UNIVERSITY OF CAPE TOWN

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT (UNDERGRADUATE) 2016

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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

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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) *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.

f) *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.

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:
Ms J Baron

Deputy Deans:
Associate Professor BI Collier-Reed, PrEng MSc(Eng) PhD *Cape Town* FSAIMechE
Professor P Moyo, BSc(Eng) *Zimbabwe* MSc(Eng) *Newcastle-upon-Tyne* PhD *Nanyang* MSAICE, MIABSE
Associate Professor T Winkler, BSc(TRP) MUD *Witwatersrand* PhD *British Columbia*

Assistant Deans:
Professor A Baghai-Wadji MSc(Eng) PhD *Vienna* DSc *Helsinki* FEMA SIEEE
Professor JE van Zyl, PrEng BEng MEng *RAU* PhD *Exeter* MASCE, MSAICE, MIWA, FWISA

Heads of Departments:
Architecture, Planning and Geomatics:
Professor T Berlanda, Dipl Arch, USI, PhD (Arch & Design) *Italy*

Chemical Engineering:
Professor E van Steen, MSc(Eng) *Eindhoven* PhD *Karlsruhe* FSAIChE FSAAE

Civil Engineering:
Professor NP Armitage, PrEng BSc(Eng) *Natal* MSc(Eng) *Cape Town* PhD *Stell* FSAICE FWISA FSAIMunE Mem IAHR Mem IAHS Mem IWA

Construction Economics and Management:
Professor KS Cattell, BSc(QS) *UPE* MPhil *Cape Town* PrQS PMAQS MRICS MSAPCI MSAFMA

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

Mechanical Engineering:
Professor RD Knutsen, BSc PhD *Cape Town* MSAIMM MSAIMechE

Convener Professional Communication Studies:
Associate Professor J English, BA MPhil *Cape Town* PhD *Glasgow Caledonian*

Academic Administration

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

Undergraduate Manager (Academic Administration):
D Chuter, BA HDE *Cape Town*

Postgraduate Manager (Academic Administration):
I Dilraj, BSoc Sc (Hons) *Cape Town*

Administrative Officer and Data Support:
B Cleenwerck, BSoc Sc LLB *Cape Town*

Administrative Assistants:
D Botha, BPrimEd *Wits*
Z Chikte, BSoc Sc (Hons) *Cape Town*
KW Ho, BA (Hons) *Stell* BSoc Sc (Hons) *Cape Town*
T Rossouw, BA(Gen) NC (Archival Studies) *UNISA*

Senior Secretary - Receptionist:
S Reizenburg

Clinical Psychologist

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

Communications, Marketing and Development

Manager:
M Hilton

Alumni Officer:
M Zitha, BA (Media Studies) *Cape Town*

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 Hyland

Finance Officer:
A Burmeister, BA *UNISA*

Human Resources

Human Resources Officer:
Z Matthews, BAdmin *UWC*

IT and Facilities

Manager:
E le Roux

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. The 2015/2016 Chair of the undergraduate student council is Dominic Schorr (SCHDOM007@myuct.ac.za) and the Vice-Chair is Ms Khensani de Klerk (DKLKHE001@myuct.ac.za). Further information concerning the Council is obtainable from the EBESC Office, Room 337 Menzies Building.

A Faculty Postgraduate Student Council represents the specific interests of postgraduate students. The 2015/2016 Chair is Ms Takunda Chitaka (CHTTAK002@myuct.ac.za) and Mr Mehdi Safari (SFRMEH001@myuct.ac.za) is the Vice-Chair. They can be contacted at room 338 Menzies Building.

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:

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 G Nurick	(Mechanical Engineering)
Emeritus Professor CT O'Connor	(Chemical Engineering)
Emeritus Professor H Rüther	(Architecture, Planning and Geomatics)
Professor E van Steen	(Chemical Engineering)
Professor V Watson	(Architecture, Planning and Geomatics)

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 Architectural Studies (Honours)	66569
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 Mechatronics	13980
Bachelor of Science in Engineering in Electro-Mechanical Engineering	13982
Bachelor of Science in Engineering in Mechanical Engineering	13977
Bachelor of Science in Geomatics	TBC
Bachelor of Science in Property Studies	11693
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
Master of Architecture	3977
Master of Architecture (Prof)	TBC
#Master of City Planning and Urban Design	
#Master of City and Regional Planning	
Master of Engineering	TBC
#Master of Landscape Architecture	
Master of Science in Engineering	10681
Master of Science in Project Management	13854
Master of Philosophy	TBC
Master of Science in Property Studies	11697
Doctor of Philosophy	TBC
Doctor of Architecture	19272
Doctor of Science in Engineering	10687
Diplomas	
*Postgraduate Diploma in Project Management	PGDip(ProjMgmt)
*Postgraduate Diploma in Engineering	PGDipEng
*Postgraduate Diploma in Engineering Management	PGDipEngMan
*Postgraduate Diploma in Property Studies	PGDip(PropStudies)
*Postgraduate Diploma in Transport Studies	PGDip(Transport Studies)

*Unless otherwise indicated all qualifications are HEQS-F aligned but SAQA registration numbers are still awaited, except for those marked with * which are to be discontinued, and with a # to be offered in a different format from 2016.*

Term Dates for 2016

1st Semester

1st Quarter	15 February to 24 March
Mid-term break	25 March to 3 April
2nd Quarter	4 April to 10 June

Mid-year Vacation   11 June to 17 July

2nd Semester

3rd Quarter	18 July to 26 August
Mid-term Break	27 August to 4 September
4th Quarter	5 September to 21 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
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   A person who wishes to be considered as a candidate for one of the above mentioned degrees must hold:

    (a)   a National Senior Certificate endorsed by Umalusi to state that he or she has 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 and information on the Alternative Admission Tests, 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   A candidate 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   A candidate must complete approved courses of a value 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   A candidate's 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 the candidate is registered.

FB3.4   When registering for courses a candidate shall be required to adhere to the prescribed lecture timetable slots, as documented in the departmental Lecture Timetable. A candidate 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, a candidate 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 Senate a candidate may not withdraw from a course which he or she is repeating.

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

FB4.1   A candidate 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   A candidate's academic year of study shall be determined on the basis of the year in which he or she is 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, a student may be refused permission (DPR) to present himself/herself for the examination or review if he/she fails to satisfy the Senate that he/she has 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, the candidate is required to satisfy the assessor that he or she has 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
BSc(Eng) and BSc(Geomatics) candidates

FB7.1   Senate may permit a candidate to take a supplementary examination in the courses END1020F/S and END1021F/S. However, a supplementary examination will not be offered for any other course in a department established in the Faculty of Engineering & the Built Environment.

FB7.2   Senate may permit a candidate to take a supplementary examination in a course offered by a department other than a department established in the Faculty of Engineering & the Built Environment, subject to supplementary examinations being offered by the department concerned.

Readmission Requirements
BAS candidates

FB8.1   A BAS candidate shall not be permitted to renew his or her registration except by permission of the Senate, if he or she:
  (a) at the end of first year fails either APG1020W or APG1003W;
  (b) fails any major course prescribed for second or third year, after having been registered twice for the course;
  (c) fails in any semester to obtain a DP for either or both major courses;
  (d) fails 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 a candidate may not renew his or her registration if:
  (a) he/she is in his/her first year of registration at a tertiary institution, and in the courses recognised for the degree fails to obtain at least 80 credits or, if registered through the Academic Development Programme, ASPECT, to obtain at least 64 credits; or
  (b) he/she is a transferee from another tertiary institution or another qualification at UCT, is in his/her first year of registration in the current qualification, and fails 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) he/she has re-registered in the Faculty after a break of one or more years, or is granted a concession to continue and fails in the courses recognised for the degree to obtain at least 96 credits in his/her first year of re-registration or, if first registered through ASPECT, to obtain at least 80 credits; or
  (d) he/she, in any subsequent year of registration, fails 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.

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

FB8.3   Except by permission of the Senate a candidate may not renew his or her registration if:
  (a) he/she is in his/her first year of registration at a tertiary institution and in the courses recognised for the degree fails to obtain at least 72 credits; or
  (b) he/she is a transferee from another tertiary institution or another qualification at UCT, is in his/her first year of registration in the current qualification, and fails in the courses recognised for the degree to obtain at least 80 credits; or

(c)   he/she has re-registered in the Faculty after a break of one or more years, or is granted a concession to continue and fails in the courses recognised for the degree to obtain at least 80 credits in his/her first year of re-registration; or

(d)   he/she, in any subsequent year of registration, fails 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 purpose 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   A candidate who has not been readmitted in terms of rule FB8.1, FB8.2 or FB8.3, who does not appeal, or whose appeal is unsuccessful, may be considered for readmission by the Senate, after an interval of at least one year, if he/she shows 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   In order to be awarded the degree with distinction, a candidate 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 period of time.

BSc(Eng) and BSc(Geomatics) candidates
FB9.2   In order to be considered for the award of the degree with first class honours or honours, a student must (i) complete the requirements for the degree in the minimum time 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, the award of honours or first class honours will be assessed on the basis of 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   In order to be considered for the award of the degree with distinction a candidate must obtain a minimum credit weighted average mark 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][SAQA ID:23]

Programme Convener:
Dr T Sanya, B.Arch, *Makarere*, MIP, *Stuttgart*, PhD, *Oslo*

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 the 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

Course Code	Course Title	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

Course Code	Course Title	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

Course Code	Course Title	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 III	12	7
APG3037W	Design & Theory Studio III (major course)	80	7
	Total credits per year	**144**	

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 four year Geomatics programme comprise lectures, tutorials, laboratory sessions, computation and draughting sessions, and practical fieldwork. Students must show satisfactory performance in each aspect of the work in order 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 Professional Practitioner 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 Professional Geo-Information Sciences Practitioner with the South African Geomatics Council.

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. The degree is designed to meet the challenges of geomatics practice in the African and developing world context as well as in the developed world, while maintaining international standards of teaching and research.

Streams in Geomatics: There are two streams in the Geomatics programme: Surveying and Geoinformatics. If the Geoinformatics stream is a possible choice, then certain first and second year courses must be taken to allow that option. You will be counselled at registration, but also think

about whether you may want to take environmental and geographical science or computer science to third year level prior to registration as these options may affect your courses in first year.

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 one of the following fields:
National Diploma in Cartography
National Diploma in Surveying
BSc in Geomatics/Land Surveying
National Diploma in Land Management
Diploma in Town and Regional Planning
BSc in Town and Regional Planning
Geomatics Information System (GIS)
Applicants are expected to study in any accredited South African tertiary institution. They will be expected to enter into a contract with the Department. The bursary is for a full programme, but annually renewable based on performance results. It also covers tuition and registration, 10 % of tuition and registration as book fees, accommodation and meals.

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

Surveying: Standard survey equipment such as theodolites, tacheometers, levels and other items are available for field and laboratory work in all types of engineering, topographical and cadastral surveys. Global Positioning System (GPS) to support Static and RTK teaching and research, electronic theodolites, electromagnetic distance measurement equipment and a laser scanner are also available. A number of survey control points on and in the vicinity of the University campus provide the basis for a variety of field practicals, 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, which consists of twenty eight workstations. 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.

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 measurement and modelling of the earth's gravity field, vertical datums and networks and satellite positioning. A two-computer laboratory is established for dedicated GPS processing.

Photogrammetry and Remote Sensing: The Geomatics computer laboratory has ENVI and Inpho Photogrammetry Suite software installed for use in these courses. These are both 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
[EB019APG09]

Programme Convener:
Associate Professor JF Whittal, BSc(Surv) MSc(Eng) *Cape Town,* PhD *Calgary* PrL(SA) MSAGI

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

Course Code	Course Title	NQF Credits	HEQSF Level
APG1016F	Geomatics I	18	5
CSC1017F	Programming for Engineers	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	36	5
	Total credits per year	**142**	

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2015F	Geographic Information Systems I	24	6
APG2016W	Surveying I	24	6
APG2017X	Basic Survey Camp	4	6
APG2018X	Geographic Information Systems Camp	4	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
APG2019X	Practical Training I	0	6
	Total credits per year	**148**	

Third Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3014X	Control Survey Camp	4	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
APG3015X	Practical Training II	0	7
	Total credits per year	**148**	

Fourth Year Core Courses

Course Code	Course Title	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: Geoinformatics Stream
Computer Science Specialisation[EB019APG11]

Programme Convener:
Associate Professor JF Whittal, BSc(Surv) MSc(Eng) *Cape Town,* PhD *Calgary* PrL(SA) MSAGI

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

Course Code	Course Title	NQF Credits	HEQSF Level
APG1016F	Geomatics I	18	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
	Elective	18	5
	Total credits per year	**144**	

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2016W	Surveying I	24	6
APG2017X	Basic Survey Camp	4	6
CSC2001F	Computer Science 2001	24	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
APG2019X	Practical Training I	0	6
	Total credits per year	**144**	

Third Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG2015F	Geographic Information Systems I	24	6
APG2018X	Geographic Information Systems Camp	4	6
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3016C	Surveying II	12	7
APG3027F	Cadastral Survey & Registration Projects	24	7
CON2027F	Real Property Law	16	6
CSC2002S	Computer Science 2002	24	6
APG3015X	Practical Training II	0	7
	Total credits per year	**168**	

Fourth Year Core Courses

Course Code	Course Title	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

Course Code	Course Title	NQF Credits	HEQSF Level
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
Environmental and Geographical Science Specialisation[EB019APG11]

Programme Convener:
Associate Professor JF Whittal, BSc(Surv) MSc(Eng) *Cape Town,* PhD *Calgary* PrL(SA) MSAGI

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

Course Code	Course Title	NQF Credits	HEQSF Level
APG1016F	Geomatics I	18	5
CSC1015F	Computer Science 1015	18	5
or			
CSC1017F	Programming for Engineers	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
	Elective	18	5
	Total credits per year	**142/144**	

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2015F	Geographic Information Systems I	24	6
APG2016W	Surveying I	24	6
APG2017X	Basic Survey Camp	4	6
APG2018X	Geographic Information Systems Camp	4	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
APG2019X	Practical Training I	0	6
	Total credits per year	**148**	

Third Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG3011S	Geographic Information Systems II	24	7
APG3012S	Geomatics III	24	7
APG3013F	Numerical Methods in Geomatics	16	7
APG3016C	Surveying II	12	7
APG3027Z	Cadastral Survey & Registration Projects	24	7
CON2027F	Real Property Law	16	6
EGS2013F	The Physical Environment	24	6
EGS2014S	Contemporary Urban Challenges	24	6

Course Code	Course Title	NQF Credits	HEQSF Level
APG3015X	Practical Training II	0	7
	Total credits per year	**164**	

Fourth Year Core Courses

Course Code	Course Title	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

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

Bachelor of Science in Geomatics: Geoinformatics Stream
Geology Specialisation[EB019APG11]

Programme Convener:
Associate Professor JF Whittal, BSc(Surv) MSc(Eng) *Cape Town,* PhD *Calgary* PrL(SA) MSAGI

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

Course Code	Course Title	NQF Credits	HEQSF Level
APG1016F	Geomatics I	18	5
CEM1000W	Chemistry 1000	36	5
CSC1015F	Computer Science 1015	18	5
GEO1006S	Introduction to Minerals, Rocks & Structures	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
	Total credits per year	**144**	

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
APG2016W	Surveying I	24	6
APG2017X	Basic Survey Camp	4	6
APG2019X	Practical Training I	0	6
GEO2001F	Mineralogy & Crystallography	24	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
PHY1031F	General Physics A	18	5
PHY1032S	General Physics B	18	5
STA1000S	Introductory Statistics	18	5
	Total credits per year	**162**	

Third Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG2015F	Geographic Information Systems I	24	6
APG2018X	Geographic Information Systems Camp	4	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
APG3016C	Surveying II	12	7
APG3027Z	Cadastral Survey & Registration Projects	24	7
CON2027F	Real Property Law	16	6
GEO2004S	Physical Geology	24	6
	Total credits per year	**168**	

Fourth Year Core Courses

Course Code	Course Title	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
GEO3001S	Stratigraphy & Economic Geology	36	7
GEO3005F	Petrology & Structural Geology	36	7
	Total credits per year	**192**	

Curriculum for Technikon/University of Technology Transferees to the Bachelor of Science in Geomatics
[EB019APG08]

1) Transferees must hold a Technikon/University of Technology National Diploma in Surveying and must have obtained:
   (a) An average of at least 70% in all prescribed final year University of Technology subjects.
   (b) A minimum of 75% for Mathematics II at the University of Technology.
   (c) A minimum of 70% for Physics I at the University of Technology.
2) Students who satisfy the criteria listed above may be granted up to 144 credits (for the first year) and may be exempted from the courses: APG1016F, APG2016W, APG2017X, APG2019X, APG3038F, PHY1031F and PHY1032S.
3) Such students will be required to take the following courses (or their equivalents) in their first year of registration:

First Year Core Modules

Course Code	Course Title	NQF Credits	HEQSF Level
APG2014S	Geomatics II	24	6
CSC1017F	Programming for Engineers	16	5
APG2015F	Geographical Information Systems	24	6
APG2018X	Geographical Information Systems Camp	4	6
GEO1009F	Introduction to Earth and Environmental Sciences	18	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
	Total credits per year	**122**	

Plus at least 58 credits of elective courses
4)   After completing the above courses, students will be required to complete the prescribed Third and Fourth years of study.
5)   Students with a BTECH in surveying will need to have each course assessed for credit and/or exemption towards the BSc Geomatics degree.

Course descriptions are set out in the section on Courses Offered. Certain descriptions of optional courses, which are not contained in this Handbook, may be found in the Handbook of the Faculty of Science.

