used to solve both steady state as well as transient heat transfer problems will be covered. The theory taught will be applied by presenting problems which will be solved during lectures and as homework. The laboratory session will be used to determine the characteristics of a heat exchanger in operation. The course will also cover the fundamental conditions of comfort and use psychrometric charts to calculate and determine heating load, cooling load, humidification and dehumidification of air mixtures and to determine heat load calculations during summer and winter conditions.
Lecture times: 3 Lectures per week.
DP requirements: The weighted average of the class tests must be 40% or greater and a minimum of 50% laboratory work or greater to achieve DP.
Assessment: Coursework 30%, Examination 70%.

OTHER COURSES IN THE FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

Course Outlines

END1019L   SOCIAL INFRASTRUCTURES: ENGAGING WITH COMMUNITY FOR CHANGE
Located in Professional Communications Studies (PCS) and delivered by CHED.
18 NQF credits at HEQSF level 5
Convener: Dr J McMillan
Course entry requirements: None. Enrolment is limited to 100 full-time students (90 from the Faculty of Engineering & the Built Environment and 10 from other faculties) on a first come first served basis.
Course outline:
This elective is open to students from all departments and faculties, and contributes to the Complementary Studies B requirement of engineering students. The course provides a space to explore the nexus of 'university studies and knowledge' on the one hand, and 'community issues and knowledge' on the other. Central to this exploration is the concept of 'social infrastructures'. Social infrastructures recognises that 'development' is a socio-technical process, giving rise to particular relationships between households and communities, shaped by the institutional and political context. It is also used to understand the complex set of relationships or forms of social capital developed within under-resourced communities and used to leverage social change. Through a combination of on- and off-campus classes, we utilise a process of 'horizontal learning' to explore learning and engagement with a range of community partners in the greater Cape Town area. We look particularly at how we, as students and emerging professionals, might engage with and learn from communities in the context of development and social justice.
Lecture times: Winter term
DP requirements: 80% attendance at on-campus classes, 100% attendance at off-campus classes
Assessment: Coursework 50%, Final examination 50%.

END1023S   CITIZEN PROFESSIONALS IN ENGINEERING AND THE BUILT ENVIRONMENT
18 NQF credits at HEQSF level 5
Convener: TBC
Course entry requirements: None
Course outline:
This course through a process of learning, active listening, critical thinking and engagement, will challenge students to ask questions, reflect and develop views on topics around global concerns, social justice, inequality and citizenship. This will give students a sense of the broader social context into which they will apply their technical skills as professionals in engineering and the built environment. Topics include Global Debates, Local Voices; Service Citizenship and Social Justice and Active Citizenship through Dialogue and Deliberation.
Lecture times: Mondays 6th-9th periods plus 12 hours community/activation.
DP requirements: Attendance at 80% of class sessions, submission of all assignments.
Assessment: Reflection papers, group presentations, final paper (conceptual essay and reflection).

DEPARTMENTS IN OTHER FACULTIES AND COURSES OFFERED

Departments Established in the Faculty of Commerce

COLLEGE OF ACCOUNTING

Associate Professor and Head of Department:
G Modack, BCom PGDip Tax Law *Cape Town* MCom *Cape Town* CA(SA)

ACC1006F/S   FINANCIAL ACCOUNTING
18 NQF credits at HEQSF level 5
Convener: J Winfield/M Gajewski
Course entry requirements: Admission to degree. NSC level 5 in Mathematics and level 4 in English HL (or level 5 in Eglish FAL)
Course outline:
Financial Accounting is predominantly an applied discipline that is based on broad conceptual principles. It starts with an understanding of the business cycle and various decisions taken in a business. Particular emphasis is placed on recording financial transactions in accounting records and interpreting financial transactions through the application of definitions and recognition criteria as set out in accounting framework. Students will also be required to prepare and present basic financial statements.
Lecture times: Acc1006F Tues, Wed, Thurs, Fri 13:00 – 14:00; 14:00 – 15:00Acc1006S Tues, Wed, Thurs, Fri 14:00 – 15:00
DP requirements: Attendance at and submission of a minimum of 75% of tutorials AND a weighted average of 40% for class tests (excluding objective tests) AND an average of 40% for assignments.
Assessment: Coursework: 35% Exam: 65%

ACC1012S   BUSINESS ACCOUNTING
This course is a terminating course and does not lead to a 2000 level Accounting course.
18 NQF credits at HEQSF level 5
Convener: M Zietsman
Course entry requirements: A minimum 40% final mark for ACC1106F or ACC1006F/S or equivalent.
Objective: To provide students with an overview of published financial statements, analysis and interpretation of financial information, and an introduction to costing, budgeting, and taxation.
Course outline:
This course builds on the foundation developed in Financial Accounting and is geared towards students who will not continue with financial reporting after first year. The course is designed to focus on analysing and interpreting financial statements as well as expose students to the remaining accounting disciplines namely taxation, management accounting and corporate governance.
Lecture times: Mon, Tues, Wed, Thurs, Fri 14:00 – 15:00
DP requirements: Attendance at and submission of a minimum of 75% of tutorials AND a weighted average of 40% for class tests (excluding objective tests) AND a weighted average of 40% for assignments.
Assessment: Coursework: 40%Exam: 60%

ACC2022F/S   MANAGEMENT ACCOUNTING I
18 NQF credits at HEQSF level 6
Convener: J Dean
Course entry requirements: ACC1006F/S or approved equivalent.
Course outline:
An introduction to the discipline of Management Accounting; the analysis of cost systems, cost classification and cost behaviour; product costing including job costing and process costing; the allocation of costs from service departments; absorption and variable costing; activity based costing; cost-volume-profit relationships; relevant costing and cost benefit analyses; budgeting systems; standard costing and flexible budgeting.
Lecture times: ACC2022F Mon, Tues, Wed, Thurs 13:00 – 14:00; 14:00 – 15:00ACC2022S Mon, Tues, Wed, Thurs 13:00 – 14:00; 14:00 – 15:00
DP requirements: Attendance at and submission of a minimum of 75% of tutorials AND a weighted average of 40% for class tests (excluding objective tests).
Assessment: Course work 40% final examination 3 hours 60%.

INFORMATION SYSTEMS

Associate Professor and Head of Department:
ITJ Brown, BScEng(Hons)(Electrical) *Zimbabwe* GradDipBusComp MInfSys *Curtin* PhD *Cape Town*

INF2009F   SYSTEMS ANALYSIS
18 NQF credits at HEQSF level 6
Convener: S. Kabanda
Course entry requirements: INF1003F or equivalent or INF1003F as co-requisite.
Course outline:
This course explores the role of the Systems Analyst in business, different approaches used in the development of information systems, and the various tools and techniques used in the specification of system requirements.
This course is intended to provide students with an in-depth knowledge of the systems development process, with particular emphasis on the analysis stage of the life cycle. There is a strong practical component to the course, where students will be taught to understand and use the common tools of object oriented systems analysis. These tools and techniques include scoping, risk analysis, feasibility assessment, prototyping, JAD and techniques commonly used in object oriented systems. The course will also strongly focus on the design of UML models including package, activity, use case, class, interaction and state machine diagrams. INF2009F is closely linked with INF2011S and students will implement an information system in the second semester based on these user requirements and in doing so will have completed the whole systems development life cycle (SDLC).
Lecture times: Monday to Wednesday, 4th period
DP requirements: 80% attendance at workshops, completion of all deliverables, sub-minimum of 45% for course year mark.Submitted at least 80% of exercises. Completed at least 80% of quizzes.
Assessment: The final grade is derived from results of Quizzes 3%, Class Exercises 7%, Workshops 10%, April test 15%, Business Case Assignment 7.5%, URS Assignment 7.5% and the Final Examination 50%. Sub-minimum of 45% for the final examination.

SCHOOL OF ECONOMICS

Director of the School:
L Edwards, BA *Cape Town* BA(Hons) *Rhodes* MA MSc LSE PhD *Cape Town*

ECO1007S   ECONOMICS FOR ENGINEERS

This course is open to all students not specializing in economics and but seeking an introduction to the discipline. It is aimed at providing a broad perspective on the subject covering topics from both the core microeconomics and macroeconomics syllabus. The course concentrates more on an understanding of economic concepts and their applications rather than rigorous proofs and analysis.
18 NQF credits at HEQSF level 5
Convener: C Van Walbeek
Course entry requirements: None
Co-requisites: None
Course outline:
ECO1007S is a one semester course that introduces students to the core concepts in both micro- and macroeconomics. The focus is on the understanding of theoretical concepts and applications, rather than on rigorous proofs. Microeconomics focuses on the decisions of individual consumers, producers and households and in this section we look at standard economic models including the production possibility frontier, demand and supply analysis and elasticity, we also explore the idea of comparative advantage as it applies to specialisation and trade. Macroeconomics focuses on the economy as a whole and in this section of the course we unravel the meaning, application and limitations of such everyday concepts as money, inflation, exchange rates, unemployment and GDP.
Lecture times: 12h00 - 13h00 Tuesday, Wednesday, Thursday & Friday
DP requirements: All class tests to be completed. Only students who have obtained DP certificates may write the final examination.
Assessment: Coursework: 50%; Exam: 50%. The course outline will provide more detail on the breakdown for submission weightings and variation for exemptions and absences.

ECO1010F   MICROECONOMICS

18 NQF credits at HEQSF level 5
Convener: Tony Leiman – ECO1010F
Course entry requirements: Admission to degree. National Senior Certificate: a pass (5) in Mathematics.Senior students must have passed the equivalent of 6 semester courses.
Co-requisites: There is no co-requisite, but students are strongly advised to do a formal mathematics course (Sta1001, Mam1010, Mam1000 or equivalent). Not having done such a course will preclude entry to second year Economics.
Course outline:
In any developed economy scarce resources have to be mobilised and used to meet the public's needs. This course focusses on the processes involved, particularly those common to modern western economies. It begins with market mechanism and price formation. The background to demand (cardinal and ordinal utility) follow. The neo-classical theory of supply is then introduced, leading from production function analysis to the derivation of supply under perfect competition. Other market forms follow, and the course concludes with sections on factor pricing and international trade.
DP requirements: You are required to attend the assigned tutorials. If you do not attend 70% of these you will be refused a DP, ie., you will not be entitled to write the examination. Your year mark contributes a half of your final total for the course. If your year mark is below 30% you will not be permitted to write the final examination. If you choose not to submit your essay or not to write a test you will be given a mark of zero for that component of the course, but will be allowed to write the examination provided your year mark is above 30%.

Assessment: Coursework 50%; Exam 50%. The course outline will detail the breakdown for submission weightings and variation for exemptions and absences.

ECO1011S   MACROECONOMICS
18 NQF credits at HEQSF level 5
Convener: L Neethling
Course entry requirements: A minimum mark of 45% for ECO1010F/S or ECO1110F/S within the year or a pass if stand alone in the first semester.
Course outline:
This course is an introductory level course in macroeconomic theory and policy. Macroeconomics studies the aggregate behavior of the economy. The list of topics covered include gross domestic product, economic growth, unemployment, inflation, exchange rates, balance of payments, business cycles, fiscal and monetary policy tools and objectives. The course will build on macroeconomic relationships to develop models explaining various interactions within the economy, providing students with a framework for understanding and interrogating the workings of the economy. The course emphasizes relevant and current issues in the context of South African economic history. We also explore South Africa's relationship with the rest of the world.
DP requirements: these you will be refused a DP, i.e., you will not be entitled to write the examination. Your year mark contributes a half of your final total for the course. If your year mark is below 30% you will not be permitted to write the final examination. If you choose not to submit your essay or not to write a test you will be given a mark of zero for that component of the course, but will be allowed to write the examination provided your year mark is above 30%.
Assessment: Coursework: 50%; Exam: 50%. The course outline will detail the breakdown for submission weightings and variation for exemptions and absences.

ECO2003F   MICROECONOMICS II
18 NQF credits at HEQSF level 6
Convener: Corne Van Walbeek
Course entry requirements: ECO1010F/S/H/X and one of the following Mathematics courses: MAM1000W MAM1002W, MAM1010F/S, MAM1012F/S, MAM1004H, MAM1005H, MAM1006H, or STA1001F/H. Students will be allowed to register for ECO2003 if they obtained at least 40% for MAM1000W. No concessions will be granted to students who obtained less than 40% for MAM1000W.
Course outline:
The course formalises consumer and producer optimisation, and explores markets under perfect and imperfect competition. The course introduces the concept of uncertainty and how different agents respond to uncertainty. The course also considers industrial organisation, looking at models that relax the critical assumptions of perfect competition. All sections of the course incorporate applications.
Lecture times: 09h00 – 10h00 Monday, Tuesday, Wednesday, Thursday, Friday,12h00 – 13h00 Monday, Tuesday, Wednesday, Thursday, Friday,13h00 – 14h00 Monday, Tuesday, Wednesday, Thursday, Friday
DP requirements: All class tests and essays/projects to be completed, and a weighted average mark of 30% for the tests, essays/projects and tutorials homework must be achieved. Only students who have obtained DP certificates may write the final examination.
Assessment: Coursework: 50%; Exam: 50%. The course outline will detail the breakdown for submission weightings and variation for exemptions and absences.

ECO2004S   MACROECONOMICS II
18 NQF credits at HEQSF level 6
Convener: E Nikolaidou
Course entry requirements: ECO1010F/S/H/X and ECO1011F/S and STA1001F/H or MAM1002W/X, or MAM1010F/S or MAM1012F/S or MAM1004H or MAM1005H or

MAM1006H. A student will be permitted to take ECO2004S without having passed ECO2003F, although it is desirable to pass ECO2003F prior to taking ECO2004S. If a student gets at least 40% for MAM1000W they will be allowed to register for ECO2004.

Course outline:

The course builds upon ECO1011S and aims to provide students with the analytical tools and formal models to explain the behaviour of output, inflation, employment, interest rates and other economic aggregates. These tools are used to understand current economic issues, forecast the behaviour of the economy, and assess the impact of policy choices. Specifically, the course starts with analysing the short run behaviour of the economy through the IS-LM model (building on the Keynesian model introduced in the first year) before it moves on to consider the medium run through the AS-AD model. Finally, it looks at the factors that influence long run growth using the Solow growth model. Analysis of the open economy, such as trade and exchange rate regimes is also undertaken.

Lecture times: 09h00 – 10h00 Monday, Tuesday, Wednesday, Thursday,12h00 – 13h00 Monday, Tuesday, Wednesday, Thursday,13h00 – 14h00 Monday, Tuesday, Wednesday, Thursday

DP requirements: Students must write the 2 tests and the essay and must obtain a weighted average mark of 30% for the 2 tests and the essay. Only students who have obtained DP certificates may write the final examination.

Assessment: Coursework: 50%; Exam: 50%. The course outline will detail the breakdown for submission weighting and variation for exemptions and absences.

FINANCE AND TAX

Associate Professor and Head of Department:
R Kruger, BBusSc MBusSc PhD *Cape Town*

FTX2020F   BUSINESS FINANCE

NOTE: This course is NOT for students intending to major in Finance in a Commerce degree and is not a substitute for FTX2024F/S as a course entry requirement for further studies in Finance.

18 NQF credits at HEQSF level 6; 4 Lectures per week.

Convener: C Smith

Course entry requirements: A DP in STA1001F/S/H or equivalent, or a DP in MAM1010F/S or equivalent

Co-requisites: ACC1006F Financial Accounting

Objective: The objective of this course is to provide students with a broad introduction to financial markets, corporate finance and financial management.

Course outline:

Business Finance serves as an introduction to the concepts of corporate finance. It covers the principles of corporate finance, commencing with mastery of the tools and techniques essential for financial management and proceeding to the principles underlying investment and financing decisions made by large corporations listed on a securities exchange. The course also aims to provide an entrepreneurial focus, equipping the prospective entrepreneurs with some of the quantitative decision making tools required for a successful business venture.

Lecture times: Monday, Wednesday, Thursday & Friday: 15h00 -15h45

DP requirements: 40% for coursework, completion of all required submissions and tests, attendance of 80% of the tutorials

Assessment: Tests and weekly objective tests 40%; final examination 60%.

SCHOOL OF MANAGEMENT STUDIES

Head of Department:
S Goodman, BSocSc(Hons) MBusSc PhD *Cape Town*

BUS1036F   EVIDENCE-BASED MANAGEMENT

First year status, first or second semester, (depending on degree stream).
18 NQF credits at HEQSF level 5
Convener: J Rousseau
Course entry requirements: Admission as First Year Faculty of Commerce students, or by permission of Head of the School.
Course outline:
This course is intended to furnish students with the intellectual resources required for success in a globalised knowledge-dependent economy. The focus is on the development of critical reasoning skills, in particular, the skills involved in assessing the quality of evidence available; using that evidence to reach the best-justified conclusion possible; and then efficiently and persuasively communicating those conclusions to relevant stakeholders. More broadly, the course focuses on developing the means to form independent judgements about contentious issues of policy and practice. The approach of the course is centred on case studies and controversies in areas of special relevance to understanding commercial activity as occurring within particular social and political environments, and on how those environments affect our ability to make rational decisions.
DP requirements: Submission of all coursework assignments. Achieving a weighted average of at least 40% for all coursework.
Assessment: Tutorials 50%, Examination 50%. A sub-minimum of 45% must be achieved in the final examination. First semester students who qualify are permitted to write their Supplementary Exams with the second semester students, by permission of the Head of School.

BUS2010F/S   MARKETING I

0 credits if taken as part of a Postgraduate Diploma in Management offered by the School of Management Studies
18 NQF credits at HEQSF level 6
Convener: TBA
Course entry requirements: ECO1010F and ECO1011S OR ECO1011F/H and ECO1111F OR BUS1036F/S (or BUS1010F/S), or by permission of the Head of Section.
Objective: To give an overview of the Marketing Process considering current trends in the South African context. The course will stress the importance of the Marketing Concept, Target Marketing and the Marketing Mix as a means of formulating a Marketing Strategy with the view to achieving the strategic objectives of an organisation.
Course outline:
The marketing concept, the marketing environment, consumer markets and industrial markets, buyer behaviour, marketing research, the use and importance of differentiation, market segmentation and target marketing, the marketing mix, product policy, pricing policy, distribution policy, promotion policy, marketing strategy, marketing organisation and implementation, measurement and control of marketing effectiveness including the marketing audit.
DP requirements: 40% class mark and the completion of all required assignments. Attendance of 80% of all tutorials is required.
Assessment: Essays, case studies, project and test 50%; June / October examinations (2 hours) 50%

Centres and Departments Established in the Faculty of Humanities

SCHOOL OF AFRICAN & GENDER STUDIES, ANTHROPOLOGY & LINGUISTICS

The sections in the School share a commitment to research and teaching responsive to African political, social, cultural, and material contexts, and the interaction of those contexts with others, especially but not exclusively located in the global South. The intellectual interests of the proposed new School cohere around questions relating to the production of social, political, cultural, scientific and economic knowledge within the continent of Africa, as a platform for internationally relevant research.

The letter code for all courses offered in the School is AXL.
Departmental website: www.humanities.uct.ac.za/hum/departments/axl.

The School comprises the following Sections:

AFRICAN STUDIES
ANTHROPOLOGY
GENDER STUDIES
LINGUISTICS

Professor and Director of the School:
S Vawda, BA *UDW* MA *QUB* PhD *UKZN*

AFRICAN STUDIES SECTION
The African Studies Section is housed in the Harry Oppenheimer Institute Building, Engineering Mall, Upper Campus, and can be contacted by email at: cas-africas@uct.ac.za, or telephone: 021 650 4034.

Associate Professor and Head of Section:
H Chitonge, MA PhD *KZN*

ANTHROPOLOGY SECTION
The Anthropology Section is housed in the AC Jordan Building, University Avenue, Upper Campus, and can be contacted by email at: san-admin@uct.ac.za, or telephone: 021 650 3678.

Professor and Head of Section
F C Ross, MSocSc PhD *Cape Town*

GENDER STUDIES SECTION
The Gender Studies Section is housed in Harry Oppenheimer Institute Building, Engineering Mall, Upper Campus, and can be contacted by email at: genderstudies@uct.ac.za or telephone: 021 650 2970.

Associate Professor and Head of Section:
J Bennett, BA(Hons) *Natal* MA (Linguistics) EdD (Applied Linguistics) *Columbia*

LINGUISTICS SECTION
The Linguistics Section is housed in the A C Jordan Building, University Avenue, Upper Campus, and can be contacted by email at: axl-linguistics@uct.ac.za, or telephone: 021 650 2847.