Chemical Engineering

Bachelor of Science in Engineering in Chemical Engineering
BSc(Engineering)(Chemical Engineering)[EB001CHE01]

A four-year undergraduate chemical engineering degree is offered which prepares graduates for careers in the chemical, metallurgical, and process industries. There is a limited amount of specialisation in the areas of minerals processing, bioprocess engineering, catalytic processing, crystallisation, process modelling, and environmental process engineering. 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.

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.

First Year Core Courses

Course Code	Course Title	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

Course Code	Course Title	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
	Total credits per year	**108**	
	Approved elective courses	36-48	

Third Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
CHE3005W	Principles of Chemical Engineering III	92	7
CHE3000X	Workplace Experience	0	7
	Total credits per year	**92**	
	Approved elective courses	50-58	

Fourth Year Core Courses

Students must be in their final year of study. Up to 24 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.

Course Code	Course Title	NQF Credits	HEQSF Level
CHE4029Z	Professional Communication Studies	8	8
CHE4036Z	Chemical Engineering Design	28	8
CHE4042F	Process Dynamics & Control	16	8
CHE4045Z	Chemical Engineering Project	32	8

Course Code	Course Title	NQF Credits	HEQSF Level
CHE4048F	Business, Society & Environment	20	8
CHE4049F	Process Synthesis & Equipment Design	20	8
	Total credits per year	**124**	
	Approved elective courses	16-24	

ELECTIVE COURSES

For students in First, Second or Third Year in 2016

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

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

Chemical Sciences

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

Mineralogical Sciences

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

Humanities and Other Electives
1.   **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.
2.   **Humanities selection (18 credits minimum)**
       This selection involves courses that will broaden students' capacity to cope with complex social questions that their professional practice will deliver. 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
       The course END1019L/P (Social Infrastructures), offered during the winter and summer terms, is also included in this elective group, as is FAM1001F/L/P. If students would like to do a course not mentioned here that they believe fills the objectives of this elective category, they may apply via a concession form for it to be considered for accreditation.

3.   **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.

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

Course Code	Course Title	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 Engineering	16	7

For students in Fourth Year in 2016

Students need to have completed at least 50 credits of elective courses in order to graduate. At least 18 of these credits need to be from the Humanities group; and 16 from the EBE Specialisation group. The final 16 credits (Free Elective) can be taken from any course(s) offered at UCT for which the student meets the course entry requirements, subject to the approval of the Programme Convener.

Humanities Group
This group consists of courses typical of studies in the Humanities. A list of courses satisfying this requirement is available from the Academic Administration Officer in the Department of Chemical Engineering, and is provided to students during registration. Courses not on this list require the approval of the Programme Convener.

EBE Specialisation Group
This group consists of the following courses offered by the Department of Chemical Engineering:

Course Code	Course Title	NQF Credits	HEQSF Level
CHE4050F*	Mineral & Metallurgical Processing II	8	8
CHE4057F	Industrial Ecology for Chemical Engineers	8	8
CHE4058Z	Life Cycle Assessment	8	8
EEE4103F+	Nuclear Power Sources	12	8

* CHE4050F is compulsory for mining-house bursars.
+ EEE4103F is compulsory for ESKOM 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. Such courses must be approved by the Programme Convener.

Three-Year Programme for Transferees into Bachelor of Science in Engineering in Chemical Engineering
[EB001CHE01]
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 I [Applications from students who have completed Mathematics I, Chemistry I and Physics I – but 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 (HEQS-F Credits 22, HEQS-F Level 05), 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, and will have to complete all Second, Third and Fourth Year Core Courses, as well as meeting the rules for elective credits.

Since CHE1001Z Introduction to Chemical Engineering (HEQS-F Credits 22) carries fewer credits than CHE1005W Chemical Engineering I (HEQS-F Credits 44), students on the three-year transferee programme will have to complete additional elective credits to make up this shortfall.
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
[EB001CHE01]
The entrance requirements are: a BSc degree in minimum time with Mathematics I, Chemistry I and Physics I.

BSc graduates who are provisionally accepted into the three-year conversion programme must first complete the course CHE1001Z Introduction to Chemical Engineering (HEQS-F Credits 22, HEQS-F Level 05), 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, and will have to complete all Second, Third and Fourth Year Core Courses, as well as meeting the rules for elective credits.

Since CHE1001Z Introduction to Chemical Engineering (HEQS-F Credits 22) carries fewer credits than CHE1005W Chemical Engineering I (HEQS-F Credits 44), three-year conversion students will have to complete additional elective credits to make up this shortfall.

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 (with credit, where applicable) 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 write the examinations (through self-study) for MAM1020F, MAM1021S, CEM1000W, PHY1012F and PHY1013S (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 (HEQS-F Credits 22, HEQS-F Level 05), 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, and will have to complete all Second, Third and Fourth Year Core Courses (except for CHE3000X), as well as meeting the rules for elective credits.

Since CHE1001Z Introduction to Chemical Engineering (HEQS-F Credits 22) carries fewer credits than CHE1005W Chemical Engineering I (HEQS-F Credits 44), such students will have to complete additional elective credits to make up this shortfall.

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 Courses Offered. The course code abbreviation for Chemical Engineering is CHE.

Civil Engineering

Bachelor of Science in Engineering in Civil Engineering
BSc(Engineering)(Civil Engineering)[EB002CIV01]

Programme Convener:
N S Wolmarans, MScEng *Cape Town*

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 16 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 Report allow students to integrate their knowledge and develop advanced problem-solving skills.

Professional aspects are covered by courses in communication and civil engineering practice.

First Year Core Courses

Course Code	Course Title	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
MEC1002W	Engineering Drawing	16	5
PHY1012F	Physics A for Engineers	18	5
PHY1013S	Physics B for Engineers	18	5
	Total credits per year	**144**	

Second Year Core Courses

Course Code	Course Title	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
GEO1008F	Geology for 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

Course Code	Course Title	NQF Credits	HEQSF Level
CIV3042F	Geotechnical Engineering II	16	7
CIV3043F	Hydraulic Engineering	16	7

Course Code	Course Title	NQF Credits	HEQSF Level
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.. 16		5
	Elective.. 18		
	Total credits per year.. **150**		

Fourth Year Core Courses

Course Code	Course Title	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**		

In the final year of study students may get a concession to take a maximum of 18 credits per semester over and above the published fourth year core curriculum. This may consist of outstanding courses from prior years or additional electives. Notwithstanding this provision, concessions will not be granted for the CIV4035C pre-requisites i.e. students will not be allowed to register for CIV4035C if they have not passed the following courses: EGS1005F, CIV3042F, CIV3047S, CIV4041F, CIV4045F, and CIV4046F as well as met the DP requirement for ECO1007S or equivalent.

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 that will be made available to the student at the beginning of each year. This core elective will ordinarily be undertaken in the first half of the third year, although the elective END1019L/P (Social Infrastructures: Engaging with community for change) is available in the Winter and Summer Terms. It is the responsibility of the student to ensure that there are no lecture, practical 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.

Programme for Technikon/University of Technology Transferees to Bachelor of Science in Engineering in Civil Engineering (CE)
[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

Course Code	Course Title	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
CIV2040S	Fluid Mechanics	8	6
CIV2041S	Structural Analysis I	16	6
CIV2042F	Construction Materials	16	6
ECO1007S	Economics for Engineers	16	5
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**156**	

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]

Associate Professor and Programme Convener:
KA Michell, BSc(QS) MPhil *Cape Town* PhD *Salford* PrQS PMAQS MRICS MSAFMA

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

Course Code	Course Title	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
MEC1002W	Engineering Drawing	16	5
STA1001F	Statistics 1001	18	5
CON1007X	Practical Training	0	5
	Total credits per year	**144**	

Second Year Core Modules

Course Code	Course Title	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

Course Code	Course Title	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:
KA Michell, BSc(QS) MPhil *Cape Town* PhD *Salford* PrQS PMAQS MRICS MSAFMA

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 432 credits and shall comply with all the prescribed curriculum requirements (which may in any given year exceed 432 credits).

First Year Core Courses

Course Code	Course Title	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
STA1000S	Introductory Statistics	18	5
STA1001F	Statistics 1001	18	5
	Total credits per year	**154**	

Second Year Core Courses

Course Code	Course Title	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
	Total credits per year	**152**	
	Electives	34	

Elective Core Courses

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

Course Code	Course Title	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/P	Social Infrastructures: Engaging with Community for Change	18	5
STA2020F	Business Statistics	24	6

Third Year Core Courses

Course Code	Course Title	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
	Total credits per year	**148**	
	Electives	34	

Third Year Elective Core Courses

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

Course Code	Course Title	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
CON3044S	Globalisation & the Built Environment	18	7
ECO2003F	Microeconomics II	18	6
ECO2004S	Macroeconomics II	18	6
END1019L/P	Social Infrastructures: Engaging with Community for Change	18	5
STA2020F	Business Statistics	24	6

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
BSc(Engineering)(Electrical Engineering)[EB009EEE01]

Professor and Programme Convener:
K A Folly, MSc(Eng) *Beijing* PhD *Hiroshima* MIEEJ SMIEEE MSAIEE

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

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. The first 3 years of the degree are quite general and cover the fundamentals of the Electrical Engineering disciplines.

First Year Core Courses (EE)

Course Code	Course Title	NQF Credits	HEQSF Level
AXL1200S	Culture, Identity & Globalization in Africa	8	5
CSC1015F	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
EEE1006F	Introduction to Electronic Engineering	12	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MEC1003F	Engineering Drawing	8	5
PHY1012F	Physics A 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)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE2035F	Signals & Systems I	12	6
EEE2036S	Probability & Statistical Design in Engineering	12	6
EEE2038W	Fundamentals of Electrical Engineering	24	6
EEE2039W	Fundamentals of Electronic Engineering	36	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2043F	Electrical & Mechanical Materials	12	6
PHY2010S	Electromagnetism for Engineers	16	6
	Total credits per year	**144**	

Second Year Optional Courses (EE)

Course Code	Course Title	NQF Credits	HEQSF Level
AST1000F	Introduction to Astronomy (timetable permitting)	18	5
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Third Year Core Courses (EE)

Course Code	Course Title	NQF Credits	HEQSF Level

Course Code	Course Title	NQF Credits	HEQSF Level
EEE3017W	Digital Electronics	16	7
EEE3055W	Electromagnetic Engineering	20	7
EEE3057S	Power Engineering	20	7
EEE3068F	Electronic Circuits	12	7
EEE3069W	Control Engineering	20	7
EEE3073S	Professional Communication Studies	12	7
EEE3083F	Communications System & Network Design I	12	7
EEE3086F	Signals & Systems II	12	7
MEC2026S	Project Management	8	6
EEE3000X	Practical Training	0	7
	Total credits per year	**132**	

Third Year Optional Courses (EE)

Course Code	Course Title	NQF Credits	HEQSF Level
AST2002H	Astrophysics (timetable permitting)	24	6
EEE3064W	Digital Electronics & Microprocessors	16	7
EEE3085S	Communication System & Network Design II	12	7
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Fourth Year Core Courses (EE)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4006F	Professional Communication Studies	8	8
EEE4022S/F	Final Year Project	40	8
EEE4036C/A	Electrical Engineering Design	8	8
EEE4051F	New Venture Planning	8	8
MEC4022Z	Industrial Law	8	8
MEC4063C	Industrial Ecology	8	8
	Total credits per year	**80**	

Fourth Year Elective Courses (EE)

Select courses amounting to at least 60 credits from the following:
At least one course (20 credits) from:

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4087F	Mobile Broadband Networks	20	8
EEE4089F	Power Distribution & Transmission Networks	20	8
EEE4093F	Process Control & Instrumentation	20	8

And further courses from:

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4001F	Digital Signal Processing	20	8
EEE4086F	Microwave Engineering	16	8
EEE4088F	Communication Engineering	16	8
EEE4090F	Power Systems Analysis Operation and Control	20	8
EEE4099F	Electrical Machines & Power Electronics	20	8
EEE4101F	Nuclear Power Engineering	20	8
EEE4104C	Electrical Machines & Drives	10	8

Students cannot register for the following courses in the same year as these courses are timetabled in the same periods:
EEE4001F and EEE4089F; EEE4087F and EEE4090F; EEE4088F and EEE4099F.

Fourth Year Optional Courses (EE)

Students must select three or more of the elective-core courses above plus additional optional courses listed below to bring their credit totals to at least 576 credits.

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4096F	Neural Fuzzy & Evolving Systems	8	8
END1019L/P	Social Infrastructures: Engaging with community for change	18	5
HUB4045F	Introduction to Medical Imaging & Image Processing	12	8

Bachelor of Science in Engineering in Electrical and Computer Engineering
BSc(Engineering)(Electrical and Computer Engineering)[EB022EEE02]

Professor and Programme Convener:

A Baghai-Wadji, MSc(Eng) PhD *Vienna* DSc *Helsinki* FEMA SIEEE

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 increasingly 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 possesses expertise across a broad range of engineering disciplines, and are especially well-suited to a career in networking, 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)

Course Code	Course Title	NQF Credits	HEQSF Level
AXL1200S	Culture, Identity & Globalization in Africa	8	5
CSC1015F	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
EEE1006F	Introduction to Electronic Engineering	12	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MEC1003F	Engineering Drawing	8	5
PHY1012F	Physics A 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)

Course Code	Course Title	NQF Credits	HEQSF Level
CSC2001F	Computer Science 2001	24	6
CSC2002S	Computer Science 2002	24	6
EEE2026S	Basic Electrical Engineering II	20	6
EEE2035F	Signals and Systems I	12	6
EEE2036S	Probability and Statistical Design in Engineering	12	6
EEE2040F	Basics Electrical Engineering I	24	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
	Total credits per year	**148**	

Second Year Optional Courses (EC)

Course Code	Course Title	NQF Credits	HEQSF Level
AST1000F	Introduction to Astronomy (timetable permitting)	18	5
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Third Year Core Courses (EC)

Course Code	Course Title	NQF Credits	HEQSF Level
CSC3023F	Computer Science 3023	24	7
EEE3044S	Energy Conversion & Utilization	8	7
EEE3064W	Digital Electronics & Microprocessors	16	7
EEE3073S	Professional Communication Studies	12	7
EEE3074W	Embedded Systems	20	7
EEE3081F	Control Engineering A	10	7
EEE3084W	Communication System & Network Design	24	7
EEE3086F	Signals & Systems II	12	7
MEC2026S	Project Management	8	6
EEE3000X	Practical Training	0	7
	Total credits per year	**134**	

Third Year Optional Courses (EC)

Course Code	Course Title	NQF Credits	HEQSF Level
AST2002H	Astrophysics (timetable permitting)	24	6
EEE3063F	Transmission Lines	10	7
EEE3082S	Control Engineering B	10	7
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Fourth Year Core Courses (EC)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4006F	Professional Communication Studies	8	8
EEE4022S/F	Final Year Project	40	8
EEE4036C/A	Electrical Engineering Design	8	8
EEE4051F	New Venture Planning	8	8
EEE4087F	Mobile Broadband Networks	20	8
MEC4022Z	Industrial Law	8	8
MEC4063C	Industrial Ecology	8	8
	Total credits per year	**100**	

Fourth Year Elective Core Courses (EC)

Choose two courses from the following:

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4001F	Digital Signal Processing	20	8
EEE4084F	Digital Systems	20	8

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4086F	Microwave Engineering	16	8
EEE4088F	Communication Engineering	16	8
EEE4093F	Process Control & Instrumentation	20	8

Select other optional courses to bring the credit total to at least 576 credits.

Fourth Year Optional Courses (EC)

Course Code	Course Title	NQF Credits	HEQSF Level
HUB4045F	Introduction to Medical Imaging & Image Processing	12	8
EEE4104C	Electrical Machines & Drives	10	8
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Bachelor of Science in Engineering in Mechatronics
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 world-wide 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 of understanding in physical science, advanced engineering mathematics, electro-mechanical control theory, microcomputer technology, systemic 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, power electronics and machines and industrial management.

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. Some students currently on the Programme enjoy industrial sponsorship, in the form of bursaries.

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)

Course Code	Course Title	NQF Credits	HEQSF Level
AXL1200S	Culture, Identity & Globalization in Africa	8	5
CSC1015F	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
EEE1006F	Introduction to Electronic Engineering	12	5
EEE1007S	Introduction to Electrical Engineering	12	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5

Course Code	Course Title	NQF Credits	HEQSF Level
MEC1003F	Engineering Drawing	8	5
PHY1012F	Physics A 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)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE2035F	Signals & Systems I	12	6
EEE2036S	Probability & Statistical Design in Engineering	12	6
EEE2038W	Fundamentals of Electrical Engineering	24	6
EEE2039W	Fundamentals of Electronic Engineering	36	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC2022S	Thermofluids I	16	6
MEC2043F	Electrical & Mechanical Materials	12	6
	Total credits per year	**144**	

Second Year Optional Courses (ME)

Course Code	Course Title	NQF Credits	HEQSF Level
AST1000F	Introduction to Astronomy (timetable permitting)	18	5
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Third Year Core Courses (ME)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE3017W	Digital Electronics	16	7
EEE3031S	Energy Utilisation	10	7
EEE3061W	Mechatronics Design I	12	7
EEE3068F	Electronic Circuits	12	7
EEE3069W	Control Engineering	20	7
EEE3073S	Professional Communication Studies	12	7
MEC2023F	Dynamics 1	16	6
MEC2025F	Mechanics of Solids	12	6
MEC2026S	Project Management	8	6
MEC3031S	Dynamics II	16	7
MEC3035S	Computer Integrated Manufacture & Robotics	8	7
EEE3000X	Practical Training	0	7
	Total credits per year	**142**	

Third Year Optional Courses (ME)

Course Code	Course Title	NQF Credits	HEQSF Level
AST2002H	Astrophysics (timetable permitting)	24	6
EEE3086F	Signals & Systems II	12	7
END1019L/P	Social Infrastructures: Engaging with community for change	18	5

Fourth Year Core Courses (ME)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4006F	Professional Communication Studies	8	8
EEE4022S/F	Final Year Project	40	8
EEE4036C/A	Electrical Engineering Design	8	8
EEE4051F	New Venture Planning	8	8
EEE4093F	Process Control & Instrumentation	20	8
EEE4099F	Electrical Machines & Power Electronics	20	8

Course Code	Course Title	NQF Credits	HEQSF Level
MEC4022Z	Industrial Law	8	8
MEC4063C	Industrial Ecology	8	8
	Total credits per year	**120**	

Select other optional courses to bring the credit total up to 576 credits.

Fourth Year Optional Courses (ME)

Course Code	Course Title	NQF Credits	HEQSF Level
EEE4001F	Digital Signal Processing	20	8
EEE4086F	Microwave Engineering	16	8
EEE4088F	Communication Engineering	16	8
EEE4104C	Electrical Machines & Drives	10	8
END1019L/P	Social Infrastructures: Engaging with community for change	18	5
HUB2005F	Introduction to Medical Engineering	8	6
MEC3023F	Mechanics of Solids	12	7

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.

Programme for Transferees from Universities of Technology & Science Graduates

University of Technology students will be granted credit and exemption on a course by course basis if they obtained a matriculation exemption or the NSC endorsed for degree studies before they started their National Diploma and achieved a minimum of 70% in other equivalent courses.
Suitably qualified University of Technology transferees who have completed the Bachelor of Technology degree in minimum time, will be granted credit and exemption on a course by course basis, up to a maximum of 288 credits for equivalent courses passed. Applicants must complete all the core and elective core courses, or their equivalent, prescribed for the degree and pass at least 288 credits resulting in a total credit value of at least 576 credits. All such applicants need to meet the knowledge and learning outcomes specified by ECSA.

Suitably qualified Graduates entering the BSc(Eng) Electrical Engineering, BSC(Eng) Electrical and Computer Engineering or BSc(Eng) Mechatronics degree programme are granted up to a maximum of 288 credits on a course by course basis, and are required to complete specific courses amounting to a value of not less than 288 credits in 2 years. Graduates who do not satisfy the required entry criteria for the 2-year programme may follow a 3 year programme prescribed by the Department. Applicants need to meet the knowledge and learning outcomes specified by ECSA.

Mechanical Engineering

Bachelor of Science in Engineering in Electro-Mechanical Engineering
BSc(Engineering)(Electro-Mechanical Engineering)[EB010MEC05]

Associate Professor and Programme Convener:
H D Mouton, BSc Eng *Pret* BSc *Unisa* B Eng Hons M Eng *Pretoria* PhD Eng *NWU*

The Programme in 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 of a value required to bring the total to a minimum of 576 credits and shall comply with all the prescribed curriculum requirements.

First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MAM1042S	Engineering Statics	16	5
MEC1005W	Introduction to Mechanical Engineering	24	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
MEC1000X	Practical Training I	0	5
	Total credits per year	**144**	

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
EEE2041F	Electrical Circuits	12	6
EEE2042S	Analogue Electronic Design & Labs	12	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC1017F	Programming for Engineers	16	5
MEC2022S	Thermofluids I	16	6
MEC2023S	Dynamics I	16	6
MEC2044S	Machine Element Design I	16	6
MEC2025F	Mechanics of Solids I	12	6
MEC2042F	Materials Science in Engineering	12	6
MEC2000X	Practical Training II	0	6
	Total credits per year	**144**	

Third Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
EEE3044S	Energy Conversion & Utilization	8	7

Course Code	Course Title	NQF Credits	HEQSF Level
EEE3061W	Mechatronics Design	12	7
EEE3062F	Digital Electronics	12	6
EEE3070S	Measurement & Microprocessors	8	6
MEC2026S	Project Management	8	6
MEC3023F	Mechanics of Solids II	12	7
MEC3031S	Dynamics II	16	7
MEC3033F	Thermofluids II	20	7
MEC3035F	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	**148**	

Fourth Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
MEC4047F	Mechanical Vibrations	12	8
MEC4053Z	Measurement and Control in Engineering Systems	16	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	**122**	

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 courses which fulfil the requirements of category (b).

Course Code	Course Title	NQF Credits	HEQSF Level
	Complementary Studies (b)	18	5-8

Bachelor of Science in Engineering in Mechanical Engineering
BSc(Engineering)(Mechanical Engineering) [EB005MEC01]

Associate Professor and Programme Convener:
T. Bello-Ochende, PrEng; B.Eng, M.Eng *Ilorin*; PhD *Duke*; MASME

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 discipline integrates content from other mechanical engineering courses with design philosophies and best practices and develops both team and individual skills.

A candidate shall complete approved courses of a value required to bring the total to a minimum of 576 credits and shall comply with all the prescribed curriculum requirements.

First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
CEM1008F	Chemistry for Engineers	16	5
MAM1020F	Mathematics IA for Engineers	18	5
MAM1021S	Mathematics IB for Engineers	18	5
MAM1042S	Engineering Statics	16	5
MEC1005W	Introduction to Mechanical Engineering	24	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
MEC1000X	Practical Training I	0	5
	Total credits per year	**144**	

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
EEE2030F	Electrical Engineering I	12	6
EEE2031S	Electrical Engineering II	12	6
MAM2083F	Vector Calculus for Engineers	16	6
MAM2084S	Linear Algebra and DEs for Engineers	16	6
MEC1017F	Programming for Engineers	16	5
MEC2022S	Thermofluids I	16	6
MEC2023S	Dynamics I	16	6
MEC2044S	Machine Element Design I	16	6
MEC2025F	Mechanics of Solids I	12	6
MEC2042F	Materials Science in Engineering	12	6
MEC2000X	Practical Training II	0	6
	Total credits per year	**144**	

Third Year Core Courses

Course Code	Course Title	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
MEC3072F	Mechanical Engineering Machine Element Design II	8	7
MEC3073S	Mechanical Engineering Machine Element Design III	16	7
MEC3060F	Materials Under Stress	8	7
MEC3069S	Production Processes	8	7
STA1008F	Statistics for Engineers	12	5
	Total credits per year	**148**	

Fourth Year Core Courses

Course Code	Course Title	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

Course Code	Course Title	NQF Credits	HEQSF Level
MEC4109S	Engineering Professionalism	8	8
MEC4110W	Final-Year Project	46	8
	Total credits per year	**114**	

Elective Core Courses

Students must select one of the following courses:

Course Code	Course Title	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

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 courses which fulfil the requirements of category (b).

Course Code	Course Title	NQF Credits	HEQSF Level
	Complementary Studies (b)	18	5-8

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

Academic Development in the Faculty of Engineering and the Built Environment

The ASPECT Programme
[see codes below]

The Academic Support Programme for Engineering in Cape Town (ASPECT) is designed to help 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 into ASPECT. The Programme provides a supportive environment that is sensitive to students' academic, social and emotional needs. The curriculum is designed to reduce load and therefore the degree takes five years to complete.

In the first year, students register for Mathematics IA, Mathematics IB, Physics A and Physics B, and these are full credit-bearing courses which count towards the degree. Students also register for up to two more credit-bearing courses, specific to their programme of study. The Mathematics and Physics courses are taught by staff in ASPECT, except for the Physics laboratory sessions which are offered by the Physics department. The remaining courses are taught in the departments by the department responsible.

Students who continue with engineering at UCT will complete, in their second year, 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. In the third year, students complete the remaining second year courses together with appropriate courses from the third year curriculum, while ASPECT continues to provide non-academic support and counselling. ASPECT staff will monitor and advise students while they complete the remaining degree requirements.

Chemical Engineering EB801
First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
CEM1000W	Chemistry 1000	36	5
END1020F	Mathematics IA for Engineers	18	5
END1021S	Mathematics IB for Engineers	18	5
PHY1014F	Physics A for ASPECT	18	5
STA1008S	Statistics for Engineers	12	5

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
MAM2085F	Vector Calculus for ASPECT	16	6

Civil Engineering EB802
First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
CIV1007S	Engineering Mechanics	16	5
END1020F	Mathematics IA for Engineers	18	5
END1021S	Mathematics IB for Engineers	18	5
MEC1002W	Engineering Drawing	16	5
PHY1014F	Physics A for ASPECT	18	5
PHY1015S	Physics B for ASPECT	18	5

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
MAM2085F	Vector Calculus for ASPECT	16	6

Electrical Engineering EB809; Mechatronics EB811; Electrical and Computer Engineering EB822

First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
EEE1006F	Introduction to Electronic Engineering	12	5
EEE1007S	Introduction to Electrical Engineering	12	5
END1020F	Mathematics IA for Engineers	18	5
END1021S	Mathematics IB for Engineers	18	5
PHY1014F	Physics A for ASPECT	18	5
PHY1015S	Physics B for ASPECT	18	5

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
MAM2085F	Vector Calculus for ASPECT	16	6

Mechanical Engineering EB805; Electromechanical Engineering EB810

First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
END1020F	Mathematics IA for Engineers	18	5
END1021S	Mathematics IB for Engineers	18	5
MEC1005W	Intro to Mechanical Engineering	24	5
PHY1014F	Physics A for ASPECT	18	5
PHY1015S	Physics B for ASPECT	18	5

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
MAM2085F	Vector Calculus for ASPECT	16	6

Geomatics EB819

First Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
APG1016F	Geomatics I	18	5
CSC1017F	Programming for Engineers	16	5
END1020F	Mathematics IA for Engineers	18	5
END1021S	Mathematics IB for Engineers	18	5
PHY1014F	Physics A for ASPECT	18	5
STA1000S	Introductory Statistics	18	5

Second Year Core Courses

Course Code	Course Title	NQF Credits	HEQSF Level
PHY1015F	Physics B for ASPECT	16	5
MAM2085F	Vector Calculus for ASPECT	16	6

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) *Italy*

Professors:
I Low, BArch Cape Town MArch(Urban Design) Penn PrArch MIArch CIA
E Pieterse, BA(Hons) *UWC* MA Development Studies *ISS* PhD *LSE*
G Pirie, BA BA (Hons) MA PhD (*Wits*)
V Watson, BA(Hons) *Natal* MCRP *Cape Town* AA Dip *London* PhD *Witwatersrand* MSAPI SACP

Adjunct Associate Professor:
S Townsend, PhD *Cape Town*

Emeritus Professors:
H Rüther, Dipl-Ing *Bonn* PhD *Cape Town* PrS*(SA)* FRSSAf FSAAE
F Todeschini, BArch *Cape Town* MCP MArch (Urban Design) *Penn* MIA MUDISA ArchSA
D Dewar BA(Hons) MURP PhD Cape Town TRP(SA) MSAPI BP Chair of Urban and Regional Planning

Associate Professors:
A Steenkamp, B.Arch *Pret* M.Arch *Pret* PhD *Delft* PrArch
N Coetzer, BArch *Natal* MArch *Denver* PhD *London*
HP Comrie, BArch Pret MUD Wits PhD Greenwich Arch (SA)
JL Smit, BSc(Surv) PhD *Cape Town*, PS PS(*ph*) PGP (SA)
JF Whittal, BSc(Surv) MSc(Eng) *Cape Town,* PhD *Calgary* PrL(SA) MSAGI
T Winkler, BSc(TRP) MUD *Witwatersrand* PhD *British Columbia*

Emeritus Associate Professor:
CL Merry, BSc(Surv) *Cape Town* PhD *New Brunswick* FAIG

Senior Lecturers/StudioMasters:
F Carter, BAS BArch MPhil *Cape Town* PrArch PRCPM MIA RIBA
C Hindes, BLA *Pret* MLArch
T Katzschner, BSocSc MCRP *Cape Town*
F Isaacs, B.Arch *Cape Town*, MIP *Stuttgart*
T Sanya, BArch *Makerere* MIP *Stuttgart* PhD *Oslo*
G Sithole, BSc Surveying(Hons) *Zimbabwe* MSc IGP *ITC(NL)* PhD *TU Delft(NL)* LSZ *Zimbabwe*
N Odendaal, NDip(TRP) *ML Sultan* BA *UNISA* MTRP *UND* PhD *Witwatersrand*
M Silverman, B.Arch *Johannesburg* MUD *Johannesburg*

M Fraschini, MSc(Arch) *Milan* PhDArch and Urban Design *Milan*
R Govind, BSc(Surveying) *Natal* MSurvSc *New South Wales* PhD *Colorado*
K Fellingham, BArch (WITS), SM ArchS (MIT), PR Arch (SA), ARB (UK), RIBA (UK)
J Raxworthy, Assoc Dip (Applied Science) *TAFE*, BLA(Hons) *RMIT*, MLA (*RMIT*), PhD *Queensland*

Lecturers:
A Crowder, ND Arch (PTech), BTech (Applied Design) CPUT, BArch (UP), MArts (BTU-Cottbus)
S Hull, BSc Surveying *Kwazulu Natal* MSc(Eng) *Cape Town* PGCE *UNISA* PrL(SA)
S Le Grange, BArch *Cape Town* M Urban Design *UC Berkeley*
M Louw, BArch *Pretoria* MPhil *Stellenbosch* PrArch(SA), MIArch
SS Papanicolaou, BArch *Cape Town,* MPhil *Cape Town*
S Spamer, BAS *Cape Town,* B.Arch *Cape Town*

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

Principal Technical Officer:
D Matthee, NHD (Mechanical Eng.) ND (Surveying)

Chief Technical Officer:
J Coetzee, NHD (Building Tech)
M Wells

Departmental Manager:
J Meyer

Photographic Technician:
TBC

Administrative Officers:
J M Thompsett
M Joubert

Administrative Assistant:
H Martin

Senior Secretaries:
A du Plooy
N Pickover
M Waglay

Print Room Manager:
T Swarts

Departmental Assistant:
N Stanley

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: Monday, 6th & 7th periods and tutorials 8th & 9th periods & Friday, 7th period (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: Monday, 6th & 7th period; and tutorials on Wednesday 8th & 9th period (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.

APG1016F   GEOMATICS I
18 NQF credits at HEQSF level 5; First year undergraduate.
Convener: 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, surveying software, spreadsheets, introduction to fields of geomatics and integrated systems.
Lecture times: 3rd period Mon-Fri. Practicals: one per week Mon 14h00-17h00
DP requirements: This course requires an 80% attendance, class tests must be written with a minimum average of 40% and practical assignments must be attended and completed to the satisfaction of the course convenor.
Assessment: Tests count 20% , practical assignments count 25%, , examination 3 hours 55% (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: Monday, Wednesday & Friday, 1st & 2nd period & practicals from 3rd, to 5th periods (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 elelments 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: Thursday 1st to 8th period (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.

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: Wednesday, 2nd & 3rd, & tutorials in 6th & 7th periods (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: Wednesday, 2nd &,3rd, & tutorials in 6th & 7th period (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: Wednesday, 8^{th,} & 9th period (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: Wednesday, 8th & 9th period (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 R Govind

Course entry requirements: CSC1015F or CSC1017F, APG1016F, MAM2083F

Co-requisites: APG2016W, MAM2084S, 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 Mon-Fri. Practicals: one per week, Friday 14h00- 17h00
DP requirements: Completion of all assignments with a minimum average of 40% and to the satisfaction of the course convenor, a minimum test average of 40% and an 80% attendance record.
Assessment: Tests count 15%, practical assignments count 25%, examination 3 hours counts 60% (sub minimum 40%).

APG2015F   GEOGRAPHIC INFORMATION SYSTEMS I
24 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: S Hull
Course entry requirements: CSC1015F or CSC1017F, MAM1000W or MAM1017F/S or MAM1004F and STA1000S, APG1016F.
Co-requisites: APG2016W, 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 Mon to Fri. Practicals: one per week, Fri 14h00-17h00
DP requirements: Completion of all practical assignments with a minimum average of 50% and to the satisfaction of the course convener, a minimum test average of 40% and an 80% attendance record.
Assessment: Tests count 20%, practical assignments 25%, 3 hour examination 55% (sub minimum 40%).

APG2016W   SURVEYING I
24 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: S Hull
Course entry requirements: MAM1021F/S or MAM1004F and STA1000S; APG1016F.
Co-requisites: APG2017X, APG2015F
Course outline:
This course is designed for students of Geomatics to provide understanding of graphical and 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 the student with group work skills and technical report writing skills. The content of the course includes the basic instrumentation, calculations used in surveying to determine co-ordinates on a mapping plane. These include, but are not limited to theodolites, levels, electronic distance measuring equipment (EDM) and GPS; joins, polars, traversing, intersection, resection, triangulation, trilateration, triangulateration, error figures, eccentric reduction and reverse polars, levelling calculations, distance measurement, and tachaeometry and topographic mapping and surface fitting. In addition, the course builds competency in the solution of integrated survey calculation problems.
Lecture times: 5th period Mon to Fri. Practicals: one per week, Tues 14h00-17h00
DP requirements: Completion of all practical assignments with a minimum average of 50%, and completion of all tutorial assignments with a minimum average of 50%, a minimum class test average of 40%, and subminimum of 40% in the examination and an 80% attendance record.
Assessment: Pracs count 12.5%; tests count 25%; tuts count 12.5%, 3-hour examination counts 50% (sub-minimum 40%)

APG2017X   BASIC SURVEY CAMP
4 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: S Hull
Course entry requirements: APG1016F.
Co-requisites: APG2016W with the DP requirement for class tests (average of 40%) and practicals (average of 50%).
Course outline:
This course aims to consolidate knowledge and skills learnt in APG2016W, and to further develop problem solving skills in relation to practical surveying problems, equip students with group work skills, and engender tolerance of diversity. In addition the course aims to equip students with simple technical report writing skills. This 1-week field camp is project-based with the main emphasis on basic survey operations, including traverse, tacheometry and levelling, with the preparation of a site plan. Other tasks may be performed in addition to the above and will vary from year to year.
Lecture times: one week during the September short vacation
DP requirements: None
Assessment: Project 100%.