Professor and Head of Section
A Deumert, MA *Freiburg* PhD *Cape Town*

AXL1200S   AFRICA: CULTURE, ID & GLOBALISATION
Please note that this course does not count as a credit towards a Humanities degree.
8 NQF credits at HEQSF level 5; First-year, second-semester course, one lecture and one compulsory tutorial per week.
Convener: Z Msomi
Course entry requirements: This course is for non-Humanities students only and does not count towards Humanities degrees.
Course outline:
This is a service course designed specifically for non-Humanities students preparing themselves for a life of professional practice. Broad-based and introductory, it is intended to satisfy the complementary studies requirements of professional institutes (like the Engineering Council of South Africa). It does this by focusing on contexts and ideas which will be of direct benefit in professional practices, as well as on more abstract ideas which will be generally enriching.
In the time available, this course sets out to introduce and discuss the dynamic interplay between the various forces of globalisation and the impact on culture and identity in Africa. The ideas explored and debates encouraged in the course are expected to contribute towards a more thoughtful professional practice and critical awareness of social and historical context, particularly, the post-colonial context in Africa.
From Cape Town to Algiers and Puntland, the course examines a range of different contemporary issues, historical moments and diverse localities across the continent. Dominant concepts and vocabularies that operate in relation to complex processes of globalisation which impact everyday life in distinctly different ways are critically discussed as "tools to think with."
Lecture times: Friday, 5th period.
DP requirements: Attendance at lectures and tutorials is compulsory, failing which students' papers may not be marked.
Assessment: Three assignments count 10% each; one group project counts 20%; one 2-hour examination counts 50% of the final mark.

Departments Established in the Faculty of Law

COMMERCIAL LAW

Professor and Head of Department:
R le Roux, BJuris LLB *UPE* LLM *Stell* PG Dip (Employment Law and Social Security Law) *Cape Town* LLM *Anglia Polytechnic* PhD *Cape Town* Attorney and Conveyancer of the High Court

CML1001F   BUSINESS LAW I
18 NQF credits at HEQSF level 5
Convener: Ms K Lehmann
Course entry requirements: None
Course outline:
The purpose of the course is to provide students with a general introduction to the South African legal system, with its main focus the law of contract. The course starts with an overview of the South African court structure and contemporary sources and branches of South African law, and also introduces students to the Constitution and the impact that it continues to have on legal

development. The course then provides students with a general but comprehensive introduction to the general principles of contract, focusing on formation of contracts, the content of contracts, breach of contract and remedies for breach. The course also aims to provide students with an introduction to certain specific contracts, most notably contracts of sale, lease and agency. The general principles of contract are supplemented by a consideration of legislation, in particular the provisions of the Consumer Protection Act, where relevant.
Lecture times: The course is an intensive one, with 5 lectures per week for the full semester.
DP requirements: Coursework is compulsory. If the student does not submit hand-ins or write a test the student will receive a mark of 0 for that assessment (unless granted an exemption). But the student will be able to write the exam.
Assessment: Coursework 40%; final examination 60%.

CML1004S   BUSINESS LAW I
18 NQF credits at HEQSF level 5
Convener: Ms A Titus
Course entry requirements: None
Course outline:
The purpose of the course is to provide students with a general introduction to the South African legal system, with its main focus the law of contract. The course starts with an overview of the South African court structure and contemporary sources and branches of South African law, and also introduces students to the Constitution and the impact that it continues to have on legal development. The course then provides students with a general but comprehensive introduction to the general principles of contract, focusing on formation of contracts, the content of contracts, breach of contract and remedies for breach. The course also aims to provide students with an introduction to certain specific contracts, most notably contracts of sale, lease and agency. The general principles of contract are supplemented by a consideration of legislation, in particular the provisions of the Consumer Protection Act, where relevant.
Lecture times: The course is an intensive one, with 5 lectures per week for the full semester.
DP requirements: Coursework is compulsory. If the student does not submit hand-ins or write a test the student will receive a mark of 0 for that assessment (unless granted an exemption). But the student will be able to write the exam.
Assessment: Coursework 40%; final examination 60%.

CML2001F   COMPANY LAW
18 NQF credits at HEQSF level 6
Convener: Mr T Thabane
Course entry requirements: Business Law 1 and no undergraduate student in his/her first year of study may register for Company Law.
Course outline:
The course offers an overview of the laws that govern the nature, formation, and management of partnerships, trusts, companies and close corporations with the main focus being on companies. Students are encouraged to apply the analytical abilities acquired in previous law courses and these skills are further developed. After the course students will be able to, amongst others, navigate the Companies Act 71 of 2008 and will be familiar with its core provisions and their practical impact.
Lecture times: The course is an intensive one with 5 lectures per week for the full semester.
DP requirements: Coursework is compulsory. If the student does not submit hand-ins or write a test the student will receive a mark of 0 for that assessment (unless granted an exemption). But the student will be able to write the exam.
Assessment: Coursework 40%; final examination 60%.

CML2005F   LABOUR LAW
18 NQF credits at HEQSF level 6
Convener: Ms S Singlee
Course entry requirements: No undergraduate student in his/her first year of study may take Labour Law. It is recommended that students have passed a foundation course in law, e.g. Business Law I.
Course outline:
This course aims to provide students with an understanding of the common law contract of employment and labour law statutes; including the Labour Relations Act; Basic Conditions of the Employment Act; and the Employment Equity Act. The course will specifically focus on the following issues that commonly arise in the workplace: the legal definition of 'employee'; discipline and dismissals; unfair labour practices; unfair discrimination in employment and recruitment and selection; employment equity issues; collective bargaining; strikes and lock-outs; and dispute resolution.
Lecture times: This course is an intensive one, with 3 lectures per week for the full semester.
DP requirements: Coursework is compulsory. If the student does not submit hand-ins or write a test the student will receive a mark of 0 for that assessment (unless granted an exemption). But the student will be able to write the exam.
Assessment: Coursework 40%; final examination 60%.

CML2010S   BUSINESS LAW II
18 NQF credits at HEQSF level 6
Convener: Ms J Franco
Course entry requirements: Business Law I and no undergraduate student in his/her first year of study may register for Business Law II.
Course outline:
Business law 2 is designed to give students an understanding of commercial transactions, how they are financed and the risks involved. The course covers insolvency, credit agreements, the various forms of security that can be used to finance commercial transactions as well as insurance and methods of payment. We briefly discuss intellectual property, focussing on its value as an asset which can be used as security to finance transactions. By the end of the course, students should have an appreciation of the types of legal issues that commonly arise in financing transactions – how creditors can best secure themselves in the event of non-payment and ultimately the risk of insolvency; how debtors are protected under the National Credit Act and by the courts; as well as the benefits of insurance and the risks and possibility of the insurer rejecting a claim.
Lecture times: The course is an intensive one, with 5 lectures per week for the full semester.
DP requirements: Coursework is compulsory. If the student does not submit hand-ins or write a test the student will receive a mark of 0 for that assessment (unless granted an exemption). But the student will be able to write the exam.
Assessment: Coursework 40%; final examination 60%.

CML4607Z   LAW FOR ENGINEERS
First semester course, four lectures per week.
8 NQF credits at HEQSF level 8
Convener: Ms J Franco
Course entry requirements: This course is only available to BSc(Eng) Electrical Engineering; BSc(Eng) Electrical and Computer Engineering and BSc(Eng) Mechatronics students.
Course outline:
The course is designed to give students a general understanding of the legal issues they will face in their engineering careers and to enable them to act professionally and ethically. The course gives an overview of the South African legal system, and then provides a general but comprehensive synopsis of the law of contract, labour law , corporate governance and the various entities which can be used for conducting business and the legal implications of each. In addition students are given an

introduction to intellectual property. By the end of the term students should have an appreciation of the types of issues and risks that commonly arise in the socio-legal context of engineering practice.
Lecture times: Tuesday to Friday 1st period.
DP requirements: Completion of assignment and class test is compulsory. If the student does not submit the assigment or write the test the student will receive 0 for that assessment (unless granted an exemption). But the student will be able to write the exam.
Assessment: Assignment (15%), Class test (15%), Exam (70%)

WINTER TERM   SERVICE COURSES

<u>Admission Criteria</u>: The following courses will be limited to a **maximum of 75 students**. Once this number has been reached, no further students will be registered for the course.
Note: A first year student may not do a law course during Winter Term.
Note: Students may not anticipate a course in order to lighten their standard work load

In addition to the above, only the following students are eligible to do these law courses in Winter Term:
a) Semester Study Abroad Students (from UCT), registered in the Commerce Faculty who need the course to graduate in the current year;
b) Construction Studies students who require Business Law 1 as a prerequisite for CON3032W and who already have a full credit load and which could impact on their graduation;
c) Students for whom the course is the only course required in order to graduate by the second semester (i.e. it is the only scheduled course outstanding for the degree);
d)Students who require the course in order to graduate in the current year of study and who are already carrying a normal scheduled workload;

Note: In the event of an over-subscription students may have to be de-registered for the course and preference will be given to students in the order of the above categories i.e first group (a), second group (b) and so on. **<u>Students must register by 1 April and will be notified by the end of April if they are to de-register.</u>**

Note: A course will only run if **a minimum of 45 students** register for the course – if fewer students register, the course will be withdrawn due to insufficient demand.

The authority and responsibility for administering the admission criteria and registering students on the Winter Term programme rests with each student's home faculty.

CML1001L   BUSINESS LAW I - WINTER TERM
18 NQF credits at HEQSF level 5
Convener: Ms K Lehmann
Course entry requirements: None
Course outline:
Refer to course outline for CML1001F/CML1004S.
Lecture times: Lectures are offered on a daily basis for three hours over a four week period.
DP requirements: Writing the test is compulsory. If a student does not write the test and does not get an exemption then the student will be marked absent and awarded 0 for the test. But the student will be able to write the exam.
Assessment: Test 40%; final examination 60%.

CML2001L   COMPANY LAW - WINTER TERM
18 NQF credits at HEQSF level 6
Convener: Mr T Thabane
Course entry requirements: No undergraduate student in the first year of study may register for Company Law. Business Law I is a prerequisite for Company Law, and students cannot register for Company Law unless they successfully completed Business Law I in the previous year of study.

Course outline:
Refer to course outline for CML2001F.
Lecture times: Lectures are offered on a daily basis for three hours over a four week period
DP requirements: Writing the test is compulsory. If a student does not write the test and does not get an exemption then the student will be marked absent and awarded 0 for the test. But the student will be able to write the exam.
Assessment: Test 40%; final examination 60%.

CML2005L   LABOUR LAW - WINTER TERM
18 NQF credits at HEQSF level 6
Convener: Ms S Singlee
Course entry requirements: No undergraduate student in his/her first year of study may take Labour Law. It is recommended that students have passed a foundation course in law, e.g. Business Law I.
Course outline:
Refer to course outline for CML2005F.
Lecture times: Lectures are offered on a daily basis for three hours over a four week period.
DP requirements: Writing the test is compulsory. If a student does not write the test and does not get an exemption then the student will be marked absent and awarded 0 for the test. But the student will be able to write the exam
Assessment: Test 40%; final examination 60%

CML2010L   BUSINESS LAW II WINTER TERM

18 NQF credits at HEQSF level 6
Convener: Ms J Franco
Course entry requirements: Business Law I. No undergraduate student in the first year of study may register for Business Law II.
Course outline:
Refer to course outline for CML 2010S.
Lecture times: Lectures are offered on a daily basis for three hours over a four week period.
DP requirements: Writing the test is compulsory. If a student does not write the test and does not get an exemption then the student will be marked absent and awarded 0 for the test. But the student will be able to write the exam.
Assessment: Test 40% and final examination 60%.

Departments Established in the Faculty of Health Sciences

HUMAN BIOLOGY

Associate Professor and Head of Department:
M R Collins, BSc(Hons) *Stell* PhD *Cape Town* FECSS

The programme in Biomedical Engineering is offered in the Faculty of Health Sciences Its activities are concentrated at postgraduate level and students may pursue the following qualifications:

Postgraduate Diploma in Health Care Technology Management
MSc(Med) Biomedical Engineering
MPhil
PhD

The Department of Human Biology also collaborates at an undergraduate level with departments in the Faculty of Engineering & the Built Environment, particularly Electrical Engineering and Mechanical and Materials Engineering.

HUB2005F   INTRODUCTION TO MEDICAL ENGINEERING
This course is intended as an introduction to the field of Biomedical Engineering and for students with an interest in applying for their engineering skills to the solution of problems in healthcare. This course is offered by the Division of Biomedical Engineering in the Department of Human Biology, and is particularly valuable for students considering postgraduate studies in Biomedical Engineering. Entrance may be limited.
8 NQF credits at HEQSF level 6
Convener: Dr T Mutsvangwa and Dr T Abdalrahman
Course entry requirements: None
Objective: To provide an introduction to biomedical engineering in particular to undergraduate students.
Course outline:
This course provides an introduction to the field of biomedical engineering to undergraduate students in the Faculty of Engineering and the Built Environment and others. Topics include an overview of medical technology and innovation, medical imaging, image processing, and biomechanics of the musculoskeletal system.
DP requirements: None
Assessment: Class test: 20%; group presentation: 30%; June examination: 50%.

HUB4045F   INTRODUCTION TO MEDICAL IMAGING & IMAGE PROCESSING
12 NQF credits at HEQSF level 8
Convener: Dr M Jankiewicz
Course entry requirements: Students must be in their fourth year of study.
Course outline:
This course provides an introduction to the principles of physics and engineering involved in the acquisition and processing of medical images. Topics include mathematical tools of image processing; computed tomography; ultrasound; and magnetic resonance imaging.
Assessment: The assessment is through assignments, written assessment and/or a final project. (As per Biomedical Engineering Dept rules)

Departments and Units Established in the Faculty of Science

BIOLOGICAL SCIENCES

Associate Professor and Head of Department:
A M Muasya, MPhil *Moi* PhD *Reading*

BIO1000F   CELL BIOLOGY
18 NQF credits at HEQSF level 5
Convener: Dr H Marco
Course entry requirements: Admission will be restricted to students who have passed either NSC Physical Science or Life Science with at least 60%. *NOTE: Preference will be given to students registered in the Science Faculty. Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to BIO1000H from week 7.*
Course outline:

Basic biological principles and processes at a cellular level provide an essential grounding for future study in the life sciences. The structure and function of cell components is introduced, followed by the structure and functions of biological macro-molecules. Cell division and the role of genetics in inheritance and the control of biological systems is then considered. This leads into an introduction to membrane physiology, metabolism and its regulation. Cellular processes that are considered in detail include the functioning of photosynthesis and cellular respiration, and how these relate to organismal physiology.

Lecture times: Monday - Friday, 5th period, Tutorials: One per week, by arrangement, Practicals: One afternoon per week, Monday, Tuesday, Wednesday or Thursday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.

DP requirements: Attendance at 70% of the practicals and a minimum of 35% for the class record.

Assessment: Class record counts 45% (three class tests count 27% and a practical book mark of 18%); one practical paper counts 15%; one 2-hour examination paper written in June counts 40%. A subminimum of 40% is required in the June examination.

CHEMISTRY

Professor and Head of Department:
T J Egan, BSc Hons PhD *Witwatersrand* MSACI

CEM1000W   CHEMISTRY 1000

NOTES: Preference will be given to students registered in the Science Faculty. Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to CEM1009H from week 7.

36 NQF credits at HEQSF level 5

Convener: Associate Professor G S Smith

Course entry requirements: Students wishing to register for CEM1000W will normally be expected to have passed NSC Physical Science with at least 60% and NSC Mathematics with at least 70%.

Course outline:

This course lays the foundation of chemistry in its context as a central science for scientists and engineers working in the chemical, biological or earth sciences or in chemical engineering. Fundamental concepts in chemistry are covered to illustrate their application to understanding the molecular nature of the world around us. Topics include microscopic and macroscopic concepts, atomic structure, chemical bonding and molecular structure, the chemistry of the elements and inorganic chemistry, chemical equilibrium, acids and bases, solubility, phases of matter, thermochemistry and thermodynamics, colligative properties, oxidation and reduction, electrochemistry and chemical kinetics. The course continues with an introduction to the language of organic chemistry, including structure and reactivity in organic chemistry, describing and predicting organic reactivity and the properties and reactivity of biologically important molecules. Practicals aim to develop essential manipulative and technical laboratory skills, as well as to draw links to interpreting the physical world in terms of its molecular nature.

Lecture times: Monday to Wednesday and Friday, 2nd or 4th period. Tutorials: Thursday 2nd or 4th period. Practicals: Tuesday, Thursday or Friday, 14h00 - 17h00.

DP requirements: Attendance and completion of practicals, tests and tutorial exercises, and at least 35% for the class record.

Assessment: Class record (comprising tests, tutorials and practicals) counts 50%; one 3-hour examination written in November counts 50%. A subminimum of 45% is required in the final examination.

CEM1008F   CHEMISTRY FOR ENGINEERS

1 practical and/or tutorial per week.
16 NQF credits at HEQSF level 5
Convener: Dr C Oliver
Course entry requirements: Passed NSC Physical Sciences with at least 60% and NSC Mathematics with at least 70%.
Course outline:
This course is intended to develop an understanding of basic chemical concepts for students in Civil, Electro-mechanical and Mechanical Engineering. The course includes topics in chemical stoichiometry, some systematic inorganic chemistry, atomic structure and chemical bonding, with the emphasis on the structure of solids, chemical equilibrium and aqueous solution chemistry, acids and bases, thermochemistry, electrochemistry and corrosion of metals, polymers.
Lecture times: Monday to Wednesday & Friday 4th period. Tutorial/practical Monday 6th to 8th period.
DP requirements: Attendance and completion practicals, tests and tutorial exercises, and at least 35% for the class record.
Assessment: June examination of 2 hours counts 60%, course record counts 40%. It is necessary to obtain a subminimum of 45% for the June examination and obtain an aggregate of 50% to pass the whole course overall.

CEM2005W   INTERMEDIATE CHEMISTRY

48 NQF credits at HEQSF level 6
Convener: Dr G A Venter
Course entry requirements: For Science students: CEM1000W (or equivalent), 1000-level full course in Physics, 1000-level full or semester course in Mathematics. Concurrent registration for STA1000F/S (or equivalent) is highly recommended. For Chemical Engineering students: CEM1000W (or equivalent), PHY1012F/S, MAM1020F/S, CHE1005W
Course outline:
This course develops the foundations of a major in Chemistry at an intermediate level and allows continuation to third-year Chemistry for the completion of a major in Chemistry. The theory component features a set of intermediate topics, and the laboratory component develops both experimental and interpretative skills. The course includes the following topics: spectroscopy and modern analytical tools, introduction to inorganic chemistry, organic structure and reactivity, thermodynamics, thermodynamics of solutions, phase equilibria, chemical reaction kinetics and equilibria, reactions of organic molecules (patterns, predictions and preparation of new products), introduction to coordination chemistry, structures and energetics of inorganic solids and electrochemistry. The practical course covers the same topics and aims to develop manipulative and technical laboratory skills including the application of modern analytical methods to the elucidation of chemical structures.
Lecture times: Monday - Friday, 3rd period. Six tutorials by arrangement. Practicals, EBE: Tuesday, 14h00 - 17h00; Science: Thursday, 14h00 - 17h00.
DP requirements: Attendance and completion of practicals, tests and tutorial exercises; minimum 50% for the practicals and tutorial exercises; minimum average of 45% for class tests.
Assessment: The class record (comprising tests and practicals) counts 50%; one 3-hour examination written in November counts 50%. The class record consists of two class tests (2 x 5%), one 2-hour June test counts 15%, tutorials count 5% and practicals count 20%. A subminimum of 45% is required in the final examination.

COMPUTER SCIENCE

Associate Professor and Head of Department:
H Suleman, MSc *UDW* PhD *Virginia Tech*

CSC1015F   COMPUTER SCIENCE 1015
18 NQF credits at HEQSF level 5
Convener: A Safla
Course entry requirements: At least 70% for NSC Mathematics. *Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to CSC1010H from week 7.*
Course outline:
This course is an introduction to problem solving, algorithm development and programming in the Python language. It includes fundamental programming constructs and abstractions, sorting and searching techniques, and machine representations of data. The practical component covers input/output, conditionals, loops, strings, functions, arrays, lists, dictionaries, recursion, text files and exceptions in Python. Students are taught testing and debugging, as well as sorting and searching algorithms, algorithm complexity and equivalence classes. Number systems, binary arithmetic, Boolean algebra and logic gates are also introduced.
Lecture times: 4th or 5th period daily, Tutorials: One per week, replacing one lecture, Practicals: One per week, Monday, Tuesday, Wednesday or Thursday 14h00 - 16h00 or 16h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Theory tests 15%; practical tests and practical assignments 25%; June examination 2 hours 60%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

CSC1016S   COMPUTER SCIENCE 1016
18 NQF credits at HEQSF level 5
Convener: A Safla
Course entry requirements: CSC1015F (or supplementary exam for CSC1015F or at least 70% for CSC1017F)
Course outline:
This course builds on the foundation of CSC1015F/CSC1010H, with a focus on object-oriented design and programming in Java, as well as introducing important considerations relating to ethical and professional issues. The latter introduces students to ethical issues such as property rights, freedom of expression and privacy, and concepts such as free and open source software, ICT for Development, and Professional Codes of Conduct. The Java component of the course covers object-oriented design techniques and UML class diagrams, as well as elementary data structures such as lists, stacks and queues. The practical component includes use of inheritance, polymorphism, interfaces, generics and GUI programming in Java.
Lecture times: 4th or 5th period daily, Tutorials: One per week, replacing one lecture, Practicals: One per week, Monday, Tuesday or Wednesday, 14h00 - 16h00 or 16h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Theory tests count 15%; practical tests and practical assignments count 25%; one 2-hour exam written in November counts 60%. Subminima: 45% for practicals and 45% on weighted average of theory tests and examination.