APG2018X   GEOGRAPHIC INFORMATION SYSTEMS CAMP
4 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: Associate Professor Julian Smit
Course entry requirements: APG1016F.
Co-requisites: APG2015F.
Course outline:
This course aims to consolidate knowledge and skills learnt in the course GIS I, to further teach problem solving skills in relation to practical GIS problems, and to equip the student with group work skills and engender tolerance of diversity. This 1-week camp is structured to teach problem solving skills in relation to practical spatial data management challenges in the GIS environment. Groups are made up of students who will work together in a simulated project environment. The camp covers the basic steps of GIS project planning with a focus in project layout, data acquisition, needs analysis, user requirements, and system implementation and maintenance. The successful team will present a GIS solution to a spatial project, showing the project layout, data acquisition, needs analysis, user requirements.
Lecture times: One week during the June vacation
DP requirements: Completion of project to the satisfaction of the course convener.
Assessment: Project 100%.

APG2019X   PRACTICAL TRAINING I
0 NQF credits at HEQSF level 6; Second year undergraduate.
Convener: Associate Professor J Whittal
Course entry requirements: None
Co-requisites: APG2016W.
Course outline:
This course aimsto 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 five weeks duration related to surveying, as well as practical tasks and computations set by the course convener, during the vacation. The work must be approved by the course convener. The student is required to submit a diary, signed by his or her employer, as well as a technical report according to the Geomatics document "Guidelines for the Preparation of Practical Reports" prior to registration as a third year student.
Lecture times: None
DP requirements: Completion of course to the satisfaction of the course convener.

Assessment: Report 100%.

APG2021W   TECHNOLOGY II

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: Thursday, 4th to 8th periods (refer to departmental timetable)
DP requirements: 80% attendance and participation and 100% completion of all projects and assignments.
Assessment: By *en-loge* test and examination of portfolio of all tutorials, projects and assignments.

APG2026F   CONSTRUCTION SURVEYING

16 NQF credits at HEQSF level 6
Convener: S Hull
Course entry requirements: STA1001F OR MAM1020F/S and STA1000S, or MAM1004F and STA1000S or equivalents
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: 5th period Mon to Fri. Practicals: one per week Mon 08h00-11h45
DP requirements: 80% attendance record, completion of practical assignments with a minimum average of 50% and to the satisfaction of the course convener and a test average of 40% or more.
Assessment: Tests 25%, practical assignments 25%, examination 3 hours counts 50% (sub minimum 40%).

APG2026S   CONSTRUCTION SURVEYING

16 NQF credits at HEQSF level 6
Convener: S Hull
Course entry requirements: STA1001F OR MAM1020F/S and STA1000S, or MAM1004F and STA1000S or equivalents
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: 2nd period Tues - Fri. pracs on either Wed or Thurs 14:00 - 17:00

DP requirements: 80% attendance record, completion of practical assignments with a minimum average of 50% and to the satisfaction of the course convener and a test average of 40% or more.

Assessment: Tests 25%, practical assignments 25%, examination 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, NGO's, community based projects, building sites, etc.

Lecture times: None

DP requirements: None.

Assessment: Submission of Work Experience Report.

APG2038W　ENVIRONMENT & SERVICES II

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: Monday, 2nd & 3rd & tutorials in 4th & 5th periods (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

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: Mondays; Wednesdays; Fridays 1st & 2nd periods and practicals 3rd; to 5th periods (refer to departmental timetable)
DP requirements: 80% attendance and participation; 100% submission of assignments and projects.
Assessment: By portfolio examination.

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: Wednesday, 4th & 5th period (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: Wednesday, 4th & 5th period (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 Julian Smit
Course entry requirements: MAM1021F/S, STA1000S, CSC1015F or CSC1017F, APG2014S, APG2015F, APG2018X.
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: 4th period Mon to Fri. Practicals: one per week, Mon 14h00-17h00

DP requirements: Satisfactory completion of practical assignments, a test average of 35% or more and an 80% attendance record.

Assessment: Tests count 20%, practical assignments count 25%, examination 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: MAM1021F/S, STA1000S, PHY1032S CSC1015F or CSC1017F, APG2014S, APG2015F, APG2016W, APG2017X, APG2018X, 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: Completion of practical assignments with a minimum of 50%, a test average of 35% or more and an 80% attendance record.

Assessment: Tests, practical assignments, examination 3 hours (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: MAM2083F/S or equivalent, APG2014S, APG2016W.

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: Completion of practical assignments to the satisfaction of the course convener, a minimum average of 35% for all tests, and an 80% attendance record.

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

APG3014X   CONTROL SURVEY CAMP

4 NQF credits at HEQSF level 7; 1 Week practical project. Third year undergraduate.

Convener: Dr R Govind

Course entry requirements: APG2016W and APG2017X.

Co-requisites: APG3017D, APG3016C and APG2014S.

Course outline:
Course Aims: To provide practical experience in carrying out control surveys. Course Content: GPS control survey measurements - network design, measurement, adjustment and analysis. Precise traversing. This camp will take place during a vacation, away from the UCT campus.
Lecture times: One week during April vacation
DP requirements: Completion of project to the satisfaction of the course convener.
Assessment: Project counts 100%.

APG3015X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 7; Third year undergraduate.
Convener: Associate Professor J Whittal
Course entry requirements: APG2019X, APG2016W.
Co-requisites: None
Course outline:
Course Aims: To further equip the student with skills relating to the workplace. To provide the student with further insight into a career in one or more specialised fields of geomatics. To consolidate knowledge and skills learnt in third year geomatics courses. Course Content: Practical work of not less than five weeks duration related to geomatics, as well as practical tasks and computations set by the course convener, during the vacation. The work must be approved by the course convener. The student is required to submit a diary, signed by his or her employer, as well as a technical report according to the Geomatics document "Guidelines for the Preparation of Practical Reports" prior to registration as a final year student.
Lecture times: None
DP requirements: Completion of course to the satisfaction of the course convener.
Assessment: Report counts 100%.

APG3016C   SURVEYING II
12 NQF credits at HEQSF level 7; Third year undergraduate..
Convener: Associate Professor J Whittal
Course entry requirements: APG1016F and APG2015F; for BSc Geomatics students APG2016W 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 quarter. 3rd period Mon-Fri. Assignments: one per week, Wed 14h00-17h00
DP requirements: Attendance at and completion of all assignments with an average of 50%, a minimum class test average of 35% and an 80% lecture attendance record.
Assessment: Tests count 20%, practical assignments count 20%, examination 1½ 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, APG2015F, 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: Fourth quarter. 3rd period Mon-Fri. Assignments: one per week, Wed 14h00-17h00
DP requirements: Attendance and completion of all assignments with an average of 50%, a minimum class test average of 35% and an 80% lecture attendance record.
Assessment: Tests count 20%, practical assignments count 20%, examination 1½ 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: Thursday, 6th to 9th periods. (refer to departmental timetable)
DP requirements: 80% attendance, participation and completion of all essays and assignments.
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. Third year undergraduate.
Convener: Associate Professor J Whittal
Course entry requirements: APG2015F, APG2016W, APG2019X.
Co-requisites: CON2027F, for students of surveying stream also 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: Completion of all projects and assignments. Attendance at all scheduled events.
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. Practical: First semester, Wed 14h00-17h00.Second semester Fri 14h00-14h45. Practical 15h00 – 17h00
DP requirements: Attendance at and completion of all assignments with an average of 50%, a minimum class test average of 40% and an 80% lecture attendance record.
Assessment: Tests count 34% and 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: Monday, 6th & 7th periods. (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: Monday, 8th & 9th periods (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 III
12 NQF credits at HEQSF level 7; Third year undergraduate.
Convener: TBA
Course outline:
The course provides a broad understanding of social and organizational 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: Wednesday, 1st, 2nd and 3rd periods. (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: Tuesday & Friday, 1st period and studio sessions 2nd – 5th periods (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: Satisfactory attendance at all sessions, minimum of 50% for class mark
Assessment: Coursework 75%, Examination 25%

APG4001S GEODESY
24 NQF credits at HEQSF level 8
Convener: Dr R Govind
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: Completion of practical assignments to the satisfaction of the course convener and an 80% attendance record. A minimum average of 35% for all tests.
Assessment: Tests, practical assignments, examination 3 hours (sub minimum 40%).

APG4002Z LAND USE PLANNING & TOWNSHIP DESIGN
16 NQF credits at HEQSF level 8
Convener: Dr R Govind
Course entry requirements: APG3016C, APG3027Z, CON2027F.
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: Completion of practical assignments to the satisfaction of the course convener and an 80% attendance record.
Assessment: Tests, practical assignments, class work, examination 3 hours (sub minimum 40%).

APG4003Z　 GEOMATICS PROJECT

40 NQF credits at HEQSF level 8; 10 - 12 contact sessions, mid-year seminar..
Convener: Associate Professor J Smit
Course entry requirements: The candidate must be able to graduate in the year in which the course is taken.
Course outline:
Course Aims: 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, poster and oral presentation of their work in the second semester. Course Content: Presentation of the project plan and proposal, execution of the project, presentation of the result in written, poster and oral form.
Lecture times: Friday, 6th to 8th period
DP requirements: None.
Assessment: Project report, poster presentation; and may include oral presentation

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: Completion of practical assignments to the satisfaction of the course convener and a minimum average of 35% for all tests and an 80% attendance record.
Assessment: Tests (15%), practical assignments (25%), 3 hours examination (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: April vacation.
DP requirements: Completion of the project to the satisfaction of the course convenor.
Assessment: Project work results and report (100%).

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.

DP requirements: Completion of the practical assignments to the satisfaction of the course convener (with a minimum average mark of 50%) ; a test average of 35% or more and an 80% attendance record.

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

APG4012S   GEOMATICS MANAGEMENT AND PROFESSIONALISM

24 NQF credits at HEQSF level 8

Convener: Associate Professor J Whittal

Course entry requirements: BSc Geomatics students: CON2027Z, APG3027Z; BSc Hon GIS students: none.

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 an average of 40%, a minimum class test average of 35% and an 80% lecture attendance record.

Assessment: 5 Assignments 40%, 1 exam in November 60% (3 hour)

CHEMICAL ENGINEERING

The Department offers the following Degree Programme:

BSc(Eng) Programme 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:
E van Steen, MSc(Eng) *Eindhoven* Dr.Ing. *Karlsruhe* FSAIChE FSAAE AFIChemE

Professors:
JM Case, BSc(Hons) *Stell* HDE MSc *Cape Town* MEd *Leeds* MSc *Cape Town* PhD *Monash* MASSAf
M Claeys, Dipl.Ing (Chem Eng) Dr. –Ing.*Karlsruhe*
DA Deglon, BSc(Eng) *Witwatersrand* MBA PhD *Cape Town* MSAIMM
JCQ Fletcher, BSc(Eng)Chem PhD *Cape Town* MACS FSAAE
STL Harrison, BSc(Hons) *Cape Town* PhD *Cantab* MSAIChE SASM FSAIMM FSAAE ASSAf FWISA
A Mainza, BSc(Eng)Chem *UNZA* PhD *Cape Town*
KP Möller, BSc(Eng)Chem PhD *Cape Town*
J Petersen, BSc(Eng)Chem *Witwatersrand* PhD *Cape Town* MSAIMM (Director of Postgraduate Studies)
HB von Blottnitz, PrEng BSc(Eng)Chem *Cape Town* BSc(Hons) UNISA MSc(Eng) *Cape Town* Dr.-Ing. *RWTHAachen* MSAIChE

Emeritus Professors:
CT O'Connor, PrEng BSc *UNISA*, STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAIChE FSAAE FRSSAf

Honorary Professor:
JG Petrie, C. Eng. BSc(Eng)Chem *Cape Town* MSc(Chem Eng) *Houston* PhD *Cape Town* FIChemE

Adjunct Professor:
P Dempsey, BSc *UNISA*, NHD Metallurgy *Wits Technicon*; MDP *UNISA*
AS Lambert, BSc(Hons) Extractive Metallurgy *Glasgow*, FSAIMM
JW Mann, BSc(Eng) Extractive Metallurgy *Witwatersrand* MBL *UNISA*
DW Wright, BSc(Eng)Chem *Natal* MSAIChE FSAAE
WA van Dyk, BEng (Chemical, Extractive Metallurgy) *Stellenbosch,* PhD *Stellenbosch*

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

Senior Lecturers:
L Bbosa, BSc (Eng) Elec-Mech MSc(Chem Eng) PhD *Cape Town* MSAIMM
MA Fagan-Endres, BSc(Eng)Chem *Cape Town* PhD *Cantab*
HR Heydenrych, BSc(Eng)Chem MSc(Eng) *Cape Town*

A Isafiade, BSc(Hons) *Ilorin* MSc(ChemEng) *Ife* PhD *Cape Town* AMIChemE
PBJ Levecque, MSc(Eng) PhD *Leuven* (Director of Undergraduate Studies)
T Rampai, BSc(Hons) MSc(Materials Engineering) *Cape Town*
S Tai, BSc(Hons)*UMIST* MSc PhD *Delft*

Contract Lecturers
N Abbas, BSc(Hon) MSc(Eng) *Cape Town*
A Mabentsela, BSc(Eng)Chem *Cape Town*

Honorary Research Associates:
MJ Griffiths, BSc(Med) (Hons)MSc PhD *Cape Town*
MA Petersen, BSc MSc *Cape Town* PhD *Cantab*
RP van Hille, BSc MSc PhD *Rhodes*

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

Senior Research Officers:
M Becker, BSc(Hons) MSc Geology *Cape Town* PhD *Pret*
R Brosius, BSc(Eng) (RUC Antwerpen) MSc(Eng) PhD *Leuven*
KC Corin, BSc(Hons) PhD *Cape Town*
NF Fischer, Dipl.-Ing.(Chem Eng) *Karlsruhe* PhD *Cape Town*
BJ McFadzean BSc(Hons) MSc *Port Elizabeth* PhD *NMMU*
JA Sweet, BSc(Eng)Chem MSc *Cape Town*
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CJ Fenner, BSc(Hon) PhD *Cape Town*
RJ Huddy, BSc(Hons) PhD *Cape Town*
N Hussain,,, BSc(Eng)Chem MSc *Cape Town*
M Johnstone-Robertson, BSc(Eng)Chem PhD *Cape Town*
NTJ Luchters, BTech *Leiden*
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Chief Technical Officers:
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Senior Technical Officer:
G de la Cruz

Technical Officers:
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RB Cupido, BTech(Chem Eng), MTech *CPUT*
G Kaufmann, BTech *CPUT* MTech *NMMU*
WP Koorts, BTech(Chem Eng) *CPUT*
CA Le Roux, BTech(Chem Eng) *UNISA*

Senior Scientific Officers:
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AS Geldenhuys, BEng(Chem) *Stell*
M Lisso, BSc(Eng)Chem MSc *Cape Town*
GC Edwards, BSc(Eng)Chem *Cape Town*
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Scientific Officers:
RE Van Schalkwyk, BTech(Chem Eng) *CPUT*

Analytical Laboratory Manager:
S La Grange, BTech (Chemistry) *CPUT*

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

Department Manager:
SI Pillay

Building Supervisor:
E Matthews

Administrative Staff:
J Broadley (Administrative Assistant)
N Dili (Receptionist)
B Cloete (Undergraduate Administrator)
B Davids (Postgraduate Administrator)
N Davids (Finance Assistant)
A Warrin (Finance 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, bioreactor design, process kinetics, novel bioprocesses and the recovery of biological products;
- 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; and

☐   Process synthesis featuring the application of pinch technology to heat and mass transfer systems as well as the control of process systems.

Course Outlines

CHE1001Z   INTRODUCTION TO CHEMICAL ENGINEERING
22 NQF credits at HEQSF level 5
Convener: Ms N Abbas
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 tests,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: Ms N Abbas
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 tutorials, practicals, mastery and competency tests, projects and class tests, satisfactory attendance at tutorials and outings.
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: Ms T Rampai
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: Satisfactory performance in mastery and competency tests, 40% average over class tests and mid-year tests. Submission of and satisfactory performance in all practicals and projects.

Assessment: Mastery tests, competency tests, class tests, mid-year tests, practicals, projects, November examinations

CHE2006S   INTRODUCTION TO BIOTECHNOLOGY
24 NQF credits at HEQSF level 6
Convener: Dr C Fenner
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: Active participation in all designated assignments. Completion of all practicals.
Assessment: Written exam (60%), assignment portfolio, including practical assignments (30%), class test (10%)

CHE3000X   WORKPLACE EXPERIENCE
0 NQF credits at HEQSF level 7
Convener: Professor E van Steen
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

CHE3005W   CHEMICAL ENGINEERING III
92 NQF credits at HEQSF level 7
Convener: TBA
Course outline:
This course aims to develop the understanding of chemical engineering theory and practice. The theory is covered in integrated blocks and reinforced and contextualised with: 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. Topics include: thermodynamic systems, solid-fluid systems, reaction systems, interface systems, dynamic systems and control, project management, integrated laboratory experience, integrated design projects and professional communication.
DP requirements: A sub-minimum of 40% for each written and oral final examination will apply 50% for the two projects.
Assessment: Class Tests: 16% = 8 x 2¼h tests (1 for each block) Mid-Year Tests: 20% = 2 x 3h papers End-of-Year exams: 30% = 2 x 3h papers plus a 20 minute oral exam Practicals: 8% = 4 per year Project: 26% = 2 (1 per semester; with interim tasks/ assessment)

CHE3040S   SOLID-FLUID OPERATIONS
Not available to SSA students in 2016.
12 NQF credits at HEQSF level 7
Convener: TBA
Course entry requirements: CHE2031F, CHE2040S
Course outline:
This course covers: solid-fluid operations; 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.
DP requirements: Satisfactory performance in tutorials; minimum of 40% for class test, minimum of 40% for class mark.
Assessment: Class tests, November examination 3 hours. Sub-minimum 40% in the final examination.

CHE3044F   REACTOR DESIGN I
Not available to SSA students in 2016.
12 NQF credits at HEQSF level 7
Convener: TBA
Course entry requirements: CHE2031F, CEM2007F, DP in CHE2035S.
Co-requisites: MAM3085F
Course outline:
This course covers Isothermal Homogeneous Reactor Design: Concepts of mole (mass) balances over reactions with ideal flow patterns (plug flow, mixed flow, batch, semi-batch, membrane, bio-chemical, reactors with recycle). Combining and sequencing reactor types. Reaction rate laws, reaction kinetics and elementary reactions. Designing reactors with ideal flow pattern for single and multiple reactions and bio-chemical reactions. Interpreting and analysing experimental reaction data.
DP requirements: Satisfactory performance in tutorials; minimum of 40% for class mark.
Assessment: Tutorial tests, Class tests; June examination 3 hours. Sub-minimum: 40% in the final exam.

CHE3046F   THERMODYNAMICS II

Not available to SSA students in 2016.
12 NQF credits at HEQSF level 7
Convener: TBA
Course entry requirements: CHE2031F, DP in CHE2035S.
Course outline:
This course aims to develop an understanding of thermodynamics of 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.
DP requirements: Satisfactory performance in tutorials; minimum of 40% for class mark.
Assessment: Class tests; computer examination; June examination 3 hours. Sub-minimum: 40% in the final examination.

CHE3049W   CHEMICAL ENGINEERING LABORATORY II

Not available to SSA students in 2016.This course is not eligible for additional assessment.
16 NQF credits at HEQSF level 7; 4 presentations and 1 class test.
Convener: TBA
Course entry requirements: CHE2033W, CHE2031F, CHE2040S.
Course outline:
The course requires students to design an experimental program, to perform the experiments and to analyse the subsequent data from a range of practicals relevant to typical processes/unit operations found in the process industries. These include classification, crystallisation, distillation, filtration, fluidization, heat transfer, mass transfer, milling, process control, reaction kinetics and thermodynamics. The focus is on comparing theoretical descriptions and empirical data with experimentally observed phenomena. Students are required to present findings, as individuals and in groups, both orally and in the form of concise technical reports.
DP requirements: None
Assessment: Class test, reports, and presentations. Sub-minimum: attend and contribute to all practicals and presentations, and attend and obtain a minimum of 40% for the competency test.

CHE3050S   CHEMICAL PROCESS UNIT DESIGN

Not available to SSA students in 2016.
6 NQF credits at HEQSF level 7
Convener: Professor K Möller
Co-requisites: CHE3053S, CHE3054S
Course outline:
This course combines elements of chemical engineering process design covered in 2nd and 3rd year courses within 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, optimization and economics. Stages 1-3 will each require submission of an interim individual technical report, while stage 4 will require an integrated group report.
DP requirements: None.
Assessment: Individual and group reports. Sub-minimum: satisfy the requirements of the ECSA exit level outcomes of the course.

CHE3053S   SEPARATION PROCESSES
Not available to SSA students in 2016.
13 NQF credits at HEQSF level 7
Convener: TBA
Course entry requirements: CHE2031F, DP in CHE3046F, DP in CHE3063F.
Course outline:
This course develops an understanding of the general principles of mass transfer operations in stage wise and continuous contact equipment, gas absorption, distillation, liquid-liquid extraction, adsorption and multi-component separation.
DP requirements: Satisfactory performance in tutorials; minimum of 40% for class mark
Assessment: Class test, November examination 3 hours. Sub-minimum: 40% in the final examination.

CHE3054S   REACTOR DESIGN II
Not available to SSA students in 2016.
13 NQF credits at HEQSF level 7
Convener: TBA
Course entry requirements: DP in CHE3044F, DP in CHE3046F, DP in CHE3063F, DP in MAM2084F/S.
Course outline:
This course aims to develop an understanding of non-isothermal reactor design; multiple steady states; heterogeneous catalysis and rate expressions; transport resistances in heterogeneous processes and non-catalytic solid-fluid reactions and reactor design.
DP requirements: Satisfactory performance in tutorials; minimum of 40% for class mark.
Assessment: Class tests; November examination 3 hours. Sub-minimum: 40% in the final examination.

CHE3062S   PROFESSIONAL COMMUNICATION STUDIES
Not available to SSA students in 2016.For Chemical Engineering and Geomatics students. (NOTE: Second-year students may not register for CHE3062S.)
12 NQF credits at HEQSF level 7
Convener: Associate Professor J English
Co-requisites: CHE3049W
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: Satisfactory attendance at all sessions; minimum of 50% for class mark.
Assessment: Class test, 2 hour written examination, presentation examination.

CHE3063F   MASS TRANSFER
Not available to SSA students in 2016.
16 NQF credits at HEQSF level 7
Convener: TBA
Course entry requirements: CHE2031F, CHE2040S, MAM2084F/S
Course outline:
This course covers types of diffusion, Fick's law, Maxwell-Stefan theory, molecular diffusion, single and multicomponent mass transfer analysis. Film coefficients, boundary conditions, macro-scopic 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.

DP requirements: Satisfactory performance and attendance in tutorials and project, minimum of 40% for class mark.
Assessment: Class test; project; tutorial tests; June examination 3 hours. Sub-minimum: 40% in the final examination.

CHE3067S   DESIGN AND OPERATION OF CATALYTIC REACTORS
16 NQF credits at HEQSF level 7
Convener: TBA
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: Satisfactory class record and 50% for design project.
Assessment: Class test: 20%; Design project (design of catalytic reactor): 20%; Final examination: 60%.

CHE3068S   BIOPROCESS ENGINEERING
16 NQF credits at HEQSF level 7
Convener: TBA
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
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 ENGINEERS
16 NQF credits at HEQSF level 7
Convener: TBA
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: None.
Assessment: 10 computer assignments, 10% each = 100%.

CHE4029Z   PROFESSIONAL COMMUNICATION STUDIES
For Chemical Engineering students.
8 NQF credits at HEQSF level 8
Convener: Associate Professor J English
Course entry requirements: CHE3062S or EEE3073S or MEC3037S.*Note: Any student who has failed or not taken CHE3062S and who wishes to register for CHE4029Z may apply through his/her Department for a special concession.*
Co-requisites: CHE4048F
Course outline:
This course develops the following aspects of communication: theory; professional writing including: business proposals; graphic communication; posters; readability; and group presentations using PowerPoint to an audience drawn from industry.
DP requirements: Satisfactory attendance at all sessions.
Assessment: Oral examination, projects. Sub-minimum: Satisfy the requirements of the exit level outcomes of the course.

CHE4036Z   CHEMICAL ENGINEERING DESIGN
This course is not eligible for additional assessment
28 NQF credits at HEQSF level 8
Convener: Dr S Tai
Course entry requirements: All core third year courses, CHE4048F, CHE4049F, DP in CHE4042F.
Co-requisites: Maximum number of credits taken concurrently is 16.Students will not be given a concession to do CHE3054S or CHE3053S for the first time alongside CHE4036Z.
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.

CHE4042F   PROCESS DYNAMICS & CONTROL

16 NQF credits at HEQSF level 8
Convener: Mr A Mabentsela
Course entry requirements: All core third year courses.
Course outline:
This course aims to develop an advanced understanding of process dynamics: mathematical models, transfer functions, open-loop response of first, second and higher order systems. Feedback control systems; block diagrams, types of feedback controller. Stability analysis: Bode diagrams and stability, gain and phase margins, controller tuning. Feedforward and cascade control. Multi-input-multi-output systems: stability, interaction, relative gain array and decoupling.
DP requirements: Satisfactory attendance at and performance in tutorials. Minimum 50% for practical, minimum 40% for class test, minimum 50% for each project.
Assessment: Practical; projects; June examination, one 3 hour and one 2 hour paper. Sub-minimum: 40% in each of the two examination papers.

CHE4045Z   CHEMICAL ENGINEERING PROJECT

This course is not eligible for additional assessment
32 NQF credits at HEQSF level 8
Convener: Dr L Bbosa
Course entry requirements: All core third year courses.
Co-requisites: Maximum number of credits taken concurrently is 16.
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, CHE4029Z
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%).

CHE4050F   MINERAL AND METALLURGICAL PROCESSING II

8 NQF credits at HEQSF level 8
Convener: Prof A Mainza
Course entry requirements: All third year core courses.
Course outline:
The course begins with a multimedia-based overview of the theory and practice of milling and flotation process items and circuits (Metso CBT). The course then discusses laboratory techniques, sampling procedures and data reconciliation procedures applicable to the analysis of milling and flotation process devices and circuits. Introduction to mineralogy and liberation analysis methods are discussed. An introduction to hydrometallurgy containing the basic concepts and calculations encountered in this field is given. Students are required to demonstrate their understanding of the course material through four projects. The course then presents selected theories/models used for the design, modelling and simulation of industrial milling and flotation process devices and circuits. The course concludes with an overview of the use of milling and flotation simulators (JKSimMet).
Lecture times: Wednesday, 5th & 7th period; Thursday, 5th period
DP requirements: None
Assessment: Projects.

CHE4057F   INDUSTRIAL ECOLOGY FOR CHEMICAL ENGINEERS

8 NQF credits at HEQSF level 8
Convener: Prof H von Blottnitz
Course entry requirements: All 3rd year core courses in chemical engineering
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: Prof 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%)

CIVIL ENGINEERING

The Department offers the following Undergraduate Degree Programme:

BSc Engineering Degree 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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N P Armitage, PrEng BSc(Eng) *Natal* MSc(Eng) *CapeTown* PhD *Stell* FSAICE FWISA FSAIMunE Mem IAHR Mem IAHS FIWA

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M Vanderschuren, BSc(Eng) *Tilburg* MScEng *Delft* PhD *Enschede* MSAICE MSASITS
MB van Ryneveld, PrEng CEng BSc(Eng) *CapeTown* PhD *Witwatersrand* FSAICE,MICE, MIWA, MWISA, MSASEE
MHP Zuidgeest, MSc(Eng) PhD (Eng) *Twente*

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D Kalumba, BSc(Eng) *Makerere* MSc(Eng) *Cape Town* PhD *Newcastle-upon-Tyne*
K Mudenda, PrEng BEng *Zambia* MSc(Eng) *Cape Town*
S Skatulla, Dipl-Ing *Karlsruhe* PhD *Adelaide*

Academic Development Senior Lecturer:
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C J Nicholas

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N Hassen

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Administrative Officer - Postgraduate:
R Geswindt

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Purchaser:
A Courie

Senior Secretary:
C Wright

Departmental Assistants:
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: Ms N Wolmarans/Associate Professor M Zuidgeest
Course entry requirements: None
Course outline:
This course aims at forming the platform for the development of personal, academic and profession 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: Associate 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: Assignments (25%), Class tests (2 tests, 25% in total), final examination in November (2 hours, 50%).

CIV1007S   ENGINEERING MECHANICS
16 NQF credits at HEQSF level 5
Convener: Dr 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 60%, class tests 40%, November examination 3 hours

CIV2011F   MECHANICS OF MATERIALS
16 NQF credits at HEQSF level 6
Convener: Dr S Skatulla
Course entry requirements: MAM1042S/CIV1007S; 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 60% - of which a sub--minimum of at least 40% must be obtained in the final exam, class tests 40%. June examination 3 hours.

CIV2020X   PRACTICAL EXPERIENCE
0 NQF credits at HEQSF level 6; 10 weeks.
Convener: Associate Professor M Vanderschuren
Course outline:
This course requires Civil Engineering students to gain at least 10 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 four weeks in each) is achieved. This course provides the framework for gaining practical experience to supplement academic study.

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: Continuous assessment course work - assignments, laboratory report, class tests (50%), November examination 3 hours (50%).

CIV2040S   FLUID MECHANICS
8 NQF credits at HEQSF level 6
Convener: Dr D Ikumi
Course entry requirements: MAM1021F/S (DP), MAM1020F/S (DP), PHY1012F/S (DP)
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: November examination 2 hours.

CIV2041S   STRUCTURAL ANALYSIS I
16 NQF credits at HEQSF level 6
Convener: Professor A Zingoni
Course entry requirements: PHY1012F/S (DP), MAM2083F/S, 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: Two class tests (20% each); Final examination (60%)

CIV2042F   CONSTRUCTION MATERIALS
16 NQF credits at HEQSF level 6
Convener: Associate Professor Hans Beushausen
Course entry requirements: CEM1008F
Co-requisites: CIV2011F
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: Assignments (15%); Experimental design project (20%); One class test (15%); Final examination (50%)

CIV3042F   GEOTECHNICAL ENGINEERING II
16 NQF credits at HEQSF level 7
Convener: Dr D Kalumba
Course entry requirements: CIV2039S, GEO1008F

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: Continuous assessment course work - assignments, class tests (50%), June examination 3 hours (50%).

CIV3043F   HYDRAULIC ENGINEERING
16 NQF credits at HEQSF level 7
Convener: Professor J E van Zyl
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: June examination 3 hours. A sub-minimum of 40% is required in the final exam paper.

CIV3044F   ENGINEERING HYDROLOGY
8 NQF credits at HEQSF level 7
Convener: Professor N P Armitage
Course entry requirements: CIV2037S / 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: Assignments 20%, Test 30% and Exam 50% (Exam counts 100% if this is to the advantage of the student).

CIV3045S   TRANSPORTATION PLANNING
16 NQF credits at HEQSF level 7
Convener: Associate Professor M Vanderschuren
Course entry requirements: CIV2037F / STA1008F (DP)
Co-requisites: ECO1007S
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: November examinations 3 hours 50%, class mark 50%.

CIV3046S   WATER TREATMENT
12 NQF credits at HEQSF level 7
Convener: TBA
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 class average for the two class tests. Submission of all completed assignments in professional style by due date.

Assessment: Two tests of 2 hours each. One 3 hour November examination. Tests count one third and the exam counts two thirds of final mark. A minimum exam mark of 50% and a final mark greater than 50% are required to pass the course.

CIV3047S   URBAN WATER SERVICES

16 NQF credits at HEQSF level 7
Convener: Professor N P Armitage
Course entry requirements: CIV2034S/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: Three design projects (60%). November examination 2 hours (40%).

CIV3048F   STRUCTURAL ANALYSIS II

16 NQF credits at HEQSF level 7
Convener: Professor A Zingoni
Course entry requirements: CIV2011F; CIV2041S (Structural Analysis I) and MAM2084F/S (DP)
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); and the yield line method of analysis are included. 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 modeling of frame structure) (20%); Final examination (50%)

CIV3049S   STRUCTURAL DESIGN I

16 NQF credits at HEQSF level 7
Convener: Mr K Mudenda
Course entry requirements: CIV3048F (Structural Analysis II)
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%); Final examination (50%)

CIV4035C   DESIGN PROJECT
24 NQF credits at HEQSF level 8; 5 weeks full time duration.
Convener: Professor N Armitage
Course entry requirements: EGS1008F, CIV3042F, CIV3047S, CIV4041F, CIV4045F, CIV4046F, ECO1007S (DP)
Course outline:
The aim of this course is 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: Coursework: 100% (50% planning and 50% detailed technical design).

CIV4041F   PROFESSIONAL PRACTICE
12 NQF credits at HEQSF level 8
Convener: Associate Professor M Vanderschuren
Co-requisites: CIV4035C and CIV4044F/S
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: Two tests of 2 hours each. One 3 hour June examination. Tests count a third and exam counts two thirds of final mark. A minimum exam mark of 50% and a final mark =>50% is required to pass the course.

CIV4044F   RESEARCH PROJECT
48 NQF credits at HEQSF level 8
Convener: Associate Professor R Behrens
Course entry requirements: No simultaneous registration of more than two additional courses. Students will not be permitted to undertake a research topic in a field for which they have not successfully completed the relevant core courses. Ordinarily this course may only be attempted in the student's last year of study.
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 presentation or e-portfolio.
DP requirements: Submission of all interim reports, final report and poster or e-portfolio. Satisfy all the critical course outcomes for the course to the satisfaction of both the internal and external examiners.
Assessment: Research proposal (15%), Poster / E-portfolio (10%), Final report (75%).

CIV4044S   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. Ordinarily this course may only be attempted in the student's last year of study.
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 presentation or e-portfolio.
DP requirements: Submission of all interim reports, final report and poster or e-portfolio. Satisfy all the critical course outcomes for the course to the satisfaction of both the internal and external examiners.
Assessment: Research proposal (15%), Poster / E-portfolio (10%), Final report (75%).