CSC1017F   INTRODUCTION TO PROGRAMMING

16 NQF credits at HEQSF level 5

Convener: Dr G Nitschke

Course outline:

This course aims to provide an introduction to programming and algorithms, using the Python programming language. Topics to be included will be: basic syntax, variables, operators, comments, expressions, strings, input and output; conditional statements, if, nested ifs, if-else ladders, Boolean expressions; loops, for and while, nested loops; functions, parameters, return values; testing and debugging; arrays and lists, multidimensional arrays; sorting and searching; text files; and number systems.

DP requirements: 45% weighted average for practical work.

Assessment: Theory tests count for 15%, practicals count for 15%, practical tests count for 10%, June examination counts for 60% of the course mark.

Subminima: 45% weighted average for practical work, 45% weighted average of tests and exams.

CSC2001F   COMPUTER SCIENCE 2001

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.cs.uct.ac.za/teaching. (A tablet or "netbook" will not be suitable). The course convenor will provide details of additional software (open source) required.

24 NQF credits at HEQSF level 6

Convener: Associate Professor S Berman

Course entry requirements: (CSC1015F and CSC1016S) or (CSC1010H and CSC1011H)

Course outline:

This course builds on the first year Computer Science foundation with an emphasis on data storage and manipulation. The course covers abstract data types and assertions, recursive algorithms, tree structures such as AVL and B-trees, graph traversals, minimum spanning trees, sets, hashing and priority queues. An introduction to conceptual modelling, database design and relational database manipulation is included. Practical programming in Java in a Unix environment is an important part of the course

Lecture times: Monday - Friday, 2nd period, Four or five lectures per week, Practicals: One 4-hour practical per week, Monday - Friday, 14h00 - 18h00

DP requirements: Minimum of 45% aggregate in practical work.

Assessment: Tests count for 16.7%; practicals count 33.3%; one 3-hour paper written in June counts 50%. Subminima: 45% on weighted average of theory tests and examination.

CSC2002S   COMPUTER SCIENCE 2002

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.cs.uct.ac.za/teaching. (A tablet or "netbook" will not be suitable). The course convenor will provide details of additional software (open source) required.

24 NQF credits at HEQSF level 6

Convener: Associate Professor S Berman

Course entry requirements: CSC2001F (or supplementary exam for CSC2001F)

Course outline:

The goal of this course is to complete the basic education of a Computer Scientist. Mobile application development and interface design, an introduction to computer architecture and concurrent programming. Practical work in Java and in assembler programming are included.

Lecture times: Monday - Friday, 2nd period, Four lectures per week, Practicals: One 4-hour practical per week, Monday - Friday, 14h00 - 18h00

DP requirements: Minimum of 45% aggregate in practical work.

Assessment: Tests count for 16.7%; practicals and practical test count 33.3%; one 3-hour paper written in November counts 50%. Subminima: 45% on weighted average of theory tests and examination.

CSC2004Z   PROGRAMMING ASSESSMENT

This is a required course for all students majoring in Computer Science and/or who wish to continue to any third year courses in Computer Science. It should be taken in the second year of study and will demonstrate competency in programming, which is assumed in all third year courses. It is a compulsory course in the Computer Science major CSC05.
0 NQF credits at HEQSF level 6
Convener: Associate Professor S Berman
Course entry requirements: (CSC1015F and CSC1016S) or (CSC1010H and CSC1011H)
Course outline:
All students who take advanced courses in Computer Science need to build on a foundation of strong programming skills. The aim of this course is to assess and confirm mastery in fundamental programming skills before students can proceed to advanced courses.
Lecture times: None
DP requirements: None
Assessment: Practical programming examination counts for 100%

CSC3002F   COMPUTER SCIENCE 3002

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.cs.uct.ac.za/teaching. (A tablet or "netbook" will not be suitable). The course convenor will provide details of additional software (open source) required.
36 NQF credits at HEQSF level 7
Convener: Associate Professor P Marais
Course entry requirements: CSC2001F, CSC2002S and ((MAM1004F+MAM1008S) or MAM1000W). CSC2004Z is required if CSC2002S was passed after 2017.
Course outline:
The course provides an introduction to the two topics (1) structure and organisation of operating systems and (2) a basic knowledge of computer networks that will take the student through the various logical layers of the ISO OSI layers, focusing on the Internet Protocol suite.
Lecture times: Monday - Friday, 2nd period, Practicals: Two 4-hour practicals per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests count 15%; practical work counts 35%; one 3-hour paper written in June counts 50%. Subminima: 45% for practicals; 45% on weighted average of theory tests and examinations.

CSC3003S   COMPUTER SCIENCE 3003

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.cs.uct.ac.za/teaching. (A tablet or "netbook" will not be suitable). The course convenor will provide details of additional software (open source) required.
36 NQF credits at HEQSF level 7
Convener: Associate Professor P Marais
Course entry requirements: CSC2001F, CSC2002S and ((MAM1004F+MAM1008S) or MAM1000W), and either INF2009F or permission from the Head of Department to do compensation work to a satisfactory standard. CSC2004Z is required if CSC2002S was passed after 2017.
Course outline:
This is a course on two advanced topics: (1) advanced software design is about turning requirements into effective and efficient implementations in a systematic manner; and (2) the algorithms module

expands on a topic central to computing. This module describes how algorithms are categorised, and shows interesting algorithms in each category and analyses their complexity. It also touches on Turing machines and the limits of computation.
Lecture times: Monday - Friday, 2nd period, Practicals: Two 4-hour practicals per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests count 15%; practical work counts 35%; one 3-hour paper written in November counts 50%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

CSC3023F   COMPUTER SCIENCE 3023
24 NQF credits at HEQSF level 7
Convener: Associate Professor P Marais
Course entry requirements: CSC2001F, CSC2002S. CSC2004Z is required if CSC2002S was passed after 2017.
Course outline:
This course aims to develop an understanding of operating system structure and operations; computer system organisation; process management and storage management; protection and open source operating systems. Also included is an introduction to C++; pointers and memory management; streams and I/O; OO in C++; operator overloading; function objects; templates; the STL; and exceptions.
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests count for 15%; practicals count for 35%; June examination counts for 50%.**Subminima:** 45% for practicals; 45% for tests and examination.

ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE

Associate Professor and Head of Department:
M R Sowman, MSc PhD *Cape Town*

EGS1003S   GEOGRAPHY, DEVELOPMENT & ENVIRONMENT
There is a compulsory fieldwork component involving half-day field excursions.
18 NQF credits at HEQSF level 5
Convener: Professor M F Ramutsindela
Course entry requirements: A 50% pass in NSC Geography or GEO1009F
Course outline:
The course introduces students to development and environment debates in geography, by exploring the geography of third world development, focusing on the historical roots and spatial patterns that underpin development
Lecture times: Monday - Friday, 2nd period
DP requirements: Attendance and satisfactory completion of practicals, including fieldwork, and tutorial assignments; students must attain an average mark of not less than 40% for the coursework component.
Assessment: Essays, a class test, practical assignments (including fieldwork) and tutorial work count 50%; one 2-hour theory examination written in November counts 50% (subminimum of 40% required).

EGS1005F   INTRODUCTION TO ENVIRONMENTAL ASSESSMENT & MANAGEMENT
12 NQF credits at HEQSF level 5
Convener: Dr K Winter
Co-requisites: Any one of CIV4041F, CIV4042F, CIV4045F and CIV4046F

Course outline:
This course aims to introduce environmental management, sustainable development and climate change. Students are guided through the process of environmental assessment, methods, reports, and public involvement. The environmental management of construction is also covered. The course includes practical sessions: case studies, field trips and a course project.
Assessment: A class test, practical assignments and field report count 50%; one 2-hour examination written in June count 50% (sub-minimum of 40% required).

EGS2013F   THE PHYSICAL ENVIRONMENT
There is a compulsory fieldwork component involving half-day field excursions.
24 NQF credits at HEQSF level 6
Convener: Associate Professor F Eckardt
Course entry requirements: GEO1009F
Course outline:
The course focuses on contemporary Atmosphere-Earth surface interactions, in particular the role of precipitation and water from a global to a regional scale and examines temporal dynamics, driven by natural process as well as anthropogenic pressures. It covers in detail global circulation patterns, climate variability, soil formation, polar response to climate change, tropical deforestation, and desertification and earth observation technology. It concludes with a detailed study of local scale systems and applications covering stream catchments, estuaries, wetlands and coastlines. It is expected that students will enhance their understanding of Earth system dynamics, systems interactions and develop an appreciation for scales both temporal and spatial. Students are also expected to put the local context into a regional setting and make linkages to the larger global picture.
Lecture times: Monday - Friday, 5th period
DP requirements: Satisfactory completion of practicals and all written assignments, including projects, fieldwork reports, practicals, essays and class tests. Students must attain an average mark of not less than 40% for the coursework.
Assessment: Project, essays, class tests and practical assignments including fieldwork report count 50%; one 3-hour examination written in June count 50% (subminimum of 40% required).

EGS2014S   CONTEMPORARY URBAN CHALLENGES
There is a compulsory fieldwork component involving half-day field excursions.
24 NQF credits at HEQSF level 6
Convener: Dr S Daya
Course entry requirements: For BSc: EGS1003S; For BA or BSocSc: EGS1003S or Social Science Foundation course and two full first year Humanities courses, or equivalent.
Course outline:
This course focuses on urban change in South Africa, drawing together historical and contemporary analysis of social, political, economic and environmental dimensions of the South African city. The course includes a section on the historical geography of the South African city to contextualise contemporary challenges, and explores issues of race and gender politics in South African cities, as well as challenges of service delivery and natural systems. This conceptual material is grounded in field-based experiential learning in Cape Town.
Lecture times: Monday - Friday, 5th period
DP requirements: Attendance and satisfactory completion of practical including fieldwork and tutorial assignments; students must attain an average mark of not less than 40% for the coursework.
Assessment: Essays, a class test, practical assignments based on compulsory fieldwork and tutorial work count 50%; one 2-hour theory examination written in November counts 50% (subminimum of 40% required).

EGS3012S   ATMOSPHERIC SCIENCE
36 NQF credits at HEQSF level 7
Convener: Associate Professor B J Abiodun
Course entry requirements: GEO1009F (or equivalent), EGS2013F (or SEA2004F or SEA2002S or SEA2003F or approved 2000-level Science course), and any 1000-level Physics (or Mathematics) course.
Course outline:
This course aims to provide a thorough understanding of the physical processes that control the Earth's atmosphere. It covers the following topics: atmospheric energy balance, thermodynamics, dynamics, and general circulation; tropical and mid-latitude weather producing systems; weather and climate extreme events (e.g. heat-waves, drought, and floods) in Africa; climate variability and change; atmospheric boundary layer turbulence, chemistry, and pollution. The lectures are complemented with field measurements and laboratory practicals to demonstrate basic data analysis techniques employed in atmospheric sciences.
Lecture times: Monday - Friday, 1st period
DP requirements: Satisfactory completion of practicals and all written assignments, including essays, project reports and class tests.
Assessment: Essays and tests count 20%; project reports and practicals count 20%; one 3-hour examination in November counts 60% (subminimum of 40% required).

EGS3021F   SUSTAINABILITY & ENVIRONMENT
There is a compulsory fieldwork component involving half-day field excursions.
36 NQF credits at HEQSF level 7
Convener: Associate Professor M Sowman
Course entry requirements: EGS2013F, EGS2014S
Course outline:
The course critically engages with current debates and discourses in the fields of sustainability, vulnerability and environmental management, including examination of key concepts such as integration, systems-thinking, complexity, equity, vulnerability, risk, resilience, adaptation and mitigation. Approaches and methods for analysing environmental problems and integrating risk reduction as well as sustainability principles and practices into policy, programme, plan and project cycle processes are investigated and applied in different contexts.
Lecture times: Monday - Friday, 3rd period
DP requirements: Attendance and satisfactory completion of practicals (including fieldwork), other assignments and tests; students must attain an average mark of not less than 40% for the coursework.
Assessment: Practical reports (including fieldwork), class tests and other assignments count 50%; one 3-hour June examination counts 50% (subminimum of 40% required).

EGS3022S   GEOGRAPHIC THOUGHT
36 NQF credits at HEQSF level 7
Convener: To be advised
Course entry requirements: EGS2014S
Course outline:
The course focuses on international debates in classical and contemporary human geography. It considers important thematic areas in the geographical literature, such as development; spatiality; urban, political and feminist geographies. Each thematic area explores specific debates and key author's work in the field, providing students with an introduction to literature, a content overview, and skills to deconstruct and build conceptual and analytical arguments related to evidence drawn from geographical research from around the world, other than South Africa. The course also emphasises academic reading and writing skills taught in the practical sessions.
Lecture times: Monday - Friday, 4th period

DP requirements: Satisfactory completion of essay assignments and class test; students must attain an average mark of not less than 40% for the coursework
Assessment: Essay and other assignments count 50%; one 3-hour written examination in November count 50% (subminimum of 40% required).

EGS3023F   ANTHROPOCENE ENVIRONMENTS IN PERSPECTIVE
36 NQF credits at HEQSF level 7
Convener: Professor M E Meadows
Course entry requirements: EGS2013F
Course outline:
The course deals with the dynamic physical environment including the human impact on global environments at various spatial and temporal scales during the so-called Anthropocene. The general aim of this course is to illustrate the nature and scale of changes that characterise the earth's environment, against a background of both natural and anthropogenically-induced processes. This provides an important perspective when thinking about contemporary environments and how they might change in the future – with obvious consequences for our own species and that of the others with which we share the planet.
Lecture times: Monday - Friday, 5th period
DP requirements: Satisfactory completion of practicals and all written assignments, including fieldwork report, essays and class tests. Students must attain an average mark of not less than 40% for the coursework.
Assessment: Field report, essays, class tests and practical assignments count 50%; one 3-hour examination written in June count 50% (sub-minimum of 40% required).

GEOLOGICAL SCIENCES

Philipson Stow Professor of Mineralogy & Geology and Head of Department:
C Harris, MA DPhil *Oxon*

GEO1008F   INTRODUCTION TO GEOLOGY FOR CIVIL ENGINEERS
12 NQF credits at HEQSF level 5
Convener: Dr A Sloan
Course outline:
This course provides an introduction to the geological sciences for students in civil engineering. The course covers: The structure of planet Earth, plate tectonics, physical and chemical properties of rock forming minerals, petrology of igneous, sedimentary and metamorphic rocks. Weathering and applied geomorphology. Structural geology and the interpretation of geological maps. Slope failure, geological hazards and site assessment. Hydrology, climate change and the stratigraphy and geology of South Africa.
DP requirements: Attendance of at least 80% of the practicals.
Assessment: June examination 3 hours 60%, year mark 40%.

GEO1009F   INTRODUCTION TO EARTH AND ENVIRONMENTAL SCIENCES
This course is presented jointly by the Departments of Archaeology, Environmental & Geographical Science and Geological Sciences, but administered by Geological Sciences. Students are required to attend three half-day excursions in the Cape Peninsula. Students who fail this course will be advised to register for AGE1004S (see entry in Department of Archaeology).
18 NQF credits at HEQSF level 5
Convener: To be advised
Course entry requirements: At least 60% for NSC Physical Science, Life Sciences or Geography (or AGE1004S). NOTE: Preference will be given to students registered in the Science Faculty.

Course outline:
This course aims to develop a broad understanding of how the Earth works, leading to majors in Archaeology, Environmental & Geographical Sciences, Geology and Ocean & Atmosphere Science. The course covers the following general topics: structure and dynamics of the Earth; stratigraphy and geological history; climatology; surface processes and evolution of landscapes; biogeography; humans and the environment.
Lecture times: Monday - Friday, 2nd period
DP requirements: An average of 30% on all marked classwork and tests.
Assessment: Marked classwork counts 24%; marked class tests count 16%; June examination 3 hours 60%. A Subminimum of 40% is required in the theory examination paper. Supplementary examinations for GEO1009F will be written in July.

GEO2006S   APPLIED MINERALOGY FOR CHEMICAL ENGINEERS
24 NQF credits at HEQSF level 6
Convener: Dr P J le Roux
Course entry requirements: CEM1000W
Course outline:
Introduction to mineralogy; the structure and composition of minerals, how minerals form, their general properties and how this can be exploited in minerals beneficiation. Minerals and element associations and their implications for mining and processing. Identification of minerals in hand specimen, and using a petrographic microscope. Overview of instrumental analytical methods used in geology and mineralogy. Application of different analytical methods to rocks, minerals and minerals beneficiation products.
Assessment: Coursework: 30%. Exam: 70%.

MATHEMATICS AND APPLIED MATHEMATICS

Professor and Head of Department:
P K S Dunsby, BSc PhD *London*
Refer to the Science Faculty Handbook for details of other courses offered by the Department.

MAM1010F   MATHEMATICS 1010
18 NQF credits at HEQSF level 5
Convener: M Kirova
Course entry requirements: NSC level 5 in Mathematics, or 50% in Higher Grade Mathematics (SC), or passes in both MAM1014F and MAM1015S.
Course outline:
The aim of this course is to introduce topics in mathematics that are of interest to Commerce students, with applications to economics. Introductory financial mathematics including compound interest and annuities, functions, limits, differential calculus and applications of the derivative including graph sketching and Newton's Method, introduction to integral calculus and techniques of integration.
Lecture times: Monday - Friday, 1st, 3rd, or 4th period
DP requirements: Minimum of 30% in class tests and full attendance at workshops.
Assessment: Semester mark up to 40%. June examination 1 x 2 hour paper

MAM1020F   MATHEMATICS 1A FOR ENGINEERS
18 NQF credits at HEQSF level 5
Convener: M Mokhithi
Course entry requirements: A pass in NSC Mathematics with at least 70%, or at least a D symbol at A-level.

Course outline:
The course aims to develop a good conceptual and visual understanding of the fundamentals of the mathematics of differential and the beginning of integral calculus as applied in engineering contexts. Topics include: Functions, limits and continuity. Rational functions, the natural exponential and logarithm functions. Radian measure and the Trigonometric functions. The rules of differentiation. Curve sketching. Applications of the mean value theorem. Rates of change and optimization involving functions of a single variable. L'Hospital's rules, indeterminate forms and the squeeze theorem. Anti-differentiation. Finite series, permutations, combinations and the binomial theorem. The definite integral and the fundamental theorem of calculus. The substitution rule.
Lecture times: Monday & Thursday & Friday, 1st & 2nd period; Tuesday & Wednesday, 1st & 2nd period, 1 double-period tutorial per week, offered in each semester.
DP requirements: 30% For class record, high tutorial attendance.
Assessment: Examination, not longer than 3 hours in June: Class record up to 40%.

MAM1020S   MATHEMATICS 1A FOR ENGINEERS
18 NQF credits at HEQSF level 5; 5 lectures per week, 1 double-period tutorial per week, offered in each semester..
Convener: Dr B Mongwane
Course entry requirements: A pass in NSC Mathematics with at least 70%, or at least a D symbol at A-level.
Course outline:
The course aims to develop a good conceptual and visual understanding of the fundamentals of the mathematics of differential and the beginning of integral calculus as applied in engineering contexts. Topics include: Functions, limits and continuity. Rational functions, the natural exponential and logarithm functions. Radian measure and the Trigonometric functions. The rules of differentiation. Curve sketching. Applications of the mean value theorem. Rates of change and optimization involving functions of a single variable. L'Hospital's rules, indeterminate forms and the squeeze theorem. Anti-differentiation. Finite series, permutations, combinations and the binomial theorem. The definite integral and the fundamental theorem of calculus. The substitution rule.
Lecture times: Monday & Thursday & Friday, 1st & 2nd period; Tuesday & Wednesday, 1st, 2nd & 7th period
DP requirements: 30% For class record, high tutorial attendance.
Assessment: Examination, not longer than 3 hours in June or November: Class record up to 40%.

MAM1021F   MATHEMATICS 1B FOR ENGINEERS
18 NQF credits at HEQSF level 5
Convener: Dr J Frith
Course entry requirements: MAM1020F.
Course outline:
The course aims to develop a good conceptual and visual understanding of the fundamentals of the mathematics of differential and the beginning of integral calculus as applied in engineering contexts. The course covers the following: Further calculus of a single variable. The inverse trigonometric functions. Integration by parts. Partial fractions. Areas, volumes and arc length. Taylor series. An introduction to modelling and differential equations. Vector algebra and geometry. Points, lines and planes. Dot products and cross products. Matrices. Systems of linear equations. Gauss reduction. Matrix algebra. Linear transformations. The matrix representing a linear map. Inverses. An introduction to complex numbers. The complex plane. Moduli and arguments, conjugates. De Moivre's theorem. Roots of polynomials.
Lecture times: Monday & Thursday & Friday, 1st & 2nd period; Tuesday & Wednesday, 1st & 2nd period, 1 double-period tutorial per week, offered in each semester.
DP requirements: 30% for class record, high tutorial attendance.
Assessment: Examination, not longer than 3 hours in June or November: Class record up to 40%.