CIV4045F   STRUCTURAL DESIGN II
18 NQF credits at HEQSF level 8
Convener: Professor P Moyo
Course entry requirements: CIV3049S (Structural Design I) CIV3048F (Structural Analysis II)
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 prestressed 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: Two class tests (20%); Design project (30%); Final examination (50%)

CIV4046F   TRANSPORTATION ENGINEERING
18 NQF credits at HEQSF level 8
Convener: Associate Professor M H P Zuidgeest
Course entry requirements: APG2026S/CIV2034S; CIV3045F(DP)
Co-requisites: n/a
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) analyzing (multi-modal) capacity of traffic facilities, including for public transport and Non-Motorized Transportation (NMT); and (4) management and control of traffic flows (both urban roads, rural roads and highways), including road pricing.

The course includes a 4 credits 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: Two course tests (10% and 15%), a group project (25%) and one exam (50%)

CONSTRUCTION ECONOMICS AND MANAGEMENT

The Department offers the following Undergraduate degree programmes:

BSc Degree Programmes in
Construction Studies
Property Studies

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

Staff

Professor and Head of Department:
KS Cattell, BSc(QS) *UPE* MPhil *Cape Town* PrQS PMAQS MRICS MSAPCI MSAFMA

Professor:
PA Bowen, BSc(QS) BCom *Natal* MSc(Construction Management) *Heriot-Watt* PhD *UPE* PrQS PMAQS FRICS FCIOB PrCM PrCPM PrValuer

Associate Professors:
KA Michell, BSc(QS) MPhil *Cape Town* PhD *Salford* PrQS PMAQS MRICS MSAFMA
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*
AJ Stevens, MSc(Building) *Cape Town* PhD *UPE*

Adjunct Professors:
GJ Paddock, BA LLB *Cape Town* AAArb
GJ Snyman, BCom MCom *Stell* PhD *Cape Town* FCIOB FIHSA

Senior Lecturers:
E Edwardes, BSc BSc(QS) MSc(Project Management) *Pret* PrQS PMAQS
K Evans, BSc(QS) MSc(Property Studies) *Cape Town* 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*
MM Mooya, BSc(Land Economy) *Copperbelt* MPhil(Land Economy) *Cantab* PhD(Real Estate) *Pret*
N-T Tuan, BSc(Eng) *Chung Cheng Institute of Technology*, MEng *Pret*, PhD *Cape Town*, INFORMS *Taiwan Chapter*

Lecturers:
SD Nurick, BCom BSc(Hons)(Property Studies), MPhil *Cape Town* MRICS
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

Departmental Manager:
TBA

Administrative Officer:
M Fagodien (Postgraduate)

Administrative Assistants:
A Haddon (Undergraduate and Honours)
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: U Ordor
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% (3 tests, 25%, assignments 40%); November examination 3 hours 35%

CON1007X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 5
Convener: 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: 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: 50% (2 tests 10% each; 8 tutorials 30%); November examination 2 hours 50%.

CON1011F   PROPERTY STUDIES IA
16 NQF credits at HEQSF level 5; 4 lectures per week, tutorials, practicals.
Convener: R McGaffin
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: 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% (2 tests 10% each; 8 tutorials 30%); 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: S Nurick
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: A Ellmann

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% (1 test 15%; group project 15%; 2 individual projects 10% each); June examination 2 hours 25%, November examination 2 hours 25%.

CON1019F/S   PROFESSIONAL COMMUNICATION
CON1019F for Property Studies students; CON1019S for Construction Studies students
16 NQF credits at HEQSF level 5; 4 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: Class test, 2 hour written examination, presentation examination. (Written examination 25%, Oral examination 25%, projects and class test 50%.).

CON2006W   CONSTRUCTION TECHNOLOGY II
32 NQF credits at HEQSF level 6; 4 lectures per week, seminars, 1 studio session per week.
Convener: A Thompson
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% (4 tests 20%; 9 assignments 45%); November examination 3 hours 35%.

CON2013X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 6
Convener: 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
Course entry requirements: BUS1010F or 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% (group assignment 20%; 2 tests 20%; individual assignment 5%); 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: 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% (3 or 4 tests); November examination 4 hours 50%.

CON2024S   PROPERTY STUDIES IIA
16 NQF credits at HEQSF level 6; 4 lectures per week, 8tutorials.
Convener: 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% (2 tests 15% each; 1 assignment 20%); November examination 3 hours 50%.

CON2027F   REAL PROPERTY LAW I
16 NQF credits at HEQSF level 6; 4 lectures per week, tutorials.
Convener: T Boxall
Co-requisites: CML1001F (or equivalent).
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% (2 tests 20% and 30%); June examination 2 hours 50%.

CON2029S   MEASUREMENT
8 NQF credits at HEQSF level 6; 2 lectures per week.
Convener: E Müller
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% (2 tests 25%; short assignments 0%); November examination 2 hours 50%.

CON2030F   PROPERTY INVESTMENT MATHS II
8 NQF credits at HEQSF level 6; 2 lectures per week, tutorials.
Convener: S Nurick
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%. (test and tutorials); June examination 3 hours 70%.

CON2031S   PROPERTY STUDIES IIB
16 NQF credits at HEQSF level 6; 4 lectures per week, tutorials.
Convener: Dr M Mooya/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% (1 test 20%, 2 assignments 15% each) 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: A Ellmann
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% (2 tests 10% each, 4 assignments 7.5%); June examination 2 hours 25%, November examination 2 hours 25%.

CON3023X   PRACTICAL TRAINING
0 NQF credits at HEQSF level 7
Convener: 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: A Street
Course entry requirements: CON1010F or CON1015F, CON1004W or CON1018W, CON2022W or CON2029S and CON3043W
Co-requisites: CON3040W
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% (project,test); November examination 2 hours 50%.

CON3031W   MEASUREMENT & DESIGN APPRAISAL II
32 NQF credits at HEQSF level 7; 4 lectures per week, 1 studio session as required..
Convener: 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% (3 tests, project and short assignments); November examination 4 hours 50%.

CON3032W   APPLIED CONTRACT LAW I
12 NQF credits at HEQSF level 7; 2 lectures per week, seminars.
Convener: T Boxall
Course entry requirements: CML1002F or CML1001F or CML1006S
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: S Nurick
Course entry requirements: STA1001F/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% (3 tests 35%; 1 assignment 15%); (June examination 2 hours 50%.

CON3034F   PROPERTY STUDIES IIIA
16 NQF credits at HEQSF level 7; 4 lectures per week, tutorials.
Convener: K Evans
Course entry requirements: CON2024S, CON2030F, CON2031S, ECO1010F, ECO1011S.
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% (2 tests 20%; project 20%, 2 assignments 10%); June examination 2 hours 50%.

CON3035S   PROPERTY STUDIES IIIB
16 NQF credits at HEQSF level 7; 4 lectures per week, tutorials.
Convener: A Street

Course entry requirements: CON2024S, CON2031S, STA1001F, ACC1006F/S, ECO1010F, ECO1011S.
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: T Boxall
Course entry requirements: CML1002F or CML1001F or CML1006S; 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% (2 tests 15% each; assignment 20%) 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: M Massyn/Associate Professor A Windapo
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% (2 tests 10% each; 3 assignments 10% each); 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
Course entry requirements: BUS1010F or 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% (group assignment 20%; 2 tests 20%; individual assignment 5%); 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 PA Bowen/Associate Professor K Michell
Course entry requirements: CON1018W and CON2029S or CON2006W and CON2022W.
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% (Test 10%, Blog 5%, Peer Review 5%, Project 30%); 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: Dr M Mooya
Course entry requirements: CON2024S or CON2030F, CON2031S, CON1017S, CON1018W, STA1001F, ECO1010F.
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% (2 tests 20% each, assignment 10%) 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 PA Bowen/Associate Professor K Michell
Course entry requirements: CON1017S, CON2006W, CON2022W, CON2029S.
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% (Test 10%, Blog 5%, Peer Review 5%, Project 30%); June examination 2 hours 25%; November examination 2 hours 25%.

CON3044F/S GLOBALISATION & THE BUILT ENVIRONMENT
Not offered in 2016
18 NQF credits at HEQSF level 7
Convener: TBA
Course outline:
This course aims to develop an understanding of globalisation and the built environment. Topics include: the globalisation debate; globalisation and technology; globalisation and the information age; globalisation and American power; state power; international law; regionalist governance; the declining authority of nation states; national culture and global culture; cosmopolitan cities; media and consumer culture; culture and identity; global citizens; migration; global trade; information and the knowledge economy; inequality; and world orders. Globalisation is contextualised in the final project in terms of the property and construction industries.
DP requirements: Weekly submissions and attendance; 40% subminimum in course work.
Assessment: Year mark 100% (major project 50%; assignment 20%; essay 15%; presentation 15%).

CON3045S MANAGEMENT & ENTERPRISE
Not offered in 2016
18 NQF credits at HEQSF level 7; 4 lectures per week, 12 tutorials..
Convener: TBA
Course outline:
Management and Enterprise is a foundational course for property and construction students. The course will focus on creating a common language and understanding related to business, management, enterprise and entrepreneurship within the context of the property and construction environment. Students will engage with the elements of business formation and management through an integrated project. Alignment with other courses will illustrate the role of business management in the property and construction process, and the importance of an enterprise mindset in developing and managing sustainable and viable projects.
DP requirements: 50% year mark.
Assessment: Year mark 100% (projects 35%; 2 assignments 10% each; individual assessment 15%; presentation 30%).

ELECTRICAL ENGINEERING

The Department offers the following Undergraduate Degree programmes:

Bachelor of Science in Engineering Degree Programme 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
Telephone no.: 021 650 2811

Staff

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

Professors:
A Baghai-Wadji, MSc(Eng) PhD *Vienna* DSc Vienna FEMA SMIEEE
KA Folly, MSc(Eng) *Beijing* PhD *Hiroshima* MIEEJ SMIEEE MSAIEE
MR Inggs, BSc(Hons) Rhodes PhD *London* SMIEEE
P Martinez, BSc, BScHons(Mat Eng), MSc, PhD, *Cape Town* IAAA, IISL, FRAS, MSAIP

Part-time Professor:
P Pillay, CEng BSEng *UDW* MSc(Eng) *Natal* PhD *Virginia Tech* FIET FIEEE

Emeritus Professors:
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, PrEng BSc(Eng) *Natal* MBL SA PhD *Cape Town* FIET FSAIEE
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:
R Prasad, BSc EEng *Sindri* MScEEng *Mesra* PhD *Mesra* PPh

Adjunct Professor:
PJ Cilliers, PrEng BEng (Hons) *Pret* MS George Washington PhD *Ohio* SAIP

Associate Professors:
P Barendse, MSc(Eng) PhD *Cape Town* MIEEE
ME Dlodlo, Reg Eng, BSEE BS *Geneva* MSc *Kansas State* PhD *Delft* FZweIE MIEEE
OE Falowo, BEng MEng *Akure* PhD *Cape Town* SMIEEE
RH Geschke, BEng MSc(Eng)PhD *Stellenbosch* SMIEEE
MA Khan, MSc(Eng) PhD *Cape Town* SMIEEE
A Mishra, BE (*REC India*) PhD *Edinburgh* SMIEEE
F Nicolls, MSc(Eng) PhD *Cape Town*
D O'Hagan, BEng (Hons) MSc *Ulster* PhD *UCL* MIEEE, MIET

AJ Wilkinson, BSc(Eng) *Cape Town* PhD *London*

Emeritus Associate Professors:
JR Greene, MSc(Eng) *Cape Town* MIEEE
M Malengret, MSc(Eng), PhD *Cape Town*

Visiting Professors:
F Anderson, MSc *Georgia Tech*
C Baker, BSc(Hons) PhD *Hull*
H Griffiths, BA *Oxon* PhD DSc *London*
T Magedanz PhD *Berlin*
K Woodbridge, BSc(Hons) *Sussex* Dphil

Senior Lecturers:
S Chowdhury, BEE(Hons) PhD (Eng) *Kolkata* MIET SMIEEE MIE SMSAIEE
SI Ginsberg, MSc(Eng) Cape Town
M Hanif, BEng(Hons) *UK* PhD *Ireland* MIEEE, MIET
A Murgu, MSc(Eng) *Bucharest* Ph Lic (Comp Sci) PhD (Appl Math) *Jyväskylä* MIEEE
R Smit, MSc(ScEd) *Witwatersrand,* (Academic Development Lecturer)

Adjunct Senior Lecturer:
I Khan, MSc(Eng) *Cape Town* MIEEE

Lecturers:
K Awodele, Reg Eng, BSc(Eng) *Ife* MSc(Eng) *Abu* PGDM MNSE MIEEE
J Mwangama, MSc(Eng) *Cape Town*, MIEEE
D Oyedokun, MSc(Eng) PhD *Cape Town* MIEEE SAIEE
A Patel, MSc(Eng) PhD *Cape Town*
MS Tsoeu, MSc(Eng) *Cape Town* MIEEE
RA Verrinder, MSc(Eng) *Cape Town* MIEEE
S Winberg, BSc(Hons) *Cape Town* MSc *UTK* PhD *Cape Town*

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

Senior Research Officer:
R Herman, BSc(Eng) *Cape Town* MSc(Eng) PhD(Eng) *Stell*

Principal Technical Officer:
AC Wozniak, BSc(Eng) *Cape Town*

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

Senior Technical Officers:
P Bizimana
HP Daniels
P Titus

Technical Officer:
B Daniels

Departmental Manager:
J Buxey

Administrative Officer (Undergraduate):
M van der Westhuizen, BA PGDip LISC *Cape Town*

Finance Officer:
C Koonin

Administrative Assistant (Postgraduate):
N Moodley

Administrator (General):
R Harris

Receptionist:
L Johannes

The activities of the Department cover a wide field both at undergraduate and postgraduate level. The Department regards laboratory work as of significant importance and a range of dedicated laboratories exist. These are in the fields of Control and Process Control, Data Communications, Digital Systems and Computers, Electrical Machines and Transformers, Electronics and Telecommunications, Image Processing, Instrumentation, Microwave, Radar, Robotics, Power Electronics and Power Systems.

The undergraduate programmes endeavour to provide the student with an education in *Electrical Engineering* with a range of specialisations, in *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: Ms R Smit
Course outline:
Lecturer: Mr S Ginsberg
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, Wed, Thurs 3rd period
DP requirements: 80% Lab and tutorial attendance; 100 % attendance at all class tests
Assessment: Project: 10%, Tests: 20%, June Examination: 70%

EEE1007S   INTRODUCTION TO ELECTRICAL ENGINEERING
12 NQF credits at HEQSF level 5
Convener: Mrs R Smit
Course outline:
Lecturers: Dr S Chowdhury and Ms R Smit
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, Wed, Thurs, 3rd period
DP requirements: 80% Lab and tutorial attendance; 100% attendance test attendance
Assessment: Design Project: 10%, Tests: 20%, November Examination: 70%

EEE2026S   BASIC ELECTRICAL ENGINEERING PART 2
20 NQF credits at HEQSF level 6
Convener: Associate Professor D O'Hagan
Course entry requirements: CSC1015F, CSC1017F, MAM1018F/S or PHY1013F/S
Course outline:
 Divided into Modules D, E and F of EEE2039W.

Module D: Introduction to Microprocessors
8 NQF credits at level 6, 24 lectures.
Lecturer: Ms J Mwangama
Outline: This module aims to introduce students to how a microcontroller works and how to develop microcontroller based systems. It contains a strong practical element in terms of setting up a development toolchain and writing code in both assembly and C. In order to facilitate this learning, students will build a microcontroller development kit, write and debug code and interface with peripheral modules such as GPIO pins, ADCs and timers. Interrupts will also be explored.
Lecture times: Thurs, Fri, 3rd period
DP requirements: 50% average for practical exam
Assessment: Group practicals (15%), Class test (5%), Tutorials (10%), Practical exam (10%), November exam (60%)
.
Module E: Analog Electronic Design
8 NQF credits at level 6; 24 lectures, 4 assignments
Lecturer: Associate Professor D O'Hagan
Outline: This module aims to develop an understanding of the operation of electronic devices such as diodes, bipolar junction transistors and field effect transistors. It exposes students to the design of common circuits incorporating these devices including, but not limited to amplifiers, and transistor switches, and their frequency response. In addition, we study operational amplifiers and other basic analogue circuit building blocks.
Lecture times: Tues, Wed, 3rd period
DP Requirements: Submission of all 4 assignments and attendance at both class tests
Assessment: Assignments (10%), Class Tests (30%), November Examination (60%)

Module F: Laboratories
4 NQF credits at level 6, 4 practicals.
Lecturer: Mr J Pead
Outline: The aim of this project-based work is to allow students the opportunity to apply their knowledge in projects on opamps/voltage regulators, filter, logic, transistors.
Lecture times: Tues, Thurs, 6th to 9th periods
DP requirements: Satisfactory completion of coursework for each and every module.
Assessment: Tests and practicals (100%)

EEE2030F   ELECTRICAL ENGINEERING I
For students in Mechanical Engineering programme only.
12 NQF credits at HEQSF level 6
Convener: Dr D Oyedokun
Course entry requirements: MAM1018S, PHY1013S
Course outline:
This course aims to develop and understanding of electrical quantities, circuit components, network theorems, AC circuits including Phasor diagrams, resonance, RMS values, power and power factor; transducers and electronic devices.
Lecture times: Mon , Wed , Thurs ^{d} , Fri, 5th
DP requirements: Class Quiz: (5%), Class Test (25%), June Examination (70%)
Assessment: Class Test (30%), June examination (70%).

EEE2031S   ELECTRICAL ENGINEERING II
For students in Mechanical Engineering programme only
12 NQF credits at HEQSF level 6
Convener: Dr S Chowdhury
Course entry requirements: DP for EEE2030F
Course outline:
This course aims to develop an understanding of single phase series and parallel AC Circuits and phasor diagrams, 3-phase star and delta connected AC circuits, single-phase and 3-phase complex power, electromagnetism and simple magnetic circuits, single phase transforms and DC machines.
Lecture times: Mon, Wed, Thurs, Fri, 5th period
DP requirements: 1) 80% Lab and Tutorial attendance, 2) 50% marks for laboratories
Assessment: Tutorials & Laboratory work (10%), Class Test (20%), November Examination (70%)

EEE2035F   SIGNALS & SYSTEMS I
12 NQF credits at HEQSF level 6
Convener: Associate Professor F Nicolls
Course entry requirements: MAM1018F/S.
Co-requisites: MAM2083F/S.
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, and sampling of continuous-time signals.
Lecture times: Mon, Thurs, Fri, 5th period
DP requirements: None
Assessment: Assignments (10%), Class Test (30%), June examination (60%).

EEE2036S   PROBABILITY & STATISTICAL DESIGN IN ENGINEERING
12 NQF credits at HEQSF level 6; MAM2083F/S.
Convener: Dr A Murgu
Course outline:
This course teaches fundamental concepts of set theory; events, sample spaces and randomness; counting methods, combinations and permutations; calculus, modelling and analysis of engineering systems using random variables; discrete/continuous events; functional calculus of random variables; conditioning and independence of random variables; probability distributions (discrete, continuous); expectation, variance; higher-order moments, moment generating function; joint random variables; law of large numbers; central limit theorems; Gaussian approximation; inductive data analysis, least squares method, maximum likelihood estimation.
Lecture times: Mon, Wed, Fri, 3rd period
DP requirements: 1) 100% Laboratory attendance and submission. 2) 50% mark for laboratories
Assessment: Tutorials and Laboratory (15%), Class Test (20%), November Examination (65%)

EEE2038W   FUNDAMENTALS OF ELECTRICAL ENGINEERING
24 NQF credits at HEQSF level 6
Convener: Associate Professor P Barendse
Course entry requirements: MAM1018F/S, PHY1013F/S
Course outline:
Divided into Modules A and C.

1st sem: Module A: Electrical Circuits
12 NQF credits at level 6; 36 lectures, 10 tutorials, 1 practical, 1 project.
Lecturers: Associate Professor P Barendse and Professor E Boje
Outline: This module covers electrical circuits and aims to develop an understanding of DC circuits, voltage, current and power network theorems, transient circuit analysis, single phase AC circuit theory; phasor diagrams for resistive, inductive and capacitive loads; complex power and power factor correction.
Lecture times: Mon, Wed, Fri 3rd period.
DP requirements: 1) 100% laboratory attendance and submission. 2) 50% mark for laboratories. 3) Satisfactory completion of project.
Assessment: Project (5%), Class Test (35%), June examination (60%).

2nd sem: Module C: Power Engineering
12 NQF credits at level 6; 36 lectures, 10 tutorials, 2 practicals, 1 project.
Lecturers: Associate Professor MA Khan and Associate Professor P Barendse
Outline: This module covers power engineering and aims to develop an understanding of three phase AC circuits; Amperes circuit law; properties of magnetic circuits; features, characteristics, modelling and performance of single phase transformers; and features, characteristics, modelling and performance of D.C. machines.
Lecture times: Mon, Tues, Fri 5th period.
DP requirements: 1) 100% laboratory attendance and submission. 2) 50% mark for laboratories. 3) Satisfactory completion of project.
Assessment: Tutorial and Laboratory (2%), Projects (8%), Class Tests (30%), November Examination (60%).

EEE2039W   FUNDAMENTALS OF ELECTRONIC ENGINEERING
36 NQF credits at HEQSF level 6
Convener: Associate Professor D O'Hagan
Course entry requirements: CSC1015F, CSC1017F, MAM1018F/S or PHY1013F/S.
Course outline:
Divided into Modules B, D, E, F and G.

Module B: Digital Electronics
12 credits, 24 lectures, 4 tutorials, 5 laboratories, 1 project (equivalent to 2 tutorials and 1 laboratory
Lecturer: Professor A Baghai-Wadji
Outline: Module B of EEE2039W. This module on digital electronics aims to develop an understanding of digital systems and information representation, binary logic, Boolean algebra, combinational circuits, design concepts and procedures, arithmetic functions, sequential circuits, and state automata.
Lecture times: Tues, Thurs 3rd period.
DP requirements: 1) 80% lab and tutorial attendance, 2) 50% mark for laboratories
Assessment: Tutorials, Laboratories, Project (20%), Class Tests (20%), June Examination (60%).

Module D: Introduction to Microprocessors
8 NQF credits at level 6, 24 lectures.
Lecturer: Ms J Mwangama
Outline: This module aims to introduce students to how a microcontroller works and how to develop microcontroller based systems. It contains a strong practical element in terms of setting up a development toolchain and writing code in both assembly and C. In order to facilitate this learning, students will build a microcontroller development kit, write and debug code and interface with peripheral modules such as GPIO pins, ADCs and timers. Interrupts will also be explored.
Lecture times: Thurs, Fri, 3rd period
DP requirements: 50% average for practical exam
Assessment: Group practicals (15%), Class test (5%), Tutorials (10%), Practical exam (10%), November exam (60%)

Module E: Analog Electronic Design
8 NQF credits at level 6; 24 lectures, 4 assignments
Lecturer: Associate Professor D O'Hagan
Outline: This module aims to develop an understanding of the operation of electronic devices such as diodes, bipolar junction transistors and field effect transistors. It exposes students to the design of common circuits incorporating these devices including, but not limited to amplifiers, and transistor switches, and their frequency response. In addition, we study operational amplifiers and other basic analogue circuit building blocks.
Lecture times: Tues, Wed, 3rd period
DP Requirements: Submission of all 4 assignments and attendance at both class tests
Assessment: Assignments (10%), Class Tests (30%), November Examination (60%)

Module F: Laboratories
4 NQF credits at level 6; 4 practicals.
Lecturer: Mr J Pead
Outline: The aim of this project-based work is to allow students the opportunity to apply their knowledge in projects on opamps/voltage regulators, filter, logic, transistors.
Lecture times: Tues, Thurs, 6th to 9th periods
DP requirements: Satisfactory completion of coursework for each and every module.
Assessment: Tests and practicals (100%)

Module G: Computing II for Electrical Engineers
4 NQF credits at level 6; 12 lectures, 3 programming assignments, 1 class test.
Lecturer: Dr SW Winberg
Outline: The aim of this module is to develop the knowledge and skills required to write C++ programmes with application towards electrical engineering problems.
Lecture times: Mon 2pm
DP requirements: Minimum 40% coursework mark.

Assessment: Assignment & Tests (60%), Final Class test (40%)

EEE2040F BASIC ELECTRONIC ENGINEERING 1
for EC students only
24 NQF credits at HEQSF level 6
Convener: Associate Professor P Barendse
Course entry requirements: MAM1018F/S, PHY1013F/S.
Course outline:
Divided into Modules A and B

Module A: Electrical Circuits
12 credits, 36 lectures, 10 tutorials, 1 practical.
Lecturers: Associate Professor P Barendse
Outline: Module A of EEE 2038W. This module covers electrical circuits and aims to develop an understanding of DC circuits, voltage, current and power network theorems, transient circuit analysis, single phase AC circuit theory; phasor diagrams for resistive, inductive and capacitive loads; complex power and power factor correction.
Lecture times: Mon, Wed, Fri 3rd period.
DP requirements: 1) 100% laboratory attendance and submission. 2) 50% mark for laboratories. 3) Satisfactory completion of project.
Assessment: Class Tests (35%), Projects (5%), June examination (60%),

Module B: Digital Electronics
12 credits, 24 lectures, 4 tutorials, 5 laboratories, 1 project (equivalent to 2 tutorials and 1 laboratory
Lecturer: Professor A Baghai-Wadji
Outline: Module B of EEE2039W.This module on digital electronics aims to develop an understanding of digital systems and information representation, binary logic, Boolean algebra, combinational circuits, design concepts and procedures, arithmetic functions, sequential circuits, and state automata.
Lecture times: Tues, Thurs 3rd period.
DP requirements: 1) 80% lab and tutorial attendance, 2) 50% mark for laboratories
Assessment: Tutorials, Laboratories, Project (20%), Class Tests (20%), June Examination (60%).

EEE2041F ELECTRICAL CIRCUITS
For students in the Electro-Mechanical Engineering programme.
12 NQF credits at HEQSF level 6
Convener: Associate Professor P Barendse
Course entry requirements: MAM1018F/S, PHY1013F/S or equivalent.
Course outline:
Module A of EEE2038W. This module covers electrical circuits and aims to develop an understanding of DC circuits, voltage, current and power network theorems, transient circuit analysis, single phase AC circuit theory; phasor diagrams for resistive, inductive and capacitive loads; complex power and power factor correction.
Lecture times: Mon, Wed, Fri, 3rd period
DP requirements: 1) 100% Laboratory attendance and submission. 2) 50% mark for laboratories 3) Satisfactory completion of project
Assessment: Project (5%), Class Test (35%), June Examination (60%).

EEE2042S ANALOG ELECTRONIC DESIGN & LAB
For students in the Electro-Mechanical Engineering programme.
12 NQF credits at HEQSF level 6
Convener: Associate Professor D O'Hagan
Course entry requirements: MAM1018F/S, PHY1013F/S, DP for EEE2041F.

Course outline:
Divided into Modules E and F of EEE 2039W.

Module E: Analog Electronic Design
8 NQF credits at level 6; 24 lectures, 4 assignments
Lecturer: Associate Professor D O'Hagan
Outline: This module aims to develop an understanding of the operation of electronic devices such as diodes, bipolar junction transistors and field effect transistors. It exposes students to the design of common circuits incorporating these devices including, but not limited to amplifiers, and transistor switches, and their frequency response. In addition, we study operational amplifiers and other basic analogue circuit building blocks.
Lecture times: Tues, Wed, 3rd period
DP Requirements: Submission of all 4 assignments and attendance at both class tests
Assessment: Assignments (10%), Class Tests (30%), November Examination (60%)

Module F: Laboratories
4 NQF credits at level 6; 4 practicals.
Lecturer: Mr J Pead
Outline: The aim of this project-based work is to allow students the opportunity to apply their knowledge in projects on opamps/voltage regulators, filter, logic, transistors.
Lecture times: Tues, Thurs, 6th to 9th periods
DP requirements: Satisfactory completion of coursework for each and every module.
Assessment: Tests and practicals (100%)

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

EEE3017W   DIGITAL ELECTRONICS
Not for EC students.
16 NQF credits at HEQSF level 7
Convener: Ms R Verrinder
Course entry requirements: EEE2039W or equivalent.
Course outline:
This course aims to build on the understanding of**:** logic design, algorithmic state machines, data converters, advanced microcontroller usage, C application to microcontrollers; popular interface standards; common digital devices, instrument busses automated instrumentation and process control.
Lecture times: Semester 1: Mon 2nd, Tues 3rd period. Semester 2: Mon 5th and Tues 4th period.
DP requirements: 1) 100% Laboratory attendance and submission, 2) 50% mark for laboratories, 3) Complete ELO 5 assessments satisfactorily
Assessment: Class Tests (35%), Practicals (10%), November Examination (55%)

EEE3031S   ENERGY UTILIZATION
for ME students only
10 NQF credits at HEQSF level 7
Convener: Associate Professor MA Khan
Course entry requirements: EEE2038W or equivalent.
Course outline:
Lecturers: Associate Professor MA Khan, Associate Professor P Barendse
Module A of EEE3057S. This course on energy utilisation aims to provide an introduction to the features, characteristics and operation of three phase AC induction and synchronous machines; and power electronics.
Lecture times: Tues 2nd period, Thurs 3rd period.
DP requirements: 100% Laboratory attendance and submission and 50% mark for laboratories
Assessment: Class Tests (35%), Project (5%), November Examination (60%).

EEE3044S   ENERGY CONVERSION & UTILISATION
For Electrical and Computing, Electro-Mechanical and Mechanical Engineering students only.
8 NQF credits at HEQSF level 7
Convener: Professor KA Folly
Course entry requirements: EEE2031S or EEE2026S or EEE2041F.
Course outline:
Lecturers: Professor KA Folly, Mrs K Awodele
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
DP requirements: 100% Laboratory attendance and submission and 50% mark for laboratories
Assessment: Laboratory & Assignments (12%), Class Tests (28%), November Examination (60%).

EEE3055W   ELECTROMAGNETIC ENGINEERING
20 NQF credits at HEQSF level 7
Convener: Associate Professor A Wilkinson
Course entry requirements: EEE2039W, MAM2083F, PHY2010S.
Course outline:
Divided into Modules A and B.

Module A: Electromagnetic Field Theory
Lecturer: Associate Professor RH Geschke
Outline: This module aims to develop an advanced understanding of electromagnetic field theory in an electrical engineering context. Time-varying electromagnetic fields; Maxwell's equations; continuity and displacement current; basis of Kirchhoff's laws; propagation of plane waves in lossless and lossy media; power density and Poynting vector; reflection and refraction of plane waves; and antenna radiation.
Lecture times: 2nd Semester: Thurs, Fri 2nd period. Tutorials: Wed, 3rd & 4th period
DP requirements: 50% average for the best 6 out of 9 class tests
Assessment: Class Tests (30%), November Examination (70%).

Module B: Transmission Line Theory
Lecturer: Associate Professor AJ Wilkinson
Outline: This module provides an introduction to transmission lines for low and high frequency engineering. Topics include: overhead 3-phase power transmission lines. Short, medium and long line models. RF and microwave transmission lines, coaxial lines, microstrip, wave guides and fibre optic transmission lines. Equivalent circuit and line constants, two port equations, propagation, attenuation and phase constant, characteristic impedance, incident and reflected waves, reflection

coefficient, the Smith Chart, standing waves, high frequency loss-less lines, and line matching examples.
Lecture times: 1st Semester: Tues, Thurs, 1st period.
DP requirements: Satisfactory completion of coursework. Completion of laboratory session and submission of report.
Assessment: Laboratories (10%), Class Test (10%), June Examination (80%).

EEE3057S   POWER ENGINEERING
20 NQF credits at HEQSF level 7
Convener: Associate Professor MA Khan
Course entry requirements: EEE2038W or equivalent.
Course outline:
Module A: Energy Utilization
Lecturers: Associate Professor MA Khan, Associate Professor P Barendse
Course Outline: This module on energy utilisation aims to provide an introduction to the features, characteristics and operation of three phase AC induction and synchronous machines; and power electronics.
Lecture times: Tues 2nd period, Thurs 3rd period.
DP requirements: 1) 100% Laboratory attendance and submission, 2) 50% mark for laboratories, 3) 100% attendance of site visits where appropriate
Assessment: Class Tests (35%), Project (5%), November Examination (60%).

Module B: Introduction to Power Systems
Lecturers: Mrs K Awodele, Professor KA Folly
Course Outline: This module aims to provide an introduction to power systems engineering, power systems network models, load flow and balanced fault calculations, tranformers, protection principles, electrical loads and tariffs.
Lecture times: Mon, Wed, 2nd period.
DP requirements: 1) 100% Laboratory attendance and submission, 2) 50% mark for laboratories, 3)100% attendance of site visits where appropriate
Assessment: Laboratories (8%), Site Visit & Assignments (8%), Class Tests (24%), November Examination (60%).

EEE3061W   MECHATRONICS DESIGN I
For Mechatronics and Electro-Mechanical Engineering students only.
12 NQF credits at HEQSF level 7
Convener: Dr A Patel
Course entry requirements: EEE2038W, EEE2039W, EEE2031S.
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: Mon, Wed. 2nd period.
DP requirements: Completion of projects
Assessment: Projects (40%), Class Test (10%), November Examination (50%).

EEE3062F   DIGITAL ELECTRONICS
For Electro-Mechanical Engineering students only.
12 NQF credits at HEQSF level 6; 12 credits, 24 lectures, 4 tutorials, 5 laboratories, 1 project (equivalent to 2 tutorials and 1 laboratory.
Convener: Professor A Baghai-Wadji

Course entry requirements: EEE2031S
Course outline:
Module B of EEE2039W.
This module on digital electronics aims to develop an understanding of digital systems and information representation, binary logic, Boolean algebra, combinational circuits, design concepts and procedures, arithmetic functions, sequential circuits, and state automata.
Lecture times: Tues, Thurs 3rd period
DP requirements: 1) 80% lab and tutorial attendance, 2) 50% mark for laboratories
Assessment: Tutorials, Laboratories, Project (20%), Class Tests (20%), June Examination (60%).

EEE3063F   TRANSMISSION LINES
For EC students only
10 NQF credits at HEQSF level 7
Convener: Associate Professor A Wilkinson
Course entry requirements: EEE2039W, MAM2083F
Course outline:
Module B of EEE3055W. This module provides an introduction to transmission lines for low and high frequency engineering. Topics include: Overhead 3-phase power transmission lines. Short, medium and long line models. RF and microwave transmission lines, coaxial lines, microstrip, wave guides and fibre optic transmission lines. Equivalent circuit and line constants, two port equations, propagation, attenuation and phase constant, characteristic impedance, incident and reflected waves, reflection coefficient, the Smith Chart, standing waves, high frequency loss-less lines, and line matching examples.
Lecture times: Tues, Wed, 1st period
DP requirements: Satisfactory completion of coursework.
Assessment: Laboratories (10%), Class Test (10%), June Examination (80%).