MAM1021S   MATHEMATICS 1B FOR ENGINEERS
18 NQF credits at HEQSF level 5
Convener: Dr Á de la Cruz-Dombriz
Course entry requirements: MAM1020F.
Course outline:
The course aims to develop a good conceptual and visual understanding of the fundamentals of the mathematics of differential and the beginning of integral calculus as applied in engineering contexts. The course covers the following: Further calculus of a single variable. The inverse trigonometric functions. Integration by parts. Partial fractions. Areas, volumes and arc length. Taylor series. An introduction to modelling and differential equations. Vector algebra and geometry. Points, lines and planes. Dot products and cross products. Matrices. Systems of linear equations. Gauss reduction. Matrix algebra. Linear transformations. The matrix representing a linear map. Inverses. An introduction to complex numbers. The complex plane. Moduli and arguments, conjugates. De Moivre's theorem. Roots of polynomials.
Lecture times: Monday & Thursday & Friday, 1st & 2nd period; Tuesday & Wednesday, 1st & 2nd period, 1 double-period tutorial per week, offered in each semester.
DP requirements: 30% for class record, high tutorial attendance.
Assessment: Examination, not longer than 3 hours in June or November: Class record up to 40%.

MAM1023F   MATHEMATICS 1A FOR ENGINEERS EXTENDED
18 NQF credits at HEQSF level 5
Convener: K Ramesh-Kanjee
Course outline:
An introduction to differential and integral calculus. Functions, limits and continuity. Rational functions, the natural exponential and logarithm functions. Radian measure and the Trigonometric functions. The rules of differentiation. Curve sketching. Applications of the mean value theorem. Rates of change and optimization involving functions of a single variable. L'Hospital's rules, indeterminate forms and the squeeze theorem. Anti-differentiation. The binomial theorem. The definite integral and the fundamental theorem of calculus. The substitution rule.
Lecture times: Lectures from Monday - Friday, 1st and 2nd period. Tutorials on Tuesday from 6th to 8th period.
DP requirements: 35% in class record
Assessment: Class record (tests, problem sets) 50%, Final examination 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supplementary tutoring and revision programme.

MAM1023S   MATHEMATICS 1A FOR ENGINEERS EXTENDED
18 NQF credits at HEQSF level 5
Convener: Dr H Pearce
Course outline:
An introduction to differential and integral calculus. Functions, limits and continuity. Rational functions, the natural exponential and logarithm functions. Radian measure and the Trigonometric functions. The rules of differentiation. Curve sketching. Applications of the mean value theorem. Rates of change and optimization involving functions of a single variable. L'Hospital's rules, indeterminate forms and the squeeze theorem. Anti-differentiation. The binomial theorem. The definite integral and the fundamental theorem of calculus. The substitution rule.
Lecture times: Lectures from Monday - Friday, 1st and 2nd period. Tutorials on Tuesday from 6th to 8th period.
DP requirements: 35% in class record
Assessment: Class record (tests, problem sets) 50%, Final examination 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a

supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supplementary tutoring and revision programme.

MAM1024F   MATHEMATICS 1B FOR ENGINEERS EXTENDED

18 NQF credits at HEQSF level 5
Convener: A Campbell
Course outline:
Further calculus of a single variable. The inverse trigonometric functions. Integration by parts. Partial fractions. Areas, volumes and arc length. Taylor series. An introduction to modelling and differential equations. Vector algebra and geometry. Points, lines and planes. Dot products and cross products. Matrices. Systems of linear equations. Gauss reduction. Matrix algebra. Linear transformations. The matrix representing a linear map. Inverses. An introduction to complex numbers. The complex plane. Moduli and arguments, conjugates. De Moivre's theorem. Roots of polynomials
Lecture times: Lectures Monday - Friday 1st period. Tutorials on Tuesday from 6th to 8th.
DP requirements: 35% in class record
Assessment: Class record (test, problem sets) 50%, Final examination 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supplementary tutoring and revision programme.

MAM1024S   MATHEMATICS 1B FOR ENGINEERS EXTENDED

18 NQF credits at HEQSF level 5
Convener: K Ramesh-Kanjee
Course outline:
Further calculus of a single variable. The inverse trigonometric functions. Integration by parts. Partial fractions. Areas, volumes and arc length. Taylor series. An introduction to modelling and differential equations. Vector algebra and geometry. Points, lines and planes. Dot products and cross products. Matrices. Systems of linear equations. Gauss reduction. Matrix algebra. Linear transformations. The matrix representing a linear map. Inverses. An introduction to complex numbers. The complex plane. Moduli and arguments, conjugates. De Moivre's theorem. Roots of polynomials
Lecture times: Monday, Tuesday, Wednesday & Friday 1st& 2nd periods. Workshops: Wednesday 6th – 8th periods.
DP requirements: 35% in class record
Assessment: Class record (test, problem sets) 50%, Final examination 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supplementary tutoring and revision programme.

MAM2083F   VECTOR CALCULUS FOR ENGINEERS

This course is designed specifically for students in the Faculty of Engineering & the Built Environment.
16 NQF credits at HEQSF level 6
Convener: A Prof C Hellaby
Course entry requirements: MAM1020 or equivalent and MAM1021 or equivalent.
Course outline:
This course aims to develop an understanding of differentiation of vector valued functions, space curves and surfaces. Partial derivatives, chain rule, maxima and minima, Lagrange multipliers. Gradient, divergence and curl. Taylor's theorem for one and several variables, Jacobians, Newton's

method for several variables. Multiple integrals and change of variable. Surface integrals. Line integrals, work done by a force, potentials. Green's theorem, divergence theorem, and Stokes' theorem.

DP requirements: 35% class record and satisfactory tutorial attendance.

Assessment: One paper written in June or November no longer than 2.5 hours: 60%, year mark: 40%.

MAM2083S   VECTOR CALCULUS FOR ENGINEERS

This course is designed specifically for students in the Faculty of Engineering & the Built Environment.

16 NQF credits at HEQSF level 6

Convener: Dr B Osano

Course entry requirements: MAM1020 or equivalent and MAM1021 or equivalent.

Course outline:

This course aims to develop an understanding of differentiation of vector valued functions, space curves and surfaces. Partial derivatives, chain rule, maxima and minima, Lagrange multipliers. Gradient, divergence and curl. Taylor's theorem for one and several variables, Jacobians, Newton's method for several variables. Multiple integrals and change of variable. Surface integrals. Line integrals, work done by a force, potentials. Green's theorem, divergence theorem, and Stokes' theorem.

DP requirements: 35% class record and satisfactory tutorial attendance.

Assessment: One paper written in June or November no longer than 2.5 hours: 60%, year mark: 40%.

MAM2084F   LINEAR ALG & DE FOR ENGINEERS

This course is designed specifically for students in the Faculty of Engineering & the Built Environment.

16 NQF credits at HEQSF level 6

Convener: Dr A Schauerte

Course entry requirements: MAM1021F/S or equivalent.

Course outline:

This course aims to develop an understanding of linear algebra and differential equations for engineers. Topics include: First order ordinary differential equations. Systems of linear equations, linear combinations, linear dependence, linear subspaces and basis. Determinants. Eigenvalues and eigenvectors, diagonalization, applications to systems of linear differential equations and finding principal axes. Solution of n-th order linear differential equations. The Laplace transform.

Lecture times: 4 lectures per week, 1 double-period tutorial per week.

DP requirements: 35% class record and satisfactory tutorial attendance.

Assessment: One paper written in June or November no longer than 2.5 hours: 60%, year mark: 40%.

MAM2084S   LINEAR ALG & DE FOR ENGINEERS

This course is designed specifically for students in the Faculty of Engineering & the Built Environment.

16 NQF credits at HEQSF level 6

Convener: T C van Heerden

Course entry requirements: MAM1021F/S or equivalent.

Course outline:

This course aims to develop an understanding of linear algebra and differential equations for engineers. Topics include: First order ordinary differential equations. Systems of linear equations, linear combinations, linear dependence, linear subspaces and basis. Determinants. Eigenvalues and eigenvectors, diagonalization, applications to systems of linear differential equations and finding principal axes. Solution of n-th order linear differential equations. The Laplace transform.

Lecture times: 4 lectures per week, 1 double-period tutorial per week.
DP requirements: 35% class record and satisfactory tutorial attendance.
Assessment: One paper written in June or November no longer than 2.5 hours: up to 80%, year mark: up to 40%.

MAM2085F   VECTOR CALCULUS FOR ASPECT
16 NQF credits at HEQSF level 6
Convener: Dr P Padayachee
Course entry requirements: END1020 and END1021, or MAM1023 and MAM1024
Course outline:
This course aims to develop an understanding of vector calculus. Topics include: differentiation of vector valued functions, space curves and surfaces. Partial derivatives, chain rule, maxima and minima, Lagrange multipliers. Gradient, divergence and curl. Taylor's theorem for one and several variables, Jacobians, Newton's method for several variables. Multiple integrals and change of variable. Surface integrals. Line integrals, work done by a force, potentials. Green's theorem, divergence theorem, and Stokes' theorem.
Lecture times: Monday-Friday 1st period, 1 afternoon tutorial, optional additional mini-tutorials in 2nd or 3rd period
DP requirements: 35% class record; attendance of tutorials
Assessment: One paper written in June or November no longer than 2.5 hours: 60%, class record 40%.

MAM2085S   VECTOR CALCULUS FOR ASPECT
16 NQF credits at HEQSF level 6
Convener: Dr P Padayachee
Course entry requirements: END1020 and END1021, or MAM1023 and MAM1024
Course outline:
This course aims to develop an understanding of vector calculus. Topics include: differentiation of vector valued functions, space curves and surfaces. Partial derivatives, chain rule, maxima and minima, Lagrange multipliers. Gradient, divergence and curl. Taylor's theorem for one and several variables, Jacobians, Newton's method for several variables. Multiple integrals and change of variable. Surface integrals. Line integrals, work done by a force, potentials. Green's theorem, divergence theorem, and Stokes' theorem.
Lecture times: Monday-Friday 1st period, 1 afternoon tutorial, optional additional mini-tutorials in 2nd or 3rd period
DP requirements: 35% class record; attendance of tutorials
Assessment: One paper written in June or November no longer than 2.5 hours: 60%, class record 40%.

PHYSICS

Professor and Head of Department:
A Buffler, MSc PhD HDE *Cape Town*

Refer also to the Science Faculty Handbook.

PHY1012F   PHYSICS A FOR ENGINEERS
18 NQF credits at HEQSF level 5; First-year first semester course.
Convener: D R Geduld
Co-requisites: MAM1020F (or equivalent)
Course outline:
The course aims to provide students with a strong foundation in mechanics, properties of matter and thermodynamics. The aims are to encourage conceptual understanding, the development of certain

mathematical and graphical skills as well as problem solving. Mechanics forms the basis of all the engineering disciplines. It is therefore crucial that students have a good grasp of the concepts and proficiency in the skills. Problem solving abilities develop through the course as a preparation for further development in later engineering courses. Topics include: vectors, kinematics, dynamics, work, energy, power, conservative and non-conservative forces, friction, impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, elasticity, elastic moduli, hydrostatics, hydrodynamics, temperature, heat, kinetic theory of gases, thermodynamics, entropy.

DP requirements: An average of at least 40% for class record, including 50% for laboratories.

Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour examination counts 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1012S   PHYSICS A FOR ENGINEERS

18 NQF credits at HEQSF level 5; First-year second semester course.
Convener: Associate Professor W A Horowitz
Co-requisites: MAM1020F (or equivalent)
Course outline:
The course aims to provide students with a strong foundation in mechanics, properties of matter and thermodynamics. The aims are to encourage conceptual understanding, the development of certain mathematical and graphical skills as well as problem solving. Mechanics forms the basis of all the engineering disciplines. It is therefore crucial that students have a good grasp of the concepts and proficiency in the skills. Problem solving abilities develop through the course as a preparation for further development in later engineering courses. Topics include: vectors, kinematics, dynamics, work, energy, power, conservative and non-conservative forces, friction, impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, elasticity, elastic moduli, hydrostatics, hydrodynamics, temperature, heat, kinetic theory of gases, thermodynamics, entropy.

DP requirements: An average of at least 40% for class record, including 50% for laboratories.

Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour examination counts 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1013F   PHYSICS B FOR ENGINEERS

18 NQF credits at HEQSF level 5; First-year, first semester course.
Convener: D R Geduld
Course entry requirements: PHY1012F/S or PHY1014F/S
Co-requisites: MAM1020F
Course outline:
The course is the second part of the first year engineering Physics sequence. It aims to provide a foundation in the concepts and mathematics of physical phenomena within the context of vibrations and waves, and electromagnetism, and features the topics of electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, the magnetic field, Biot-Savart Law, Ampere's Law, electromagnetic induction, inductance, simple harmonic motion, damped osillations, resonance, travelling waves, phase velocity, superposition, standing waves, sound waves, sound intensity, Dopper effect, interference diffraction.

DP requirements: An average of at least 40% for class record, including 50% for laboratories.

Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour examination counts 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key

courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1013S   PHYSICS B FOR ENGINEERS
18 NQF credits at HEQSF level 5; First-year, second semester course.
Convener: D R Geduld
Course entry requirements: PHY1012F/S or PHY1014F/S
Co-requisites: MAM1020F
Course outline:
The course is the second part of the first year engineering Physics sequence. It aims to provide a foundation in the concepts and mathematics of physical phenomena within the context of vibrations and waves, and electromagnetism, and features the topics of electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, the magnetic field, Biot-Savart Law, Ampere's Law, electromagnetic induction, inductance, simple harmonic motion, damped osillations, resonance, travelling waves, phase velocity, superposition, standing waves, sound waves, sound intensity, Dopper effect, interference diffraction.
DP requirements: An average of at least 40% for class record, including 50% for laboratories.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour examination counts 50%. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1014F   PHYSICS A FOR ASPECT
18 NQF credits at HEQSF level 5
Convener: P le Roux
Course outline:
The course aims to provide students with a strong foundation in mechanics, properties of matter and thermodynamics. The aims are to encourage conceptual understanding, the development of certain mathematical and graphical skills as well as problem solving. Mechanics forms the basis of all the engineering disciplines. It is therefore crucial that students have a good grasp of the concepts and proficiency in the skills. Problem solving abilities develop through the course as a preparation for further development in later engineering courses. Topics include: vectors, kinematics, dynamics, work, energy, power, conservative and non-conservative forces, friction, impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, elasticity, elastic moduli, hydrostatics, hydrodynamics, temperature, heat, kinetic theory of gases, thermodynamics, entropy.
DP requirements: An average of at least 40% on the class record.
Assessment: Class record (tests, tutorials, workshops and laboratory record) counts 50%; one 2-hour examination counts 50%. A subminimum of 40% is required for the theory examination paper. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1014S   PHYSICS A FOR ASPECT
18 NQF credits at HEQSF level 5
Convener: P le Roux
Course outline:
The course aims to provide students with a strong foundation in mechanics, properties of matter and thermodynamics. The aims are to encourage conceptual understanding, the development of certain mathematical and graphical skills as well as problem solving. Mechanics forms the basis of all the engineering disciplines. It is therefore crucial that students have a good grasp of the concepts and

proficiency in the skills. Problem solving abilities develop through the course as a preparation for further development in later engineering courses. Topics include: vectors, kinematics, dynamics, work, energy, power, conservative and non-conservative forces, friction, impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, elasticity, elastic moduli, hydrostatics, hydrodynamics, temperature, heat, kinetic theory of gases, thermodynamics, entropy.

DP requirements: An average of at least 40% on the class record.

Assessment: Class record (tests, tutorials, workshops and laboratory record) counts 50%; one 2-hour examination counts 50%. A subminimum of 40% is required for the theory examination paper. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1015F   PHYSICS B FOR ASPECT
18 NQF credits at HEQSF level 5
Convener: P le Roux
Course entry requirements: PHY1014F/S or PHY1012F/S.
Course outline:
The course is the second part of the first year engineering Physics sequence. It aims to provide a foundation in the concepts and mathematics of physical phenomena within the context of vibrations and waves, and electromagnetism, and features the topics of electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, the magnetic field, Biot-Savart Law, Ampere's Law, electromagnetic induction, inductance, simple harmonic motion, damped osillations, resonance, travelling waves, phase velocity, superposition, standing waves, sound waves, sound intensity, Dopper effect, interference diffraction.

DP requirements: An average of at least 40% on the class record.

Assessment: Class record (tests, tutorials, workshop and laboratory record) counts 50%; one 2-hour examination counts 50%. A subminimum of 40% is required for the theory examination paper. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1015S   PHYSICS B FOR ASPECT
18 NQF credits at HEQSF level 5
Convener: P le Roux
Course entry requirements: PHY1014F/S or PHY1012F/S.
Course outline:
The course is the second part of the first year engineering Physics sequence. It aims to provide a foundation in the concepts and mathematics of physical phenomena within the context of vibrations and waves, and electromagnetism, and features the topics of electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, the magnetic field, Biot-Savart Law, Ampere's Law, electromagnetic induction, inductance, simple harmonic motion, damped osillations, resonance, travelling waves, phase velocity, superposition, standing waves, sound waves, sound intensity, Dopper effect, interference diffraction.

DP requirements: An average of at least 40% on the class record.

Assessment: Class record (tests, tutorials, workshop and laboratory record) counts 50%; one 2-hour examination counts 50%. A subminimum of 40% is required for the theory examination paper. Although a supplementary examination is usually granted for a final grade in the range 45-49%, a supplementary examination may also be granted for certain key courses in the range 40-44% under conditions agreed to by the Deans of EBE and Science, normally involving a mandatory pre-supp tutoring and revision programme.

PHY1031F   GENERAL PHYSICS A

18 NQF credits at HEQSF level 5
Convener: Dr S W Peterson
Course entry requirements: At least 60% for NSC Physical Science. *Note: Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to PHY1023H from week 7.*
Course outline:
PHY1031F is an algebra-based introductory course for Science students who do not intend proceeding to second-year courses in Physics. Some calculus may be used. The course includes the following topics: Mechanics: vectors, kinematics, forces, dynamics, momentum, impulse, work, energy, power, collisions, rotation, rotational dynamics, torque, angular momentum, static equilibrium, gravitation. Properties of matter: elasticity, hydrostatics, hydrodynamics. Vibrations and waves: simple harmonic motion, damped oscillations, forced oscillations, resonance, travelling waves, superposition, standing waves, sound waves, sound intensity, Doppler Effect.
Lecture times: Monday - Friday, 3rd period
DP requirements: Minimum of 40% in class record; including 50% in laboratory assessment.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination in June counts 50%.

PHY1032F   GENERAL PHYSICS B

18 NQF credits at HEQSF level 5
Convener: Dr T Salagaram
Course entry requirements: PHY1031F or PHY1023H
Course outline:
PHY1032F is an algebra-based introductory course usually taken by Science students who have completed PHY1023H. Some calculus may be used. The course includes the following topics: Electricity and magnetism: electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, magnetic field, Biot Savart law, Ampere's law, electromagnetic induction, inductance, alternating currents. Thermal physics: temperature, heat, kinetic theory of gases, first and second laws of thermodynamics. Optics: Geometrical optics, polarization, electromagnetic waves, interference, diffraction. Modern physics: atomic structure, quantum physical phenomena, wave-particle duality, X-rays, elementary nuclear physics, radioactivity.
Lecture times: Monday - Friday, 3rd period
DP requirements: Minimum of 40% in class record, including 50% in laboratory assessment.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination in June counts 50%.

PHY1032S   GENERAL PHYSICS B

18 NQF credits at HEQSF level 5
Convener: Dr T Dietel
Course entry requirements: PHY1031F or PHY1023H
Course outline:
PHY1032S is an algebra-based introductory course for Science students who do not intend proceeding to second-year courses in Physics. Some calculus may be used. The course includes the following topics: Electricity and magnetism: electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, magnetic field, Biot Savart law, Ampere's law, electromagnetic induction, inductance, alternating currents. Thermal physics: temperature, heat, kinetic theory of gases, first and second laws of thermodynamics. Optics: Geometrical optics, polarization, electromagnetic waves, interference, diffraction. Modern physics: atomic structure, quantum physical phenomena, wave-particle duality, X-rays, elementary nuclear physics, radioactivity.

Lecture times: Monday - Friday, 3rd period
DP requirements: Minimum of 40% in class record, including 50% in laboratory assessment.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination in November counts 50%.

PHY2010S   ELECTROMAGNETISM FOR ENGINEERS

16 NQF credits at HEQSF level 6
Convener: Dr T Leadbeater
Course entry requirements: PHY1012F/S and PHY1013F/S; or PHY1014F/S and PHY1015F/S. MAM2083F/S.
Co-requisites: MAM2084F/S.
Course outline:
This course aims to develop an understanding of electromagnetism in an engineering context. Topics include: Semiconductors, energy bands in solids, charge carriers in semiconductors, diodes and transistors, Coulomb's law, Gauss' law. The vector differential operator; div, grad curl. Poisson and Laplace's equations. The magnetic field. Biot-Savart law. Ampere's law. Electric and magnetic fields in materials; and propagation in optical fibres.
DP requirements: Minimum of 40% in class record; completion of all laboratory reports; 75% of tutorial work and problem sets; attendance at all tests.
Assessment: Class record (tests, weekly problem sets and laboratory work) counts 50%; 2-hour examination in November counts 50%. There is a subminimum of 40% required for the final examination.

STATISTICAL SCIENCES

Associate Professor and Head of Department:
F Little, MSc PhD *Cape Town*

For further information refer to Handbook of the Faculty of Science or Faculty of Commerce.

STA1000F   INTRODUCTORY STATISTICS

(No first year students) STA1000F and STA1000S are identical courses offered in first and second semesters. Owing to the mathematics prerequisites, first-year students can only register for STA1000S in the second semester and STA1000F on completion of the mathematics prerequisite. Workshops: One short workshop per week and one long workshop per week. Not compulsory but recommended.
18 NQF credits at HEQSF level 5
Convener: S Britz
Course entry requirements: A pass in any of MAM1004F/S or MAM1005H or MAM1000W or MAM1006H or MAM1020F/S or MAM1010F/S or STA1001F. In addition students will be admitted to STA1000F if they have failed but obtained a DP for any of the above courses and are concurrently registered for an equivalent Mathematics course during the first semester.
Course outline:
This is an introductory statistics course aimed at exposing students to principles and tools to support appropriate quantitative analysis. The aim is to produce students with a functional sense of statistics. We introduce students to statistical modelling and also cover exploratory data analysis. Appropriate tools for display, analysis and interpretation of data are discussed. This course is offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will encounter and apply statistics in their other courses and professions. Topics covered include: Exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; binomial, Poisson, exponential, normal and uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including various tests on means); determining sample sizes; simple linear regression and

measures of correlation. Students are assessed on their knowledge of the topics covered and their ability to perform simple and appropriate statistical analyses using spreadsheet functions.

This course is offered in a blended learning format. Students make use of online learning and have the option to attend face to face workshops.

DP requirements: A class record of at least 35% and quiz completion with a minimum of 90% for each quiz.

Assessment: The class record counts 30%. One 2-hour examination counts 70%.

STA1000S   INTRODUCTORY STATISTICS

STA1000F and STA1000S are identical courses offered in first and second semesters. Owing to the mathematics prerequisites, first-year students can only register for STA1000S in the second semester and STA1000F on completion of the mathematics prerequisite. Workshops: One short workshop per week and a long workshop per week. Not compulsory but recommended.

18 NQF credits at HEQSF level 5

Convener: Associate Professor L Scott

Course entry requirements: A pass in any of MAM1004F/S or MAM1005H or MAM1020F/S or MAM1010F/S or STA1001F. In addition students will be admitted to STA1000S if they (1) are concurrently registered for MAM1000W, or (2) are concurrently registered for MAM1005H, or (3) have failed but obtained a DP for MAM1010F, MAM1004F, MAM1020F or STA1001F and are concurrently registered for an equivalent Mathematics course during the second semester, or (4) have a supplementary examination for MAM1010F, MAM1004F, MAM1020F or STA1001F that will be written in November of the year of registration.

Course outline:

This is an introductory statistics course aimed at exposing students to principles and tools to support appropriate quantitative analysis. The aim is to produce students with a functional sense of statistics. We introduce students to statistical modelling and also cover exploratory data analysis. Appropriate tools for display, analysis and interpretation of data are discussed. This course is offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will encounter and apply statistics in their other courses and professions. Topics covered include: Exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; binomial, Poisson, exponential, normal and uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including various tests on means); determining sample sizes; simple linear regression and measures of correlation. Students are assessed on their knowledge of the topics covered and their ability to perform simple and appropriate statistical analyses using spreadsheet functions.

The course is offered in a blended learning format. Students make use of online learning and have the option to attend face to face workshops.

DP requirements: A class record of at least 35% and quiz completion with a minimum of 90% for each quiz.

Assessment: The class record counts 30%. One 2-hour examination counts 70%.

STA1008F   STATISTICS FOR ENGINEERS

12 NQF credits at HEQSF level 5

Convener: K Stielau

Course entry requirements: MAM1020F (or equivalent)

Co-requisites: CHE1005W or CIV1005W or EEE1006F or MEC1005W

Course outline:

This course aims to introduce engineering students to the basic concepts and tools of Statistics which are of particular relevance in an engineering context, and to enable students to apply these to data collected from engineering experiments. Topics include: Random variables, sampling and basic statistical measures; Normal, t, F and Chi-square distributions; Confidence intervals; Statistical models, such as the means and the effects models; t, F and Chi-square tests; Regression and correlation; One-way analysis of variance; Introduction to the design of experiments; Application of statistical tools to experimental data in an engineering setting.

DP requirements: Attendance at and satisfactory performance in all tutorials and practicals.
Assessment: Class test, practicals, examination.

STA1008S   STATISTICS FOR ENGINEERS
12 NQF credits at HEQSF level 5
Convener: K Stielau
Course entry requirements: MAM1020F (or equivalent)
Co-requisites: CHE1005W or CIV1005W or EEE1007S or MEC1005W
Course outline:
This course aims to introduce engineering students to the basic concepts and tools of Statistics which are of particular relevance in an engineering context, and to enable students to apply these to data collected from engineering experiments. Topics include: Random variables, sampling and basic statistical measures; Normal, t, F and Chi-square distributions; Confidence intervals; Statistical models, such as the means and the effects models; t, F and Chi-square tests; Regression and correlation; One-way analysis of variance; Introduction to the design of experiments; Application of statistical tools to experimental data in an engineering setting.
DP requirements: Attendance at and satisfactory performance in all tutorials and practicals.
Assessment: Class test, practicals, examination.

STA2020F   APPLIED STATISTICS
24 NQF credits at HEQSF level 6
Convener: W Msemburi
Course entry requirements: STA1000S or STA1006S or STA1007S and DP for MAM1000W or MAM1004F or MAM1010F/S or MAM1020F/S. Concurrent registration for MAM1000W or MAM1005H or MAM1004F or MAM1010F/S or MAM1020F/S if not already passed.
Course outline:
This is designed to extend the student's basic knowledge acquired in STA1000F/S/P/L. The emphasis of the course is on applying statistical methods and modelling techniques to data rather than focusing on the mathematical rigor underpinning these methods. Topics covered include: Analysis of variance and experimental design; revision and extension of simple linear regression; multiple regression; time series analysis; and non-parametric statistics. Students will continue to analyse data using Excel.
Lecture times: Monday - Thursday, 1st or 5th period
DP requirements: At least 35% for class record and at least 50% for Excel test.
Assessment: Class record counts 40%. One 3-hour examination counts 60%.

STA3022F   RESEARCH AND SURVEY STATISTICS
36 NQF credits at HEQSF level 7
Convener: Dr S Er
Course entry requirements: STA2020F/S or STA2005S or STA2007F/S/H
Course outline:
The aim of this course is to create a practical working familiarity with analysis of the data, focusing on multivariate methods as applied in areas such as marketing and social science research. Topics covered include classification trees, correspondence analysis, principal components and factor analysis, cluster analysis, discriminant analysis and structural equations modelling.
Lecture times: Monday - Thursday, 4th period
DP requirements: Attendance and completion of all tests/assignments, class record of at least 35%.
Assessment: Class record counts 30%. One 3-hour examination counts 70%.

CENTRES AND OTHER ENTITIES ESTABLISHED IN THE FACULTY

Centres and Units Accredited by the University Research Committee

African Centre for Cities

The African Centre for Cities (ACC) was established in 2007 as a UCT signature research theme cutting across three Faculties (Engineering & the Built Environment, Science and Humanities). The mission of ACC is to facilitate critical urban research and policy discourse for the promotion of vibrant, democratic and sustainable urban development in the global South. ACC researchers undertake research and policy work on a wide range of urban issues in Cape Town, South Africa, Africa and the global South, and collaborate with a number of other institutions across the globe (for example, as part of the Mistra Urban Futures network). Over the past decade, ACC has established an impressive international profile and reputation as a dynamic home for analysis of urban issues and policies. ACC also runs a new urban studies teaching programme (M.Phil in Urban Studies – Southern Urbanism) to help build a new generation of urbanists who are able to deal with the challenges faced by cities in the global South.

Professor and Director:
E Pieterse, BA(Hons) *UWC* MA Development Studies *ISS* PhD *LSE*

Associate Professor and Deputy Director:
A Tucker, BA(Hons) MPhil PhD *Cambridge*

Research and Academic Staff:
J Battersby, BSc(Hons) *London* MA *Newcastle-upon-Tyne* DPhil *Oxford*
M Brown-Luthango, BSocSc(Hons) MSocSc *Cape Tow*n DPhil *Stellenbosch*
LR Cirolia, BA *UCBerkeley* MCRP *Cape Town*
S Croese, BA MA *Groningen* PhD *Stellenbosch*
J Duminy, BSc *Rhodes* MTRP *UKZN* MA *Leicester* PhD *CapeTown*
A Fortuin, BSc City Planning (Hons) MCRP *CapeTown*
NR Hassan, BA(Hons) MA *Stellenbosch*
G Haysom, MPhil *Stellenbosch* PhD *CapeTown*
B Knemeyer, BAFA(Hons) *CapeTown* MLA *Edinburgh*
N Marrengane, BA *Earlham* MA Clark *Atlanta*
N Ngwenya, BA(Hons) MPhil MCRP *CapeTown*
L Nkula-Wenz, Dipl (MA equivalent) DPhil *Münster*
S Oldfield, BA(Hons) MA *Syracuse* PhD *Minnesota*
A Pulker, BSocSci MCRP *CapeTown*
V Sadie, BTech(Hons) MTech *DUT*
R Sitas, BA *CapeTown* BA(Hons) *UKZN* MA *DUT* PhD *CapeTown*
C Skinner, BSocSci *CapeTown* MSc *Natal*
W Smit, BSc MCRP PhD *CapeTown*
A Tomás, BSc *Lisbon* MSc PhD Columbia
A Weimann, BSocSci(Hons) MSocSci *CapeTown*

Finance and Operations Manager:
I Najaar, BCom *UWC*

Administrative Officer:
M Joubert

Administrative Assistant:
M Waglay, BSocSc (Hons) *CapeTown*

Communications Officer:
A Viviers, BSc (Architecture) *Pretoria*

Applied Thermofluid Process Modelling Research Unit (ATProM)

Thermofluid process modelling applies the fundamental principles of fluid mechanics, thermodynamics and heat and mass transfer to model industrial processes. To accurately model such processes the governing equations of mass, energy and momentum conservation need to be solved for steady-state and transient operating modes in a computationally inexpensive manner. By having access to representative models engineers can:

• Analyse the operation and performance of individual components, sub-systems or complete integrated plants to improve the design and operation to meet changing consumer demands.
• Detect changes that might indicate impending equipment or process degradation, thereby enabling pro-active and preventative planned maintenance outages.

The ATProM Research Unit offers students the opportunity to do applied research on projects related to industry.

Professor and Director
PG Rousseau, PrEng BEng(Mech) MEng (Mech) PhD *Pretoria* OPM HBS

Associate Professor and Deputy Director
WF Fuls, BSc(Eng) MSc(Eng) PhD *NWU*

Associated Academic and Research Staff
AG Malan, PrEng BEng(Mech) MEng(Mech) PhD *Swansea*
HD Mouton, BSc(Eng) BSc BEng Hons MEng PhD *NWU*
ES Boje, PrEng BSc(Eng) MSc(Eng) PhD *Natal* SMSAIMC MIEEE
A Mishra, BE (*REC India*) PhD *Edinburgh* SMIEEE
R Laubscher BEng(Mech) MEng(Mech) PhD *Stellenbosch*
P Gosai BSc(Eng) MSc(Eng) UCT GDE(Mech) *Witwatersrand*

Administrative Officer
S Ferguson

Website:www.atprom.uct.ac.za

Blast Impact & Survivability Research Unit (BISRU Centre)

There is an ever-increasing potential for injuries and fatalities from extreme loading events such as explosions, transportation accidents and subsequent equipment failures. The objective of the research work during the past 25 years has been, and continues to be, to strive to reduce the risks of life-changing injuries and save lives by using the fundamental principles of science and engineering. This involves using experimental, analytical and computational tools and techniques to understand the mechanics and dynamics of extreme loading events and structural response. BISRU is located within the Department of Mechanical Engineering and has developed collaborative links with industry and academia at both national and international levels. The research work, though interlinked, is categorised into the following areas:

- Blast Characterisation
- Material Characterisation
- Novel Materials
- Structural Response & Scaling
- Buried explosions
- Energy Absorbers
- Human Response and Biomechanics
- High rate material characterisation

Professor and Director
GS Langdon, BEng PhD *Liverpool* MIMechE CEng

Associated Academic Staff
S Chung Kim Yuen, BSc(Eng) MSc PhD *Cape Town*
TJ Cloete, BIng *Stell* MIng *Stell*
RA Govender, BSc(Eng) MSc(Eng) PhD *Cape Town*
GN Nurick, PrEng MSc(Eng) *Natal* PhD *Cape Town* Hon FSAIMechE MASME FSAAE

*Website:*www.bisru.uct.ac.za

Catalysis Institute

The Catalysis Institute, proclaimed by the University Research Committee in 2016, concerns itself with catalytic technologies, principally for fuels and energy production, and is comprised of three centres, viz. the Centre for Catalysis Research (CatCentre), the DST – NRF Centre of Excellence in Catalysis (c*change) and the DST Hydrogen Catalysis Competence Centre (*HySA/Catalysis*) - see elsewhere for detailed entries concerning the associated centres.

The Institute's beginnings stem from a long history in heterogeneous catalysis within the Department of Chemical Engineering and dating back to 1980. Currently, the activities of some 30 staff and 30 – 45 postgraduate/postdoctoral researchers fall within the ambit of the Institute at UCT, ranging from theoretical computational studies, catalyst synthesis & characterisation, to device (reactor) and technology development across a range of applications from liquid transportation fuels and petrochemicals to hydrogen production and low temperature fuel cells.

It is governed by a Management Committee comprising the Directors and Deputy Directors of the associated Centres and enjoys the services of an extensive Advisory Board representing Academia, Government and Industry.

Professor and Director of the Institute:
JCQ Fletcher, BSc (Eng) Chem PhD *Cape Town* MACS FSAAE

Associated Academic & Research Staff
S Blair, PhD Materials Chemistry *Simon Fraser University (Canada)*
W Böhringer, DiplChem *Karlsruhe*
J Chamier, PhD(Chem), Stellenbosch University
M Claeys, Dipl.Ing Dr-Ing(Chem Eng) *Karlsruhe,* FRSC
N Fischer, Chem MSc(Eng) Chem PhD(Eng) *Cape Town*
N Hussain, BSc(Eng) Chem MSc (Eng) Chem *Cape Town* MSACIhE
P Kooyman, PhD(Eng), *TU-Delft*
P Levecque, MSc(Eng) Bio PhD *Leuven*
N Luchters, BSc(Eng) *Leiden* Chem MSc(Eng) *Cape Town*
R Mohamed, BSc(Eng), Chem MSc(Eng), Chem PhD(Eng) *Cape Town*

CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAIChE FSAAE FRSSAf
E van Steen, MSc(Eng) *Eindhoven* PhD *Karlsruhe FSAIChE FSAAE*

Technical & Scientific Staff
T Chivengwa, MSc Chem Eng(UCT) *Cape Town*
R Cupido, NDip(Analytical Chemistry), BTech(Chemistry), MTech(Chem) CPUT *Cape Town*
F Hendricks, NDip(Mech) BTech(Mech) CPUT *Cape Town*
P Johnston, BSc(UCT) *Cape Town*
G Kaufmann, PGDip(UCT-GSB), MTech Chem, BTech Chem CPUT, MSRM, EMT-B *Cape Town*
T Khoza, BSc(Eng) Chem MSc(Eng) Chem *Cape Town*
W Koorts, BTech Chem Eng, MTech Chemistry CPUT *Cape Town*
C Le Roux, NDip CPUT, BTech(Chem) Unisa *Cape Town*
S. Mbalo, NDip Chem Eng(CPUT) Cape Town

Postdoctoral Researchers
Mohamed I. Fadlalla, BSc(Hons), MSc and PhD (Heterogeneous catalysis) *UKZN, South Africa*.
JV Fletcher MSc(Applied Science) *Cape Town South Africa*, PhD(Chemical Engineering and Chemistry) *Eindhoven, Netherlands*
GM Leteba BSc(Hons) MSc(Materials Science) *Cape Town* PhD *Cape Town & Macquarie, Australia*
RK Marella, BSc ANU, India MSc(Medicinal Chemistry), SVU, *India* PhD(Heterogeneous Catalysis) CSIR-IICT, *India*
S Sayed BSc, BSc Honours MSc & PhD(Chemistry)

Honorary Professors
GJ Hutchings BSc(Chem)UCL PhD (Chem) UCL DSC (Heterogeneous Catalysis) London FIChemE FRS CBE
JW Niemantsverdriet, BSc(Phys+Math) *Amsterdam* MSc (Exp Phys) *Amsterdam* PhD *Delft*(TechSciences)

Management Staff
LK. Kallam, NDip Accounting & Computers Protea College, BCom (IS) Unisa *Cape Town*
SJ Roberts, BSc (Eng) Chem MSc(Eng) Chem *Cape Town*
RW Weber*,* BSc (Eng) Chem MSc(Eng) Chem PhD (Eng) MBA *Cape Town*

Finance & Administrative Officers
Y Amsterdam, Dip HR & Training Varsity College *Cape Town*
S Heugh, Dip Bookkeeping Institute of Certified bookkeepers *Cape Town*

Website: www.catcentre.uct.ac.za

Catalysis Institute: Centre for Catalysis Research (Cat Centre)

Industrial catalysis research was initiated in the Department of Chemical Engineering in 1980 and was formally recognised as a Research Unit (1990) and subsequently as a Research Centre (2005) by the University. Funding comes from a variety of sources including the University, the National Research Foundation (NRF), Technology & Human Resources for Industry Programme (THRIP), and several industrial sponsors. Industrial contract research from both domestic and international companies contributes substantially to the Centre's financial base.

The Centre concerns itself with both fundamental and industrial research and development in the general field of heterogeneous catalysis, encompassing all of catalyst synthesis, physico-chemical

characterisation and performance testing for industrially interesting chemical conversions. Although engaged in topics of international interest, the Centre has a strong commitment to addressing issues of direct importance to the South African Chemical Process Industry.

The main fields of investigation within the Centre cover Fischer-Tropsch synthesis, zeolites and molecular sieves, hydrocracking, phenolics conversion, and hydrogen and fuel cell technologies. The Centre offers a MSc (Eng) degree involving coursework, and research degrees at PhD level.

Deputy and Acting Director
SJ Roberts, BSc (Eng) Chem MSc (Eng) Chem *Cape Town*

Catalysis Institute: DST - NRF Centre of Excellence in Catalysis (c*change)

The DST-NRF Centre of Excellence in Catalysis (c*change), established in 2004 and hosted by the Centre for Catalysis Research in the Department of Chemical Engineering, has as its focus the field of catalysis and catalytic processing, and is to be seen as a large yet focused virtual research programme of a national scope and significance, with multi-disciplinary participants from ten higher education institutions. It is fundamentally about directed research themes conducted by national teams to support the nation's international competitiveness. In South Africa, the principal application of catalysts is within the chemical and petrochemical industries, where catalysis lies at the heart of 90% of all chemical transformation processes. With the manufacturing sector being the largest contributor to national GDP and with chemical manufacturing being the largest single contributor to the South African manufacturing sector, chemical processing and catalysis are recognized as a distinct field for targeted initiatives as emphasized in the National Research and Development Strategy.

Professor and Director
M Claeys, Dipl.Ing Dr-Ing (Chem Eng) *Karlsruhe,* FRSC

Catalysis Institute: DST Hydrogen Catalysis Competence Centre (HySA/ Catalysis)

The Centre for Catalysis Research, together with Mintek, hosts the Department of Science and Technology's (DST) Hydrogen Catalysis Competence Centre. This Centre, established in 2007, is one of three Competence Centres that develop hydrogen-based technologies as part of the National Flagship Project in Hydrogen and Fuel Cell Technologies. Platinum-group metals are key catalytic materials in hydrogen fuel cells and South Africa has the unique driver in that it possesses 75% of the world's platinum reserves. The strategic goal is for South Africa to supply 25% of the future global fuel-cell market with novel, locally developed and fabricated platinum-group metal catalysts and platinum-based fuel cell components by 2020, thereby diversifying the applications of the nation's platinum group metal resources.

Director
S Blair, PhD Materials Chemistry *Simon Fraser University (Canada)*

Centre for Bioprocess Engineering Research (CeBER)

CeBER was formally constituted as a Unit in 2001 and upgraded to a Centre in 2008 cementing a long history of bioprocess engineering research at UCT. CeBER aims to underpin the growth and exploitation of the biotechnology, chemical and minerals sectors in South Africa through a national centre of expertise in bioprocess engineering. As such, the Centre has the following objectives:

☐	the education of engineers and scientists to the postgraduate level with key expertise to excel in careers in the bioprocess arena, both in research and in industry,
☐	the provision of research expertise in key aspects of bioprocess engineering relevant to South Africa through contract research,

☐	the contribution to fundamental insights in bioprocess engineering and related processes, and
☐	the transfer and application of knowledge across disciplines in which bioprocesses play a role, contributing to the South African bioeconomy and process industries.

CeBER maintains a productive balance between research centred on the application of biological principles through process development, on the fundamental understanding of biological processes at the mechanistic level, and on the interaction of these processes with their environment. Our key foci include biohydrometallurgy for the extraction of metals in tank and heap bioleaching processes; ARD prevention and remediation of metal rich effluents; production of fine chemicals through bacterial and fungal processes; algal biotechnology for bioenergy products, commodities and fine chemicals; biotransformation for value addition; biorefineries, including the wastewater biorefinery, product liberation and recovery; bioprocess integration and optimisation through modelling; and design and development of bioprocesses for environmental sustainability. In addressing these research areas, the Centre brings together key skills in chemical engineering science, mathematical modelling, hydrometallurgy, environmental engineering, biochemistry, microbiology and molecular biology. CeBER hosts the DST/NRF SARChI Research Chair in Bioprocess Engineering.

Professor and Director
STL Harrison, BSc(Hons) *Cape Town* PhD *Cantab* MSAIChE FSAMM SASM FSAAE ASSAf

Associated Academic and Research Staff
MA Fagan-Endres, BSc(Eng)Chem *Cape Town* PhD *Cambridge*
E Govender-Opitz, BSc(Eng)Chem PhD *Cape Town*
R Huddy, BSc(Hons) PhD *Cape Town*
A Kotsiopoulous, BSc(Eng)Chem MSc(Eng)Chem PhD *Cape Town*
M Smart, BSc(Hons) MSc *Stellenbosch* PhD *Cape Town*
S Tai, BSc(Hons) *UMIST* MSc(Biochemical Engineering) PhD(Industrial Microbiology) *TU Delft*

Technical Staff
TM Golela, NDip BTech *Cape Peninsula*
E Ngoma, BTech *TUT* MTech *CPUT*
S Rumjeet, BSc(Eng)Chem MSc(Eng)Chem *Cape Town*
S Rademeyer, NDip BTech(Chem Eng) *CPUT*
T Samkanga, NITC NTC NHD *Harare Polytechnic* MBA *Rhodes*

Postdoctoral Researchers
JR Amaral Filho, BSc(Eng) Environmental PhD *Rio Grande do Sul – Brazil*

Research Associates
C Bryan, BSc(Hons) *Nottingham* PhD *Bangor*
MJ Griffiths, BSc(Hons) *Cape Town* MPhil *Cambridge* PhD *Cape Town*
RP van Hille, BSc(Hons) PhD *Rhodes*

Administrative Staff
R Ederies, Dip(Bookkeeping) *Damelin* HR Cert *CPUT*
SH Jobson, BA *Rhodes* HDE *Cape Town*
CH Lowin, BA(Print Journalism) *Cape Town*
LD Mostert, BSc(Eng)Chem *Cape Town* MTh *Stellenbosch*

Website: www.ceber.uct.ac.za Instagram: ceber_uct Facebook: CeBER UCT

Centre for Materials Engineering (CME)

The Centre has the objectives of educating and training students in the techniques and fundamentals in the broad field of Materials Engineering. We are concerned with the physical, chemical, electrical and mechanical properties of ceramic, polymeric, metallic and composite materials. The Centre is supported by the NRF, DST and materials processing, producing, manufacturing and user industries and undertakes extensive research programmes, which prepare candidates for the degrees of MSc(Eng) in Materials Engineering and PhD. Of particular significance is the BSc(Hons) in Materials Science that is specifically designed for graduates with degrees in Physics, Chemistry or Geology and related sciences. We promote quality research by maintaining international liaisons and publication in reputable journals. The Centre also aims to support and assist both large and developing industries through research projects, practical solutions and human resource development.

Professor and Director
RD Knutsen, BSc PhD *Cape Town*

Associated Academic Staff
SL George, BSc(Eng) MSc(Eng) PhD *Cape Town*
CD Woolard, BSc(Hons) PhD *Cape Town* MSc *London*

Visiting Lecturers
T Becker, BSc(Eng) MSc(Eng) PhD *Cape Town*
M Topic, BSc *Belgrade* PhD *Cape Town*
T Rampai, BSc(Hons) *Cape Town* MSc *Wits*
P Evans, BA(Nat Sci) *Cambridge* PhD *Cambridge*
RA Ricks, BSc(Hons) *Leeds* PhD *Cambridge*

Emeritus Professor
RB Tait, PrEng BSc(Hons) *Rhodes* MA *Oxon* BSc(Eng) PhD *Cape Town* MSAIMechE

Senior Technical Officer
P Louw, BSc(Hons) *Cape Town*

Scientific Officer
S von Willingh, BSc(Hons) MSc(Eng) *Cape Town*

Senior Research Officer
RJ Curry, BSc(Eng) MSc(Eng) PhD(Eng) *Cape Town*

Website: www.mateng.uct.ac.za

Centre for Minerals Research (CMR)

The Centre for Minerals Research at the University of Cape Town is a multi-disciplinary, inter-departmental research centre based in the Department of Chemical Engineering with close associate activities in Mechanical Engineering; geology and physics. The main focus of research is on the processes of froth flotation and comminution, arguably two of the most important unit operations in mineral beneficiation. Research is conducted through industrial, laboratory and computational studies. The Centre enjoys extensive support from local and international mining companies as well as statutory funding agencies. The Centre has an excellent reputation in its field and has strong links with a number of international research institutes. The Centre is a research partner in a highly successful collaborative venture with the Julius Kruttschnitt Mineral Research Centre, University of Queensland.

Professor and Director:
DA Deglon, BSc(Eng) *Wits* MBA PhD *Cape Town* MSAIMM

Associated Academic and Research Staff:
L Bbosa, BSc(Hons) MSc PhD *Cape Town* MSAIMM
M Becker, BSc(Hons) MSc *Cape Town* PhD *Pretoria* MSAIMM FGSSA
P Bepswa, BSc(Eng)UZ PhD *Cape Town*
K Corin, BSc(Hons) PhD *Cape Town* MSAIMM
MC Harris,BSc(Hons) MSc(Eng) *Cape Town*
A Mainza, BSc(Eng) *UNZA* PhD *Cape Town*
B McFadzean, BSc PhD *NMMU*
CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM
FSAIChE FSAAE FRSSAf
A van der Westhuizen, BIng *Stell* MSc(Eng) *Cape Town* MSAIMM
J Waters, BTech(Chem Eng) *Cape Technikon* MSc *Cape Town*MSAIMM

Honorary Professor:
I Govender, BSc *UDW* HDE *UNISA* BSc(Hons) PhD *Cape Town*

Honorary Adjunct Professors:
S Lambert, BSc(Eng) BSc(Hons) *Strathclyde*
J Mann, BSc(Eng) *Wits* MBL *UNISA*

Administrative Staff:
H Sundström PGDip BA *Cape Town*
N Davies
C Pomario

Centre for Research in Computational & Applied Mechanics (CERECAM)

The Centre for Research in Computational and Applied Mechanics (CERECAM) is a multi-faculty and inter-disciplinary research grouping which concerns itself with basic and applied research and postgraduate education in computational and applied mechanics. Its members are drawn from chemical, civil, mechanical engineering, applied mathematics, and health sciences. Research in the area of solid and structural mechanics focuses on modelling and simulation of inelastic material behaviour and of various structural systems, fracture mechanics and fatigue, while work in computational fluid and particulate dynamics includes activities in industrial aerodynamics, simulations of flotation and precipitation processes, milling and comminution processes, and various aspects of non-Newtonian flows. Work in biomechanics straddles the two broad areas of solid and fluid mechanics, with a focus on cardiovascular mechanics.

Professor and Director
BD Reddy, OMB BSc(Eng) *Cape Town* PhD *Cantab* MASSAf FRSSAf FSAAE **M**Akad**SA**

Members
T Chinyoka, MSc *Zimbabwe* PhD *Virginia Tech*
F Ebobisse Bille, BSc(Hons) *Yaounde' l Cameroon* PhD *Pisa*
EB Ismail, BSc(Eng) MSc(Eng) *Cape Town*
S Skatulla, Dipl Ing *Karlsruhe* PhD *Adelaide*
A Mainza, BSc(Eng)Chem *UNZA* PhD *Cape Town*

Associate members
TJ Cloete, MIng *Stell*
DA Deglon, BSc(Eng) *Wits* MBA PhD *Cape Town* MSAIMM

M Ngoepe, BSc(Eng) *Cape Town* PhD *Oxon*

Research Officer
Vacant

Administrative Assistant
N Bent

Website:www.cerecam.uct.ac.za

Centre for Research in Engineering Education (CREE)

CREE is an interdisciplinary research centre established to promote engineering education. The work of the CREE community focuses on establishing and promoting engineering education research to improve teaching and learning and further our understanding of the educational environment more broadly. This work has strong links with the fields of academic development and higher education studies, as well as being influenced by other discipline-based education research areas such as physics and mathematics education. As such, the CREE community values an interdisciplinary approach, and seeks to develop theoretically-informed and research-based ways of understanding the education process and the tertiary learning environment. Given our location in South Africa, we have a particular interest in student success in relation to issues of race, gender and disadvantage. We are actively involved in building the capacity of academic staff at UCT and at other universities in South Africa to meaningfully engage in engineering education research and its application in teaching contexts. We are also involved in co-operation between various national and international bodies involved in supporting engineering education in order to move the field of engineering education forward as it continues to grow. CREE offers post graduate qualifications specializing in engineering education including a structured PhD programme.

Director
N Wolmarans, PhD *Cape Town*

Administrative Staff
TBC

Centre for Transport Studies (CfTS)

The Centre for Transport Studies is a multidisciplinary research and postgraduate teaching body. The Centre's primary aim is to develop into an internationally recognised research and teaching body that produces relevant research, develops skilled professionals, and advocates innovative practices and institutional arrangements for the management of complex transport systems in the dynamic cities of South Africa and other African countries.

The purpose of the Centre is to stimulate debate and undertake research that focuses on the equity, sustainability and efficiency problems associated with urban passenger transport systems in South African cities, and on the development of practices and skills that are consistent with the goals and objectives of contemporary and progressive policies. The Centre's priorities in curriculum development, and in undertaking research, are to contribute to the equitable, efficient and safe accommodation of the travel needs of poorer households within urban passenger transport systems, and to the promotion of more efficient and sustainable travel behaviour patterns and transport system operations.

Associate Professor and Director
R Behrens, Pr Pln BA MCRP PhD *Cape Town*

Associated Academic Staff
M Vanderschuren, BSc(Eng) *Tilburg* MSc(Eng) *Delft* PhD *Enschede* MSAICE MITSSA MIMESA
M Zuidgeest, MSc PhD *Twente*

Research Officer
H Schalekamp, BAS BArch MPhil PhD *Cape Town*

Website:www.cfts.uct.ac.za

Concrete Materials and Structural Integrity Research Unit (CoMSIRU)

The Concrete Materials and Structural Integrity Research Unit (CoMSIRU) became an accredited UCT Research Unit in 2010. The unit's research is focused on quality, durability and sustainability of concrete construction, structural health monitoring, structural integrity assessment, and repair and rehabilitation strategies for concrete structures. The guiding principle for CoMSIRU is developing high-level manpower for industry, research and academia, while engaging in innovative and impactful research. The unit maintains healthy and active links with industry through an advisory board, involvement in professional bodies and continuing professional development courses, as well as postgraduate training. CoMSIRU's well-established international links provide opportunities for collaborative research and benchmarking, which enables the research unit to continuously evolve and strengthen its niche research focus. The Research Programme is closely integrated with the postgraduate teaching programmes in Civil Infrastructure Management and Maintenance and Structural Engineering and Materials in the Department of Civil Engineering.

Professor and Director
P Moyo, Pr Eng BSc(Eng) *Zimbabwe* MSc(Eng) *Newcastle-upon-Tyne* PhD *Nanyang* FSAAE MISAICE MIABSE MISHMII

Professor and Co-Director
H Beushausen, Dipl-Ing HAW *Hamburg* MSc(Eng) PhD *Cape Town*

Emeritus Professor & Senior Research Scholar
MG Alexander, PrEng BSc(Eng) MSc(Eng) PhD *Witwatersrand* FSAICE FSAAE, MASSAf MICT

Honorary Research Associates
V Collis, PrEng PrArch BSc(Eng) *Cape Town*
M Santhanam, BTech *IIT Madras* MS PhD Purdue

Administrative Staff
A Sulo

Laboratory assistant
L Adams

Crystallisation and Precipitation Research Unit (CPU)

Although industrial applications of precipitation have a long history and precipitation has been studied scientifically since the 1930s, understanding of these processes is still very limited. Industrially, precipitation reactions are generally carried out in very simple reactor systems. Probably over 90% of industrial precipitation processes are carried out in ordinary stirred tank reactors operated in a batch-wise mode. Major problems, however, often occur in control of precipitation processes, specifically in understanding the effect of processing conditions on reactor performance and product characteristics such as precipitate morphology, purity and particle size distribution. Consequently, there is a need to develop a deeper scientific understanding of precipitation processes that are currently based on empirical knowledge. The specific objective of

furthering this scientific understanding is in order to be able to optimise and control precipitation processes in extractive metallurgical processes as well as in treatment of effluent streams.

The Crystallisation and Precipitation Research Unit has national recognition as the only facility in the country for concerted research in the area of precipitation and crystallisation. In addition, the particular research thrust is unique internationally. Industrial support for the programme is on-going, as seen by active funding for and interest in research projects. Presentation of Continuing Professional Development courses to industry; such as the Industrial Crystallisation course (in collaboration with Prof GM van Rosmalen of TU Delft) and specific courses given to industrial partners are an on-going activity.

Professor and Director
AE Lewis, PrEng BSc(Eng)Chem MSc(Eng) PhD *Cape Town* FSAIChE FSAIMM MASSAf
    FSAAE FIChemE

Associated Academic and Technical Staff
J Chivavava, BEng(Chem) *NUST* MSc(Chem) *Cape Town* AMIChemE
HR Heydenrych, BSc(Eng) Chem MSc(Eng) *Cape Town*
N Mukombe BEng(Chem) *NUST*

Administrative Staff
Zaeem Najaar

Website: www.crystal.uct.ac.za

Energy Research Centre (ERC)

The ERC is a multi-disciplinary Centre that conducts high quality, targeted and relevant research as well as offering postgraduate opportunities at the Master's and PhD levels. Two Master's programmes are convened by the Centre, an MSc in Sustainable Energy Engineering and an MPhil in Energy and Development Studies with a focus on policy. The energy policy stream accepts students from a wide range of graduate programmes, while the energy technology stream focuses more on engineering graduates. These two streams comprise a coursework component and a dissertation component.

Students have the option of registering for a Masters by dissertation only. This route opens opportunities for students who are unable to relocate to Cape Townand who have a good energy background.

Energy & Climate Change Group Leader
H Winkler, MSc *Berkeley* MA PhD *Cape Town*
B Rennkamp, Diplom Regional Sciences Latin America *Cologne* PhD *Twente*

Energy, Poverty and Development Group Leader:
J de Groot, BSc(Int Dev) *Wageningen* MA(Cult Anthropology) *Leiden* MSc(Dev Studies) *Wageningen*

Energy Efficiency Group Leader
M Moorlach, MSc *Eindhoven*

Energy Modelling Group Leader
AG Hughes, BIng *Stell* MSc(Eng) *Cape Town*
B Merven, MSc(Eng) MSc(FinMaths) *Cape Town*

Renewable Energy Group Leader
A Madlopha, BSc MSc *Malawi* PhD *Strathclyde*

Research Staff
S Keen, BSc MPhil *Cape Town*
F Ahjum, MSc(Eng) *Cape Town*
B Batidzirai, BSc(Eng)Elec *UZ* MSc (Energy) PhD *Utrecht*
R Larmour, BSc(Eng) *Cape Town*
A Marquard, BA *Cape Town* BA(Hons) MA *Rhodes* PhD *Cape Town*
B McCall, MSc(Eng) *Cape Town*
M Moorlach, MSc *Eindhoven*
A Moyo, MSc in Applied Economics *Cape Town*
D Sparks, MSc PhD *Cape Town*
A Stewart, MSc(Eng) *Cape Town*
HL Trollip, BSc(Elec Eng) *Wits* MSc (Elec Eng) *Wits*

Operations Manager
L Hassan

Administrator, Postgraduate & Human Resources
F Harribi

Assistant Administrator
B Matubatuba

Publications & Media Staff
T James, BA *Wits* BA(Hons) *Cape Town* MA *Essex* PhD *Cape Town*
M Roberts, MSc (Eng) PhD *Wits*

Website: www.erc.uct.ac.za

Future Water Research Institute

Future Water was established in 2016 as a transdisciplinary research institute at UCT, with the main aim of providing the intellectual framework and knowledge base to address issues of water scarcity and to underpin improved quality of life and sustainable development in South Africa. Future Water seeks to integrate technical, environmental and socio-economic aspects of water management through the adoption of inter- and trans-disciplinary (IDTD) approaches and scholarship as well as multi-stakeholder and/or user perspectives. It is hosted in the EBE faculty but includes discipline specialists as well as generalists from nine departments across six faculties, such that research is based within an over-arching systems framework supported by strong sociological, technical and environmental expertise. The research programme comprises environmental (protection of natural water resources), industrial (technical options and uses of water, water as part of the process, water as a waste resource), economic (cost benefits and viability) and people-focused (addressing social-cultural and institutional challenges and resistance) aspects of water management and includes a clear focus on the interactions between all of these. Future Water understands the need for strong collaboration in grappling with complex issues, in partnership with government at all levels, industry, communities, and other academic partners both locally and internationally.

Professor and Director
STL Harrison, BSc *Cape Town* PhD *Cambridge* FIWA FWISA FSAIChE FSAIMM FSAAE

Professor and Deputy Director
NP Armitage, PrEng BSc(Eng) *Natal* MSc(Eng) *CapeTown* PhD *Stell* FSAAE FSAICE FWISA FSAIMunE Fellow IWA Mem IAHR Mem IAHS

Key Academic Staff
J Broadhurst, BSc MSc *Port Elizabeth* PhD *Cape Town* MIMWA SACNASP
K Carden, BSc MSc PhD Cape Town FWISA
H Chitonge, BA *Zimbabwe* MA PhD *Natal*
T Sanya, BArch *Makerere* MPlan *Stuttgart* PhD *Oslo*
A Spiegel, BA MA PhD *Cape Town* MIUAES MASA
K Winter, BA HDE *Cape Town* MA *London* PhD *Cape Town*

Key Research Staff and Postdoctoral Fellows
A Abrams, BA *Columbia* MPhil *Cape Town*
G Owen, BSc *Buea* MSc *Western Cape* PhD *Western Cape*
C Selela, BSc MSc *Western Cape* PhD *Pretoria*
B Verster, BSc *Pretoria* MRes *York*
J Fell, BSc MSc *Cape Town*

Finance Manager
S Jobson

Administrative Officer
G Verster

Minerals to Metals

The Minerals to Metals Signature Theme (MtM) was established in 2007 to integrate existing capacity in minerals beneficiation research in the Department of Chemical Engineering, and address the challenges facing the minerals industry in an integrated, comprehensive and holistic manner. Technology choices are developed and evaluated not only in terms of the conventional economic returns, but also with regard to their impact on the natural and human environments, which allows stakeholders to make more holistically informed decisions. Thus solutions are developed that focus on enhanced value addition and resource productivity through the conversion of minerals to metals in a manner congruent with providing a sustainable future for African people and their environment. This is achieved through three inter-connected activity areas, viz., research, education and engagement, which are aligned with UCT's mission 'to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society'. The United Nations' Global Sustainable Development Goals (SDGs), accepted in September 2015 provide the structure by which to understand, frame and address these challenges. MtM is participating in the international effort being led by the Sustainable Development Solutions Network (SDSN) and the World Economic Forum (WEF) focused on operationalising the SDGs in the mining sector. The Master of Philosophy program specialising in Sustainable Mineral Resource Development, inaugurated in 2014, was established as part of the Education for Sustainable Development in Africa project of the United Nations University Institute for Sustainability and Peace. The programme is delivered jointly with the University of Zambia and includes courses at the UCT Graduate School of Business and the Sustainability Institute at the University of Stellenbosch. Strong collaborative partnerships exist within UCT, particularly with Mineral Law in Africa, the Development Policy Research Unit, Future Water and others, with other universities, organisations and institutions in South Africa, Africa and globally.

Professor and Interim Director
J Petersen, BSc(Eng) *Wits* PhD *Cape Town* MSAIMM

Associated Academic Staff
M Becker, BSc(Hons) MSc Geology *Cape Town* PhD *Pret*
JL Broadhurst, BSc(Hons) MSc *Port Elizabeth* PhD *Cape Town*
DA Deglon, BSc(Eng) *Wits* MBA PhD *Cape Town* MSAIMM

J-P Franzidis, BSc(Eng) MSc(Eng) *Cape Town* PhD *Open* MSAIChE MSAIMM
STL Harrison, BSc(Hons) *Cape Town* PhD *Cantab* MSAIChE SASM FSAIMM FSAAE ASSAf FWISA
AE Lewis, PrEng BSc(Eng)Chem MSc(Eng) PhD *Cape Town* FSAIChE FSAIMM MASSA fFSAAE
A Mainza, BSc(Eng) UNZA PhD *Cape Town*
HB von Blottnitz, BSc(Eng)Chem *Cape Town* BSc(Hons) *UNISA* MSc(Eng) *Cape Town* Dr.-Ing. *RWTHAachen* MSAIChE

Finance and Administrative Officer
E Jacobs

UCT-Nedbank Urban Real Estate Research Unit (URERU)

The research unit was approved by the UCT Council in June 2015 under the directorship of Associate Professor Francois Viruly. The research unit is managed by an advisory board which includes academics and property professionals. The aim of the unit is to provide an inter-disciplinary platform that promotes the identification of issues and seeks solutions to Urban Real estate investment, Finance, Economics and management problems in Africa. It offers an opportunity to initiate a unique research alliance in the built environment between UCT, universities across the continent, as well as Industry and society at large. It also provides an opportunity to further define and enhance the existing research thrusts of the department of Construction Economics & Management.

URERU is driven by four broad thrusts:
- Urban Real Estate markets dynamics and Trends
- Urban Real Estate Investment and Finance,
- Urban Real Estate land economics and management
- African Urban Real estate markets

URERU promotes academic research and disseminates research and data to the private and public sectors based on a research agenda for the period 2015-2020.

The primary source of funding of the research unit is Nedbank Corporate Property Finance who have committed to the amount of R1 million per year for four years. The intention of the unit is to raise further funding from a variety of sources. These are likely to include:
- Private sector funding
- Public sector funding
- Professional bodies (RICS)
- International bodies

Associate Professor and Director
F Viruly, BA(Hons) *Witwatersrand* MA(Dev Econ) *Kent* FRICS

Associated Academic and Research staff
KA Michell, BSc(QS) MPhil *Cape Town* PhD *Salford* PrQS PMAQS MRICS MSAFMA
RPT McGaffin, BSocSc *Cape Town* MCRP *Cape Town* MPhil *Cantab*
MM Mooya, BSc(Land Economy) *Copperbelt* MPhil(Land Economy) *Cantab* PhD(Real Estate) *Pret*
LD Boyle BSc(QS) *Cape Town* MPhil (Urban Sustainability) *Cape Town*

Other entities
Continuing Professional Development

Co-ordinator
H Tait, BHE *Stell*

Administrator
S Jemaar

The CPD programme offers short courses, workshops and conferences. These provide a means for the on-going education of engineers and other technical staff, outside of the formal academic courses offered at UCT for degree purposes. Engineering education is considered to include all subjects which will benefit engineers and technical staff in their professional and vocational activities, and this covers a wide field. Generally there are no formal academic qualification entrance requirements to CPD courses. In some cases, some prerequisite knowledge may be required. A certificate of attendance or of successful completion (where an examination is passed) is normally issued. Some courses may be undertaken outside of working hours, while others may require attendance for a number of days on a full time basis. Courses may also be run on an in-house basis for companies, if requested.

In terms of the agreements between the Engineering Council of South Africa (ECSA) and other international engineering bodies, South African registered professionals are obliged to keep abreast of developments and knowledge in their fields of expertise in order to maintain and demonstrate their competence. All ECSA registered persons are required to undertake and record CPD activities as a prerequisite to renewal of their professional registration. Most of the courses offered by the CPD Programme are registered with ECSA for CPD points.

Website: www.cpd.uct.ac.za

Geographical Information Systems Unit

Administrators
N Lindenberg, BSc(Hons) *Cape Town*
T Slingsby, MSc(Eng) *Cape Town*

The UCT GIS Laboratory acts as a consulting and resource centre for Geographic Information Systems researchers and postgraduate students. We administer the ESRI site license for Campus, act as a central data warehouse, offer support for GIS-related queries and provide a consulting service for project planning, course design and lecturing. The Lab also offers a small computing facility with PC's equipped with the latest ESRI software, an A0 digitizer, and a number of hand-held GPS receivers for field data collection.

 Website: www.gis.uct.ac.za

Professional Communication Studies

Associate Professor and Convener
J English, BA MPhil *Cape Town* PhD *Glasgow Caledonian*

Professional Communication Studies (PCS) courses aim to equip students with essential theory and skills in the areas of oral, written and interpersonal communication, as recommended by professional bodies such as ECSA, (SA)IMechE and IEEE.

Outcomes of the courses are knowledge and ability in:

- research methods using libraries, academic sources, Internet; referencing and citation; professional ethics; reports; executive summaries to company and public readership;
- business proposals; letters of application and detailed CVs; posters; presentation skills;
- visual literacy and graphics.

Website: www.pcs.uct.ac.za

SCHOLARSHIPS, PRIZES, CLASS MEDALS AND DEAN'S MERIT LIST

Scholarships/Awards

Details of scholarships and awards available are given in the Financial Assistance for Postgraduate Studies and Financial Assistance for Undergraduate Studies Handbooks available from the Registrar. The following is a selected list of scholarships and awards. Note that the scholarships on offer and the values are subject to change without notice.

Architecture, Planning and Geomatics

Architecture and Planning

Hugh and Win Walker Scholarships: Awarded with preference for degrees in Architecture and, thereafter, Planning undertaken at UCT. Applications to the Postgraduate Scholarships Office/Undergraduate Funding Office.

National Development Fund for the Building Industry Postgraduate Scholarship: Applications to the Director, National Development fund for the Building Industry, Box 1619, Halfway House, 1685, by 2 January.

Geomatics

Twamley Undergraduate Scholarship: Awarded on the basis of the most outstanding academic performance at the end of the First Year of study, provided that the nominee shall have met the requirements for inclusion in the Dean's Merit List.

Twamley Postgraduate Scholarship: Awarded on the recommendation of the Chair of Surveying on the basis of academic achievement and other appropriate experience for postgraduate study in Geomatics.

Construction Economics and Management

Association of Construction Project Management (ACPM) Scholarship: R2500 for a South African holder of UCT's Department of Construction Economics & Management's BSc Hons in Quantity Surveying or BSc Hons in Construction Management degree at UCT who meets the entrance requirements for the MSc(Project Management) programme and has financial need. Applications to the Admin Officer, Need-based Bursaries, Post-graduate Funding Office, Otto Beit building, Upper Campus, UCT. ACPM must be kept appropriately informed. (This is not a prize but an award to a worthy student in need on financial aid and must, therefore, be administered by UCT's Funding Office.)

Construction Education Sector Training Authority (CETA) Bursaries: Awarded to students entering full-time postgraduate studies. Applications to be submitted by 31 August to CETA, PO Box 644, Bedfordview 2008.

JT Ross (Pty) Ltd scholarships: Three awards of R20 000 towards the tuition fees for the BSc Honours in Property Studies : these will be awarded to three of the best students in the final year of the BSc Property Studies degree. These awards are for obtaining a cumulative GPA above 70% and will be awarded to previously disadvantaged students who are in financial need. On completion of their studies they will be required to do an internship/work experience with JT Ross.

National Research Foundation: Awarded on merit for Honours, full/part-time Master's and Doctoral Study. Applications to be submitted to the Postgraduate Scholarships Office by 15 August for Honours and 31 December for Master's study and 30 April for Doctoral study.

National Research Foundation: NRF Prestigious Awards: Awarded on merit for full-time registered Master's or Doctoral Studies. Applications to be submitted by 30 June (internal) or 31 July (agency).
NRF Grantholder Bursaries: Applications to be submitted by 28 February (internal) or 31 March (agency).

Tobie Louw Bursary - BSc(Hons)(QS) Students: Awarded for Postgraduate study in Quantity Surveying. Applications to be submitted to the Prizes and Awards Committee, Association of South African Quantity Surveyors, PO Box 3527, Halfway House, 1685 by, 31 January

Quantity Surveyor's Research Award - BSc(Hons)(QS) Students: Prestige award for research work into technical and managerial problems in the building industry. Applications to be submitted to the Prizes and Awards Committee, Association of South African Quantity Surveyors, PO Box 3527, Halfway House, 1685, by 15 June.

Queen Elizabeth II Jubilee Fund Scholarship: Awarded to Bachelor's and taught Master's students who are members of the CIOB. Applications to be submitted to the Scholarship Secretary, Professional and Technical Directorate, CIOB, Englemere, Kings Ride, Ascot, Berkshire, SL5 7TB, England.

Engineering

General
Council Postgraduate Scholarship): Awarded on the results of the examinations for the degree of BSc(Eng) or BSc(Geomatics), based on honours points. Candidates should have obtained First Class Honours and intend to continue with the study of engineering or geomatics.

E D Steytler Memorial Scholarship (Undergraduate): Awarded to the student obtaining the highest weighted average in the First Year examinations.

Klaus-Jürgen Bathe Scholarships: Awarded to students in the final 2 years of study who show evidence of high intellectual power and commitment to the achievement of excellence in the field of Engineering.

Twamley Undergraduate Scholarship: Awarded on the basis of the most outstanding academic performance at the end of the First Year of study.

Civil Engineering
Christopher Robertson Scholarship (Undergraduate): Awarded to the student in Civil Engineering who has made the most progress in the Third Year of studies. (Where there is a choice between candidates of equal merit, preference is for those with fewer scholarships and to whom the value of the award would be advantageous).

Chris van Breda Scholarship (Postgraduate): Awarded on final examination results for the BSc(Eng) Civil degree. The candidate should have obtained Honours and intend to undertake further study.

Ninham Shand Scholarship (Postgraduate): Awarded on examination results for the BSc(Eng) Civil degree. The candidate should have obtained Honours and intend to undertake further study.

Mechanical Engineering

Duncan McMillan Scholarship (Undergraduate): Awarded annually to the First Year Mechanical Engineering student gaining the highest weighted average, subject to the holder maintaining satisfactory progress and conduct.

Class Medals

Architecture, Planning and Geomatics

Class medals may be awarded to students who have shown special ability in the course. They are only awarded where special merit should be recognised. Only one medal may be awarded in a course. Any student who repeats a course will be ineligible for a medal in that course. Class medals may be awarded in the following courses:

APG1016F	Geomatics
APG2039W	Design and Theory Studio II
APG3037W	Design and Theory Studio III

Construction Economics and Management and Engineering

Class medals may be awarded to the best students in each of the following first year core courses: CHE1005W, CIV1005W, CON1004W, CON1011F, CON1012S, CON1018W, CON1019F/S, EEE1006F, EEE1007S, MEC1002W and MEC1005W.

Class medals are also awarded to each of the second, third and (where applicable) fourth years of study to students with the best weighted average in core, core-elective, elective and optional courses in the following programmes:

	Chemical Engineering
	Civil Engineering
	Construction Management
	Construction Studies
	Electrical Engineering
	Electrical and Computer Engineering
	Mechanical & Mechatronic Engineering
	Geomatics
	Materials Science
	Mechanical Engineering
	Mechatronics
	Property Studies
	Quantity Surveying

Prizes

The following prizes may be awarded at the discretion of the Faculty. The prize offerings and values are subject to change without notice.

General

David Haddon Prize: R300 for the purchase of books for the best Architecture or Quantity Surveying student in the subject Professional Practice (APG4044S or CON4034W).

Joseph Arenow Prizes: (two x R3000) (i) for the best Master's dissertation in the Faculty of Engineering & the Built Environment (ii) for the best PhD thesis in the Faculty of Engineering & the Built Environment.

Architecture, Planning and Geomatics

Aluminium Federation of South Africa Award: R1000 for the best project in the final year of BAS or BAS(Hons) entailing the use of aluminium.

ArcelorMittal South Africa Prize: R1000 for the best innovative design using ArcelorMittal South Africa Steel Products.

Cape Institute for Architecture Measured Drawing Prize: R500 for Measured Drawings of old works in the Cape Province.
Cape Institute for Architecture Prize: R750 for the best student graduating in the MArch(Prof) programme.

Cape Institute for Architecture Prize: R2000 for the best student in Design and Theory Studio II.

Cape Institute for Architecture Prize: R2000 for the best student in Design and Theory Studio III.

Cape Institute for Architecture Prize: R2000 for the best student graduating in the postgraduate Architecture degree programmes.

The Carl Borckenhagen Memorial Prize: R3000 to be awarded to the best student over the two years of study in the MCRP programme.

Clay Brick Association Prize: R250 for the purchase of books to the student of Architecture who has made best use of bricks in his or her design work.

Corobrik Prize: R500 for the best project entailing the innovative use of clay bricks from work done in 2nd year.

Corobrik Prize: R500 for the best project entailing the innovative use of clay bricks from work done in 3rd year.

CNdV Landscape Architects' Prize: R500 for the best student in Landscape Construction in the second year of the Master of Landscape Architecture programme.

CNdV Landscape Architects' Prize: R500 for the best student in History and Theory of Landscape Architecture across first and second year in the Master of Landscape Architecture programme.

Essay Prize: R300 awarded to the BAS(Hons) student who produces the best essay.

General JBM Hertzog Prize: R1250 awarded annually to the best final year student in the MArch(Prof) programme.

George Menzies Prize: R2000 awarded on the results of the final examinations to the best student in Geomatics.

Helen Gardner Travel Prize: Two prizes of R20 000 each awarded by UCT to students who have completed the third year of the BAS degree but who have not yet been admitted to the BAS(Hons) degree. Applications to the Director, School of Architecture and Planning.

Holm Jordaan Architects & Urban Designers: R500 gift voucher for a Project of Merit that deals with sustainability and/or environmental issues in BAS.

Holm Jordaan Architects & Urban Designers: R500 gift voucher for a Project of Merit that deals with sustainability and/or environmental issues in BAS(Hons).

Institute of Landscape Architects of South Africa Prize: R300 book prize for the best Landscape Design Studio Portfolio in the first year of the Master of Landscape Architecture Programme.

Institute of Landscape Architects of South Africa Prize: R500 and certificate for the best student in the second year in the Master of Landscape Architecture Programme.

Institute of Landscape Architects of South Africa Prize: R300 book prize for the best Landscape Architecture dissertation in the second year of the Master of Landscape Architecture Programme.

Ivor Prinsloo Prize: R450 for the best essay in Architectural Theory in the BAS(Hons) programme.

Ivor West Memorial Prize: R4000 for the best second or third year Geomatics student.

John Perry Prize: R2000 for the best work done in the third year of study of the BAS degree.

Lisa Blane Memorial Prize: R1000 for the best student in the Technology II course.

Lisa Blane Memorial Prize: R1000 for the most improved student in the Technology II course.

Lisa Blane Memorial Prize: R2000 for the best student in the Technology III course.

Lisa Blane Memorial Prize: R2000 for the student who displays the most innovative use of technology in 3rd year.

Molly Gohl Memorial Prize: R3000 for books or instruments to the best woman student completing the third year of study of the BAS degree.

New World Associates Prize: R300 voucher for the student with the best use of plants in Landscape Design.

OVP Associates Prize: R500 book voucher and certificate for the best student in first year in the Master of Landscape Architecture programme.

Patrick McAuslan Prize: R1000 prize to the best student in the Regulatory & Legal Framework course in the Planning programme.

Reuben Stubbs Award: A certificate for any project exhibiting an expression of structural integrity, economy of materials, and considered a worthwhile contribution to the integration of Structure and Design.

South African Association of Consulting Professional Planners (SAACPP) Prize: R2000 and certificate for the best dissertation in the MCRP programme.

South African Geomatics Institute (WC) prize: for the best final year student in cadastral surveying, land tenure and town planning.

South African Institute of Architects prize: R500 for the best student in the MArch (Professional) programme.

SACAP (South African Council for the Architectural Profession): Medal for the best Architecture student: for work done over six years.

South African Planning Institute (Western Cape) Prize: R1000 and certificate for the best first year student in the Planning and Urban Design programmes.

South African Planning Institute (Western Cape) Prize: R1000 and certificate for the best overall student work in 2nd year Planning and Urban Design programmes.

South African Planning Institute Prize: R1000 and certificate for the most improved student over the 2 year Planning and Urban Design curricula.

Urban Design Institute of South Africa (Western Cape) Prize: R1000 awarded to the top student in first year subject to a minimum achievement of passing with distinction.

Urban Design Institute of South Africa (Western Cape) Prize: R1000 awarded to the top student in second year subject to a minimum achievement of passing with distinction.

The Western Cape Government Prize for the best Local Area Planning Project (Project A): Certificate and six-month internship prize for the best Local Area Planning Project.

The Western Cape Government Prize for the best Metropolitan Planning Project (Project B): Certificate and six-month internship prize for the best Metropolitan Planning Project.

The Western Cape Government Prize for the best Regional Planning Project (Project C): Certificate and six-month internship prize for the best Regional Planning Project.

Construction Economics and Management

Association of Construction Project Management Book Prize: R2500 for the best overall student in the first year of the MSc(Project Management) programme based on the grade point average after one year of registration on a full curriculum load of four modules.

Association of South African Quantity Surveyors Gold Medal: The department nominates a candidate for this national award for the best quantity surveying graduate at any accredited South African university offering a degree in quantity surveying. Awards are not necessarily made each year.

Association of South African Quantity Surveyors Prizes: R900, R1100, R1300 and R1600 for the best student in each year of study, respectively, for the BSc(Construction Studies) and the BSc(Hons) in Quantity Surveying.

Association of South African Quantity Surveyors Western Cape Chapter Committee Prize: R3000 to the best all-round student in the final year of study of the BSc(Hons) in Quantity Surveying.

Bell-John Prize: R1600 for the best all-round student registered for BSc(Construction Studies) or BSc(Hons) in Quantity Surveying in any year of study.

Bernard James and Partners Prize: R1000 for the BSc(Hons) in Quantity Surveying student (or team) obtaining the highest award (Minimum First Class Pass) in Research Project (CON4047W).

Capital Land Prize: R1500 for the best student collectively in the subjects of Property Investment, Finance and Portfolio Management (CON2024S, CON3034F and CON4048F)

The Chartered Institute of Building (CIOB) Prize: R1000 for the final year BSc(Hons) Construction Management student who has achieved the highest average overall mark.

The Chartered Institute of Building (CIOB) Book Prize: R2000 for the MSc Project Management student who has achieved the highest average overall mark.

Clay Brick Association Prizes: Two prizes of R2000 and R1500 respectively for the best and second best students collectively in the Construction Technology subjects CON1004W, CON2006W and CON3012W.

DVPM Prize: R1500 academic book voucher for the best overall student in the second year of study while registered on a full curriculum load who has completed all the coursework requirements for the degree of MSc Project Management.

George Strachan Prize: R200 for the best final year student in the BSc(Hons) in Construction Management.

Grinaker-LTA Book Prizes: R1000 for the best student registered for the BSc(Hons) in Construction Management (CON4038F, CON4039S and CON4049S) (Minimum First Class Pass); R1000 for the best student registered for the BSc(Hons) in Quantity Surveying in the subject of Measurement and Design Appraisal III (CON4032F and CON4037S) (Minimum First Class Pass).

Master Builders Association of the Western Cape Prize (for South African Students): R1000 for the best BSc(Construction Studies) in the second year of study; R1500 for the best BSc(Construction Studies) in the third year of study; R2000 plus floating shield for the best BSc(Hons) student in Construction Management.

Mbata, Walters and Simpson Prize: R1000 for the best all round student in third year of study for the BSc(Construction Studies) degree.

The Nedbank Corporate and Investment Bank Property Finance Division Academic Achievement Award: R10 000 for the MSc in Property Studies graduating student who has achieved the highest cumulative grade point average in the taught courses of the degree.

The Nedbank Corporate and Investment Bank Property Finance Division Academic Achievement Award: R10 000 for the BSc Honours in Property Studies graduating student who has achieved the highest cumulative grade point average in the degree.

The Nedbank Corporate and Investment Bank Property Finance Division Academic Achievement Award: R10 000 for the BSc in Property Studies graduating student who has achieved the highest cumulative grade point average in the degree (to be assessed over the three years of the degree.

The Occupier Institute Prize: R1000 voucher for the best all round student in the second year of study for the BSc(Property Studies) degree.

Paragon Lending Solutions Prizes: R2500 plus job-shadow opportunity with the Paragon Lending Solutions CEO for the best student in the subject of Property Finance (CON3034F). R2500 for the best postgraduate student in the course Property Finance (CON5009Z).

PMSA (WC) Prize: R2000 academic book voucher for the dissertation in MSc (project management) which in the opinion of a select committee of PMSA (WC), is highly relevant to the project management profession. The winner will be awarded a certificate recognising their achievement at the department prize giving event. PMSA will award the prize itself at a branch meeting convenient for the winning student. At the branch meeting the student will be required to present their research to the PMSA membership. The decision of the award will be made at the sole discretion of PMSA (WC) based on an assessment from a pool of three dissertations submitted for consideration by UCT.

Robin Marten Prize: (value to be announced) for the student with the highest average final year examination results for the third (final) year of the BSc(Property Studies) and the BSc(Hons) Property Studies degrees, taken together, subject to a minimum average of 75% having been achieved each year. In the event of a tie, the student with the higher average for the Property Valuation courses within the two year period should be selected.

Tower Property Fund Academic Book Prize: R5000 for the Honours Research Report which best encapsulates Green Building technologies and/or initiatives.

Engineering

General

Bain Merit Awards: A first prize of R5000 and a second prize of R3000 to the best third-year students in Engineering, and a first prize of R5000 and a second prize of R3000 to the best second-year students in Engineering.

Bain Celebrating Women in Engineering Award: Awards of R3000 each to the top woman academic achiever in second and third year in the Engineering Departments.

ECSA Medal of Merit: for the best student graduating with the degree of BSc(Eng).

ESKOM Award (R500) and entry into the ESKOM National Awards Competition: for the best Engineering BSc(Eng) graduate over the four-year degree curriculum.

John Martin Prize: R1500 for the best first year student in the ASPECT Programme.

Sammy Sacks Memorial Prize: Two prizes of R4000 each for the best classwork in MEC1002W Engineering Drawing.

Chemical Engineering

4th Year Book Prize for South African Institute for Mineral & Metalurgy: Textbookfor best student in Mineral Processing for CHE4050.

Chevron Prize for Chemical Engineering Design: R5000 for the student with the best overall performance in the course CHE4036Z.

Malan Chemical Engineering Medals: for the best students in each of the Second (bronze), Third (silver) and Final (gold) Years.

Malan Prize:*Perry's Chemical Engineering Handbook* for the most promising First Year student.

Omnia Prize: R2000 for the student pair completing the final year project (CHE4045Z) of the highest standard.

SA Institution of Chemical Engineers' Silver Medal: for outstanding performance over the four year curriculum, based on best overall year and credit-weighted GPA, including a fourth year credit-weighted GPA of above 75%.

Sasol Prize for CHE3006F: Certificate and R1000 for the best student in the course CHE3006F (Fundamentals of Chemical Engineering III).

Sasol Prize for CHE3007S: Certificate and R1000 for the best student in the course CHE3007S (Non-ideal systems in Chemical Engineering).

Sasol Prize for CHE3008S: Certificate and R1000 for the best student in the course CHE3008S (Chemical Engineering Project Management and Unit Operation Design).

Civil Engineering

Adina Award for Excellence in Computational Engineering Mechanics: R3000 for the best undergraduate final year project on any aspect of computational engineering mechanics by a student in Civil Engineering.

Aurecon Best overall Achievement Prizes: R2500, R1500, R1000 for the three best performing students.

Aurecon Prize for Water Engineering: R2000 to the student achieving the highest aggregate score in Water Engineering courses (CIV2040S, CIV3043F, CIV3044F, CIV3046S, CIV3047S, CIV4042F).

Concrete Society of SA (WP Branch) Award: R1000 and a book for outstanding work in the area of concrete technology.

D C Robertson Memorial Prize (donated by the Western Cape Branch of the South African Institution of Civil Engineering): R1000 for the student submitting the best work in the final year design project.

George Menzies Prize: R2000 awarded on the results of the final examinations to the best student in Civil Engineering.

Gibb Student Contribution Prize: R2000, for the student with the greatest all-round contribution to the undergraduate programme.

Gibb Prize for Transport Engineering: R2000, for the student showing the most promise in the field of transportation and traffic engineering.

JG Afrika: R2000 for the fourth year civil engineering student with the highest overall achievement in professional communication.

Joint Structural Division of SAICE & IStructE Prize: R2000, for the final year student with the best overall academic achievement in the field of structural engineering.

Mott MacDonald Africa Prize: R3500 (to be shared by members of the winning team) for the design team that delivers the best design project in the final year design project.

Paterson & Cooke Prize: R2000 for the best work in the final year research project.

PPC Cement Prize: R2500 and a book for the best undergraduate project on concrete technology.

PRDW Prize:R3500 for the best Water/Coastal Engineering final year project.

Professor Derrick Sparks Geotechnical Engineering Prize (donated by the South African Institution of Civil Engineering, Western Cape Branch): R1000 for the best final year project in Geotechnical Engineering.

SA Institute of Steel Construction Prize: R1500 for the best structural steel design project submitted by an undergraduate student.

South African Institution of Civil Engineering Professional Practice Prize: R1000 for the best performance in Professional Practice (CIV4041F)

Thesis Poster/e-Portfolio Prize: R500

Thesis Talk Prize: R500

UWP Health and Safety Prize: R1500 for the best performing student in the Health and Safety module in Professional Practice (CIV4041F).

UWP Prize: R1500 for the student with the best result for the Urban Water Services course (CIV3047S).

Electrical Engineering

Peralex Electronics prize: R1500 for the best student in EEE3096S.

Peralex Electronics prize: R1500 for the best student in EEE4114F.

Peralex Electronics prize: R1500 for the best student in EEE4120F.

Siemens Prize: R2500 for the final year Electrical Engineering student submitting the best thesis (EEE4022S/F).

Mechanical Engineering/Mechanical & Mechatronic Engineering

AAT Composites Award: R1000 for best project for MEC4110W Research Project involving use or application of composite materials.

Albert Wessels Prize for Best First Year Student in the Department of Mechanical Engineering: R5000 plus a certificate for the first year student with the highest grade point average.

Albert Wessels Prize for Best Second Year Student in the Department of Mechanical Engineering: R5000 plus a certificate for the second year student with the highest grade point average.

Albert Wessels Prize for Best Third Year Student in the Department of Mechanical Engineering: R5000 plus a certificate for the third year student with the highest grade point average.

Albert Wessels Prize for Best Fourth Year Student in the Department of Mechanical Engineering: R5000 plus a certificate for the fourth year student with the highest grade point average.

Aluminium Federation of South Africa Prize: R1000 for the best report in MEC4110W Research Project or MEC4091Z Honours Research Project involving the use or application of aluminium.

Best Student in Engineering Dynamics: R500 awarded to the student with the top mark in MEC2047F/S Engineering Dynamics.

Best Student in Dynamics I1: R500 awarded to the student with the top mark in MEC3031S Dynamics II.

Best Student in Solid Mechanics I: R500 awarded to the student with the top mark in MEC2049F Solid Mechanics I.

Best Student in Solid Mechanics II: R500 awarded to the student with the top mark in MEC3023F Mechanics of Solids II.

Best Final-Year BScEng Project or BSc (Hons) Project: R1000 awarded for the top mark in the final-year BScEng project or BSc (Hons) project in an Impact-Related topic.

Element Six (Pty) Ltd and DST/NRF Centre of Excellence in Strong Materials Award: A gold medal and letter of commendation to a student for excellence in BSc (Hons) in Materials Science and Engineering:

The Gerald Nurick Prize for Excellence in Impact-Related Postgraduate Research: R1500 awarded to either an MSc student (the dissertation must be awarded with distinction) or PhD student (the thesis must have excellent reviews).

The Penny Wilson Memorial Award: Certificate and cash prize to the most congenial final year student as voted for by the class.

SAI Mech Eng Award: Floating trophy and certificate for the best student in the Mechanical Engineering & Mechanical & Mechatronic Engineering design and laboratory project in the Final Year of study.

SASOL Prize for MEC2048S: Achievement certificate and R750 for the best second-year student in the course MEC2048S, Mechanical Engineering Design.

SASOL Prize for MEC3072F: Achievement certificate and R1000 for the best third-year student in the course MEC3072F, Machine Element Design II.

SASOL Prize for MEC3073S: Achievement certificate and R1000 for the best third-year student in the course MEC3073S, Machine Element Design III.

SASOL Prize for MEC4103F: Achievement certificate and R1500 for the best fourth-year student in the course MEC4103F, Product Design.

SASOL Prize for MEC4108S: Achievement Certificate and R1500 for the best fourth-year student in the course MEC4108S, System Design.

SASOL Achievement Certificate and R2000 Cash Prize: Awarded to the best Masters Dissertation in the field of Mechanical Engineering

SASOL Achievement Certificate and R2000 Cash Prize: Awarded to the postgraduate student who produced the best published paper in the field of metallurgy/materials/corrosion science.

Dean's Merit List

The Dean's Merit List, which is published annually, contains the names of students whose academic performance over the year is meritorious and hence worthy of recognition. Students who qualify for inclusion in the List receive a letter of commendation from the Dean. The List is posted on the notice boards and published in the Dean's Circular. The academic records of students are endorsed to record their achievements in qualifying for inclusion on the List. To be eligible for the Dean's Merit List a student must pass the prescribed courses for which he or she is registered for the year in question; a student registered for a four year degree must be in the First; Second or Third year of study; and a student registered for a three year degree must be in the First, or Second year of study. The list is compiled annually in mid-December and includes all courses which have results at that point in time. The criteria for inclusion in a particular year are as follows:

•	a first-year ASPECT student must have earned not less than 96 credits and obtain a year average of not less than 75 %; a student who was in the ASPECT programme in the first year of study must earn not less than 110 credits of approved coursework in any subsequent year and obtain a year average of not less than 70%.
•	a student in any other undergraduate programme must have earned not less than 132 credits of approved course work for the year in question and obtain a year average of not less than 70%. *Note: For credits to count for Dean's Merit List purposes, they must have been taken and passed in the current year. Transferred credits from another year, degree or institution do not count.*

PROFESSIONAL STATUS AND RECOGNITION OF DEGREES
Architecture, Planning and Geomatics

Architecture and Planning

The Bachelor of Architectural Studies (BAS) degree provides the necessary grounding for entry into a professional architectural course or into postgraduate programmes in city and regional planning, urban design or landscape architecture. The programme merits exemption from Part 1 of the Royal Institute of British Architects', and the Commonwealth Association of Architects', own examination in Architecture.

The BAS(Hons) qualification introduces an honours degree within a succession of qualifications leading towards professional qualification in architecture. It is a prerequisite qualification for admission into the Master of Architecture (Professional) (HEQS-F level 8).

The MArch (Professional) qualification introduces a master's degree within a succession of qualifications leading towards professional qualification in architecture. It is a prerequisite qualification for statutory registration as a Candidate Architect with the South African Council for the Architectural Profession (SACAP), in terms of the Architectural Professions Act 2000 (Act No 44 of 2000). To attain registration as Professional Architect, the candidate must complete a two-year period of practical experience in an architectural office and pass a registration examination set by SACAP.

Both the degrees of Master of City and Regional Planning (MCRP) and Master of Urban Design (MUD) are recognised for professional accreditation purposes by the South African Council for Planners (SACPLAN). Registration with the Council, which is a statutory requirement to practise, can occur after two years of supervised practical experience. The MCRP programme has provisional accreditation from the Royal Town Planning Institute.

Landscape Architecture: The Master of Landscape Architecture (MLA) is a professional degree. Eligibility of graduates for membership of the South African Council for Landscape Architects Profession (SACLAP) will be dependent upon firstly, a further two years training under a professional landscape architect, and the successful completion of the Council's professional examination.

Information Regarding Special Qualifying Examination for Foreign Architects wishing to obtain registration as an architect within South Africa.

(a)	An applicant for registration may be recommended by the Council for admission to the Special Qualifying Examination. The nature and extent of the examination shall be determined in each case by the Council after consideration of all available evidence with regard to the standard and quality of the candidate's qualifications. If necessary, the Council may interview an applicant or require him or her to sit a written test in order to come to a decision as to the standard of the qualification. Only qualifications requiring a minimum of four years full-time study in architecture at a university or like educational establishment will be considered to be of a standard sufficient to give admission to the Special Qualifying Examination. An applicant who obtains a recommendation from the Council may be required to attend lectures and/or practical training at a university of his or her choice and to pass the examination(s) set by the University. The University or body conducting the Special Qualifying Examination shall determine when the examination(s) shall be held and when the fees are to be paid. A candidate who completes the examination(s) will be furnished with a certified statement to that effect.
(b)	All applicants who have not passed a qualifying examination recognised in terms of Section

19(2)(b) and 19(7)(c)(ii) of the Architects' Act 1970 must apply to the South African Council for Architects for admission to the Special Qualifying Examination. The following courses of action may be adopted: An applicant who, in the opinion of the Council, cannot be admitted to the Special Qualifying Examination shall be referred to the University of his or her choice which will decide what will be required of him or her in order to graduate.

Geomatics

Registration

The South African Geomatics Council recognises the BSc(Geomatics) degree, under The Geomatics Professions Act 19 of 2013, as a suitable theoretical qualification for registration as a Professional Land Surveyor and Professional Surveyor in the categories of Engineering and Photogrammetry and as a Professional Geoinformatics Practitioner. In addition to the degree, a graduate wishing to register in any of the above categories is required to undergo a period of practical training with a practising Professional and to undertake various professional examinations. Professional Land, Engineering and Photogrammetric Surveyors, as well as Professional Geoinformatics Practitioners, enjoy a status equivalent to that of an Associate Member or Fellow of the Royal Institution of Chartered Surveyors (RICS) in most parts of the world.

Representation and professional organisations

Holders of a degree in Geomatics, after registration with the SA Geomatics Council can apply for membership of the South African Geomatics Institute (SAGI). Graduates specialising in geoinformatics may prefer to become members of the Geo-Information Society of South Africa (GISSA), while those in the hydrographic surveying field may be interested in associating with the Hydrographic Society of South Africa. Internationally, Geomatics disciplines are represented by a number of organisations, the primary one being the Federation International Geodesic (FIG) and the International Society of Photogrammetry and Remote Sensing (ISPRS). These organisations represent the interests of their members at national or international level and are involved in various workshops, lectures and conference organisations.

Construction Economics and Management

All degree offerings are accredited as detailed below. The significance of accreditation is that graduates of these degrees are exempted by the accrediting bodies from having to take any further university-level exams before being allowed to take the Assessment of Professional Competence (APC) or being admitted to the Professional Interview (PI).

Association of South African Quantity Surveyors (ASAQS)

Graduates in Quantity Surveying and Construction Management are eligible for corporate membership of the Association of South African Quantity Surveyors.
Address: The Director, ASAQS, PO Box 3527, Halfway House, 1685.

South African Council for the Quantity Surveying Profession (SACQSP)

The BSc in Construction Studies together with the BSc(Hons) in Quantity Surveying and Construction Management degrees are accredited by the South African Council for the Quantity Surveying Profession as fulfilling all the academic requirements for registration as Quantity Surveyors (in terms of the Quantity Surveyors Profession Act No 49 of 2000 as amended). The BSc in Property Studies, together with the BSc(Hons) in Property Studies, enjoys similar accreditation. Thereafter, a period of three years in-service training must be undertaken under the supervision of a registered Quantity Surveyor before being admitted to the Assessment of Professional Competence and being registered with the Council as a Professional Quantity Surveyor.
Address: The Registrar, South African Council for the Quantity Surveying Profession, PO Box 3527, Halfway House, 1685.

The Royal Institution of Chartered Surveyors (RICS)
Graduates in Quantity Surveying, Construction Management and Property Studies are eligible to register with the Royal Institution as Probationers. Thereafter, a period of three years in-service training must be undertaken under the supervision of an approved mentor before being admitted to the Assessment of Professional Competence leading to membership of the Institution. Graduates of the MSc Programmes in Property Studies and Project Management enjoy similar accreditation.
Address: The Secretary-General, RICS, 12 Great George Street, Parliament Square, London SW1P 3AD, England.

Chartered Institute of Building (CIOB)
Graduates in Construction Management and Quantity Surveying are admitted to the Graduate Class of the Chartered Institute without further examination. Thereafter, a period of three years in-service training must be undertaken before being admitted to the Professional Interview leading to membership of the Institute. Address: The Secretariat, CIOB, Englemere, Kings Ride, Ascot, Berkshire SL5 8BJ, England.

South African Council for the Project and Construction Management Professions (SACPCMP)
The South African Council for the Project and Construction Management Professions registers professionals and candidates in the project and construction management professions. The BSc in Construction Studies together, with the Bsc (Hons) in Construction Management is accredited by the SACPCMP. A minimum of four years post-graduation relevant practical experience must be attained under the supervision of a registered Professional Construction Manager or Professional Construction Project Manager before being admitted to the Assessment of Professional Competence and being registered with the Council as a Professional Construction Manager or Professional Construction Project Manager. Address: The Registrar, South African Council for the Project and Construction Management Professions, PO Box 653141, Benmore 2010.

The South African Council for the Property Valuers' Profession (SACPVP)
The BSc in Property Studies together with the BSc(Hons) in Property Studies are accredited by the South African Council for the Property Valuers' Profession as fulfilling all the academic requirements for registration as a valuer in terms of the Property Valuers' Profession Act No. 47 of 2000 as amended. Thereafter, a period of three years in-service training must be undertaken under the supervision of a registered Professional Valuer before being registered with the Council as a Professional Valuer.
Address: The Registrar, SACPVP, PO Box 114, Menlyn 0063.

Engineering

The current BSc(Eng) degrees in Chemical, Civil, Electrical, Electrical and Computer, Electro-Mechanical, Mechanical Engineering and Mechatronics are accepted by the Engineering Council of South Africa (ECSA) as fulfilling all the academic requirements for registration as a Professional Engineer. In terms of the Washington Accord signed in June 2000, of which South Africa is a signatory, the Faculty's engineering qualifications have been recognised by professional engineering accrediting bodies in the United States of America, Canada, Australia, New Zealand, the United Kingdom, Ireland and Hong Kong.
In terms of the Engineering Profession Act (Act No 46 of 2000), ECSA has stipulated a minimum period of three years' approved practical training and experience after graduation under the guidance of a Professional Engineer before a candidate may register as a Professional Engineer. This period may be shortened by up to one year in recognition of successful postgraduate degree work. It is of the utmost importance that every graduate should register immediately as a candidate engineer.
The University of Cape Town enjoys a special relationship with the Association of Commonwealth Universities. The curricula, systems and standards of engineering education at the University

conform to the general pattern of the British universities and professional institutions. The degrees are therefore widely recognised.

The better known of the British and South African professional institutions are listed below. Graduates are eligible for exemption from the written Associate Membership examinations of the British institutions, as detailed below, but in all cases a period of approved professional work is required before admission to corporate membership. Student membership of these institutions is generally available to undergraduates. Information on other professional engineering bodies is available from the relevant department in the Faculty.

The Institution of Chemical Engineers
Graduates in Chemical Engineering are eligible for exemption from the Membership Examination. Address: 165-189 Railway Terrace, Rugby, CV21 3HQ, United Kingdom.

The South African Institution of Chemical Engineers
Graduates in Chemical Engineering may be admitted to membership, without further examination. Address: PO Box 808, Pinegowrie, 2123.

The Institution of Civil Engineers
Graduates in Civil Engineering are eligible for exemption from Parts I and II of the Associate Membership examinations, and must satisfy the requirements of the Professional interview for admission to corporate membership. Address: Great George Street, Westminster, London SW1 P3AA.

The South African Institution of Civil Engineering
Graduates in Civil Engineering are eligible for corporate membership once they are registered as Professional Engineers. Address: Postnet Suite 81, Private Bag X65, Halfway House, 1685.

The Institution of Structural Engineers
Graduates in Civil Engineering are eligible for exemption from all but the final Design examinations. For admission to Corporate Membership, Graduates must sit and pass the Chartered Membership (Part 3) examination, entitling them to register with the UK Engineering Council as Chartered Structural Engineers. Address: 11 Upper Belgrave Street, London, SW1.

The Institution of Engineering and Technology (IET)
Membership of the IEE is open to everyone with a professional interest in electrical, electronic, information and manufacturing engineering. Student membership is open to any student studying engineering or IT. The following categories of membership are available: Member, Fellow, Student and Affiliate. Address: URL://www.iee.org/membership/

The South African Institute of Electrical Engineers (SAIEE)
Graduates in Electrical Engineering may be admitted to membership, without further examination. Address: 18a Gill Street, Observatory, Johannesburg, 2198.

The South African Institution of Mechanical Engineers
Graduates in Mechanical Engineering may be admitted to membership, without further examination. Address: PO Box 34008, Rhodes Gift, 7707.

The South African Institution of Certificated Engineers

Holders of the Government Certificate of Competency are members of this Institution. Graduates in the relevant branches of the engineering profession are eligible for extensive exemptions, depending upon the degree of practical experience achieved. In South Africa a Government Certificate of Competency is mandatory for persons responsible for the supervision of industrial plant exceeding a specified size. Address: 18a Gill Street, Observatory, Johannesburg, 2198.

INDEX