EEE3064W   DIGITAL ELECTRONICS & MICROPROCESSORS
16 NQF credits at HEQSF level 7
Convener: Professor MR Inggs
Course entry requirements: EEE2039W
Course outline:
This course aims to develop an advanced understanding of digital electronics with emphasis on VHDL, algorithmic state machine design methods and computer architecture.
Lecture times: Sem 1: Thurs, Fri 4th period.   Sem 2: Tues, Fri 3rd period.
DP requirements: Completion of at least half of the laboratories and minimum of 40% in at least two class tests
Assessment: Tutorials and Laboratories (10%), Projects (24%), November Examination (66%).

EEE3067W   DIGITAL ELECTRONICS & MICROPROCESSORS
For Science students only. Please see the Science Faculty Handbook for further details.
24 NQF credits at HEQSF level 7
Course outline:
Refer to EEE3064W and EEE4096F.
Assessment: As for EEE3064W and EEE4096F. Credit weighted

EEE3068F   ELECTRONIC CIRCUITS
12 NQF credits at HEQSF level 7
Convener: Associate Professor AK Mishra
Course entry requirements: EEE2038W, EEE2039W
Course outline:
This course aims to develop an advanced understanding of frequency analysis of circuits. Topics include: manual Bode plot techniques for plotting magnitude and phase, breakpoints analysis.

Operational amplifiers; design of circuits using opamps, practical limitations, frequency response, stability. Noise in circuits. Introduction to analogue filters. Oscillators. Use of Spice-based simulation software to simulate electronic circuits. Laboratory practicals in building and testing of circuits on bread-board, power supplies, switched mode circuits, and mixed signal systems.
Lecture times: Mon,Tues, Wed, 5th period
DP requirements: Completion of all Laboratory experiments successfully
Assessment: Assignments (15%), Class Test (25%), June Examination (60%).

EEE3069W   CONTROL ENGINEERING

Electrical and Mechatronics Students only.
20 NQF credits at HEQSF level 7; Tutorials as required, practicals as required, design project..
Convener: Mr MS Tsoeu
Course entry requirements: MAM2084S/F, EEE2035F, EEE2038W, EEE2039W.
Course outline:
Module A (1st Semester): Lecturer: Professor E Boje
10 NQF credits at level 7; 24 lectures, tutorials as required, practicals as required, design project.
Outline: This module aims to develop an advanced understanding of control engineering. Topics include: Terminology: open and closed loop configurations, block diagrams, dynamic system modelling, transient response, steady state error criterion. System stability: Routh Hurwitz criterion, Root Locus. Frequency response: Nyquist plots, Bode diagrams, Nichols Charts. Compensation: Lead-lag circuits, minor loops, feed forward and three-term controllers. Sensitivity analysis and identification techniques are also covered.
Lecture times: Mon, Wed, Fri 3rd period
DP Requirements: 1) 100% Laboratory attendance, 2) Completion of all assigned class work, 3) Pass ECSA ELO 3 evaluation
Assessment: Semester mark (20%), June Examination (30%)

Module B (2nd Semester): Lecturer: Mr MS Tsoeu
10 NQF credits at level 7; 24 lectures, tutorials as required, practicals as required, design project.
Outline: This module aims to develop an advanced understanding of sampled data systems: Topics include: z-transforms, hold circuits, pulse transfer 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: Tues, Thurs 5th period.
DP Requirements: 1) 100% Laboratory attendance, 2) Completion of all assigned class work
Assessment: Semester mark (20%), November Examination (30%)

Overall Assessment for EEE3069W: Year Mark (40%), Examination (60%) (1st sem plus 2nd sem)
Assessment: Year mark.40% November Examination 60%

EEE3070S   MEASUREMENT & MICROPROCESSORS

For Electro-Mechanical Engineering students.
8 NQF credits at HEQSF level 6
Convener: Ms J Mwangama
Course outline:
Module D of EEE 2039W. 8 NQF credits at level 6, 24 lectures.
Lecturer: Ms J Mwangama
Outline: This module aims to introduce students to how a microcontroller works and how to develop microcontroller based systems. It contains a strong practical element in terms of setting up a development toolchain and writing code in both assembly and C. In order to facilitate this learning, students will build a microcontroller development kit, write and debug code and interface with peripheral modules such as GPIO pins, ADCs and timers. Interrupts will also be explored.
Lecture times: Thurs, Fri, 3rd period
DP requirements: 50% average for practical exams

Assessment: Group practicals (15%), Class test (5%), Tutorials (10%), Practical exam (10%), November exam (60%)

EEE3073S   PROFESSIONAL COMMUNICATION STUDIES
For Electrical Engineering, Electrical and Computer Engineering and Mechatronics students. Second-year students may not register for EEE3073S.
12 NQF credits at HEQSF level 7
Convener: Associate Professor J English
Course entry requirements: All first year courses plus 72 credits of second year courses completed.
Course outline:
This course in professional communication aims to develop effective reporting. It covers the requirements for written and oral reports in terms of planning, organisation and selection of information, as well as linguistic style and final presentation. Students will need to demonstrate proficiency in both formats.
Lecture times: Fri, 4th & 5th period
DP requirements: 100% Attendance and 50% minimum class test average
Assessment: Projects (37.5%), Class Test (12.5%), Oral Examination (25%), November Examination (25%).

EEE3074W   EMBEDDED SYSTEMS
20 NQF credits at HEQSF level 7
Convener: Dr A. Patel
Course entry requirements: CSC2001F, CSC2002S, EEE2039W or equivalent.
Course outline:
This course aims to provide an advanced introduction to the design and programming of an embedded system, controlled, for example, by a RISC processor. After the initial embedded coding practice, the tool chains for loading, testing and debugging the code are introduced, followed by more advanced topics of hardware/software interfacing. By the end of the course embedded operating systems are used. The implications of multitasking, realtime operations, safety and maintenance are covered.
Lecture times: Semester 1: Tues, Thurs 6th period.   Semester 2: Weds, Thurs. 3rd period.
DP requirements: 1) Completion of all labs, 2) Pass ECSA ELO 5 evaluations
Assessment: Quizzes (20%), Laboratory & Practicals (10%), Projects (20%), June Examination (25%), November Examination (25%)

EEE3077W   DIGITAL & EMBEDDED SYSTEMS
For Science students only. Please see the Science Faculty Handbook for further details.
36 NQF credits at HEQSF level 7
Course outline:
EEE3064W and EEE3074W
DP requirements: As for EEE3064W and EEE3074W
Assessment: As for EEE3064W and EEE3074W. Credit weighted

EEE3078W   DIGITAL EMBEDDED & ADAPTIVE SYSTEMS
For Science students only. Please see the Science Faculty Handbook for further details.
48 NQF credits at HEQSF level 7
Course outline:
EEE3064W, EEE3074W and EEE4096F
DP requirements: As for EEE3064W, EEE3074W and EEE4096F
Assessment: As for EEE3064W, EEE3074W and EEE4096F. Credit weighted

EEE3079W EMBEDDED & ADAPTIVE SYSTEMS

For Science students only. Please see the Science Faculty Handbook for further details.
28 NQF credits at HEQSF level 7
Course outline:
EEE3074W and EEE4096F
DP requirements: As for EEE3074W and EEE4096F.
Assessment: As for EEE3074W and EEE4096F. Credit weighted

EEE3081F CONTROL ENGINEERING A

For Electrical and Computer Engineering Students only.
10 NQF credits at HEQSF level 7
Convener: Mr MS Tsoeu
Course entry requirements: MAM2084S/F, EEE2035F, EEE2038W, EEE2039W.
Course outline:
Lecturer: Professor E Boje
This course aims to develop an advanced understanding of: Terminology: open and closed loop configurations, block diagrams, dynamic system modelling, transient response, steady state error criterion. System stability: Routh Hurwitz criterion, Root Locus. Frequency response: Nyquist plots, Bode diagrams, Nichols Charts. Compensation: Lead-lag circuits, minor loops, feed forward and three-term controllers. Sensitivity analysis. Identification techniques.
Lecture times: Mon, Wed & Fri, 3rd period
DP requirements: 1) 100% Laboratory attendance, 2) Completion of all assigned class work, 3) Pass ECSA ELO3 evaluation.
Assessment: Year Mark (40%), June Examination (60%)

EEE3082S CONTROL ENGINEERING B

For Electrical and Computer Engineering Students only.
10 NQF credits at HEQSF level 7
Convener: Mr MS Tsoeu
Course entry requirements: EEE3081F (DP).
Course outline:
Lecturer: Mr MS Tsoeu
This course aims to develop an advanced understanding of sampled data systems: z-transforms, hold circuits, pulse transfer 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: Tues,Thurs, 5th period
Assessment: Year Mark (40%), November Examination (60%)

EEE3083F COMMUNICATION SYSTEM & NETWORK DESIGN 1

12 NQF credits at HEQSF level 7; 36 lectures; tutorials and practicals as required..
Convener: Associate Professor O Falowo
Course entry requirements: EEE2039W
Course outline:
Lecturers: Associate Professor M Dlodlo and Associate Professor O Falowo
This course is an advanced introduction to Networks: Internet, protocol, network edge, core network and access networks, circuit switching and packet switching, LAN topology, physical media, layered architecture, performance, protocol model. Application layer: service, client-server paradigm, network applications: web and http, ftp, email, ssh, DNS, p2p file sharing, socket programming. Transport layer: transport layer services, multiplexing/demultiplexing, Network layer: Introduction, virtual circuit and datagram networks, router, Internet Protocol datagram, fragmentation, IPv4, Physical layer: Digital information, Digital communication system, Sampling, Pulse modulation, Quantization, Pulse code modulation, Bandpass modulation schemes ASK, FSK, PSK, Phase-shift

keying and amplitude phase keying in vector representation, Orthogonal frequency shift keying, and QPSK.
Lecture times: Mon, Wed, Fri 1st period.
Assessment: Tutorials & Laboratories (14%), Class Test (36%), June Examination (50%).

EEE3084W   COMMUNICATION SYSTEM & NETWORK DESIGN

24 NQF credits at HEQSF level 7
Convener: Associate Professor O Falowo
Course entry requirements: EEE2039W
Course outline:
Divided into Modules A and B.

Module A (First Semester): Communication system and network design I
12 NQF credits at level 7; 36 lectures; tutorials and practicals as required.
Lecturers: Associate Professor M Dlodlo and Associate Professor O Falowo
Outline: This module is an advanced introduction to Networks: Internet, protocol, network edge, core network and access networks, circuit switching and packet switching, LAN topology, physical media, layered architecture, performance, protocol model. Application layer: service, client-server paradigm, network applications: web and http, ftp, email, ssh, DNS, p2p file sharing, socket programming. Transport layer: transport layer services, multiplexing/demultiplexing. Network layer: Introduction, virtual circuit and datagram networks, router, Internet Protocol datagram, fragmentation, IPv4, IPv6,Physical layer: Digital information, Digital communication system, Sampling, Pulse modulation, Quantization, Pulse code modulation, Bandpass modulation schemes ASK, FSK, PSK, Phase-shift keying and amplitude phase keying in vector representation, Orthogonal frequency shift keying, and QPSK.
Lecture times: Mon, Wed, Fri 1st period.
DP requirements: 100% Completion of laboratory assignments and tutorials; minimum of 50% for laboratory assignments.
Assessment: Tutorials and Laboratories (14%), Class Test (36%), June Examination (50%).

Module B (Second Semester): Communication system and network design II
12 NQF credits at level 7; 36 lectures; tutorials and practicals as required.
Lecturers: Associate Professor M Dlodlo and Associate Professor O Falowo
Outline: This module aims to develop an advanced understanding of the Transport layer: UDP, reliable data transfer, TCP, connection management, congestion and congestion control. Network layer: ICPM, IPv6, link-state algorithm, distance vector routing algorithm, routing in internet, broadcast and multicast routing. Data link layer: link layer services, error detection and correction. Multiple access : TDMA, Aloha, CSMA, LAN technologies: IEEE 802 family, MAC, LAN addressing, ARP, Ethernet, Token Rings, hubs and switches, PPP, ATM, MPLS, all IP networks. Physical layer : Information theory and entropy, Channel capacity, source coding, probability of error, Eb/n performance, matched filter detection, ISI and pulse shaping, equalisation, bandpass demodulation / detection schemes with ASK, FSK, PSK, probability or error with bandpass detection, and MSK.
Lecture times: Wed, Thurs, Fri 1st period.
DP requirements: Completion of laboratory assignments and tutorials, and at least 40% class mark.
Assessment: Tutorials and Laboratories (14%), Class Test (36%), November Examination (50%).

EEE3085S   COMMUNICATION SYSTEMS &NETWORK DESIGN 2

Telecommunication Stream: This fundamental course in telecommunication is pre-requisite to all 4th year telecommunication courses.
12 NQF credits at HEQSF level 7; 36 lectures; tutorials and practicals as required..
Convener: Associate Professor O Falowo
Course entry requirements: EEE2039W, EEE3083F

Course outline:
Lecturers: Associate Professor M Dlodlo and Associate Professor O Falowo
This course aims to develop an advanced understanding of the Transport layer: UDP, reliable data transfer, TCP, connection management, congestion and congestion control. Network layer : ICPM, IPv6, link-state algorithm, distance vector routing algorithm, routing in internet, broadcast and multicast routing. Data link layer: link layer services, error detection and correction. Multiple access : TDMA, Aloha, CSMA, LAN technologies: IEEE 802 family, MAC, LAN addressing, ARP, Ethernet, Token Rings, hubs and switches, PPP, ATM, MPLS, all IP networks. Physical layer : Information theory and entropy, Channel capacity, source coding, probability of error, Eb/n performance, matched filter detection, ISI and pulse shaping, equalisation, bandpass demodulation / detection schemes with ASK, FSK, PSK, probability or error with bandpass detection, and MSK.
Lecture times: Wed, Thurs, Fri, 1st period
DP requirements: 100% completion of laboratory assignments and tutorials; minimum of 50% for laboratory assignments
Assessment: Tutorials & Laboratories (14%), Class Test (36%), Written examination (50%).

EEE3086F   SIGNALS & SYSTEMS II
12 NQF credits at HEQSF level 7
Convener: Associate Professor A Wilkinson
Course entry requirements: EEE2035F, EEE2036S
Course outline:
This course aims to develop an advanced understanding of signals and systems. Topics include: time domain and fourier domain analysis of linear systems. Power spectral density. Propagation of signals through linear systems. Filter concepts. Noise in linear systems. Calculation of signal to noise ratio. Decibel calculations. Amplitude modulation and demodulation. Frequency division multiplexing. Heterodyning (shifting in frequency). Angle Modulation. Applications: telecommunications transmitters and receivers; instrumentation. Some examples of non-linear systems will also be discussed; for example the generation of harmonics at the output of a non-linear time-invariant system.
Lecture times: Mon, 4th period; Thurs, Fri, 5th period
DP requirements: Submission of drill problems, assignments and laboratory reports
Assessment: Tutorials and laboratories (10%), Class Tests (20%), June Examination (70%).

EEE3087S   ELECTROMAGNETIC FIELD THEORY
10 NQF credits at HEQSF level 7
Convener: Associate Professor RH Geschke
Course entry requirements: MAM2083F, EEE2038W, EEE2039W, PHY2010S (or approved equivalents)
Course outline:
Module A of EEE3055W: This module aims to develop an advanced understanding of electromagnetic field theory in an electrical engineering context. Time-varying electromagnetic fields; Maxwell's equations; continuity and displacement current; basis of Kirchhoff's laws; propagation of plane waves in lossless and lossy media; power density and Poynting vector; reflection and refraction of plane waves; and antenna radiation.
Lecture times: 2nd Semester: Thurs, Fri 2nd period. Tutorials: Wed, 3rd & 4th period
DP requirements: 50% average for the best 6 out of 9 class tests
Assessment: Class Tests (30%), November Examination (70%).

EEE4001F   DIGITAL SIGNAL PROCESSING
20 NQF credits at HEQSF level 8; Tutorials and practicals as required.
Convener: Associate Professor F Nicolls
Course entry requirements: EEE3086F or EEE3069W or equivalent.
Course outline:

Lecturers: Professor A Baghai-Wadji and Associate Professor F Nicolls
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 theory and application of wavelets and frames.
Lecture times: Wed 3rd & 4th period; Thurs & Fri 4th period
DP requirements: Satisfactory completion of coursework.
Assessment: Project & Assignments (20%), Class Test (20%), June Examination (60%).

EEE4006F   PROFESSIONAL COMMUNICATION STUDIES
For Electrical Engineering, Electrical and Computer Engineering and Mechatronics students.
8 NQF credits at HEQSF level 8
Convener: Associate Professor J English
Course entry requirements: EEE3073S
Co-requisites: EEE4051F
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) 100% attendance and 50% minimum class test average. 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/F   RESEARCH PROJECT
40 NQF credits at HEQSF level 8
Convener: 1st sem: Associate Professor P Barendse and 2nd sem:Associate Professor D O'Hagan
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 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%)

EEE4036C/A   ELECTRICAL ENGINEERING DESIGN
8 NQF credits at HEQSF level 8
Convener: Associate Professor RH Geschke
Course entry requirements: EEE3083F, EEE3069W or EEE3086F or EEE3057S

Course outline:
1st sem Lecturer: Associate Professor RH Geschke
2nd sem Lecturer: Associate Professor AK Mishra
This course aims to synthesis the prior material in the EE, CE and ME degrees, in the context of professional project and design work. Topics include: The design environment - Project, production and manufacturing processes. The pessimistic mind view - worst-case design, tolerances, reliability and statistical yield. Standards and codes. STEEP analysis - social, technical, environmental, economic and political context. EDA and CAD. Design methods - Synthesis of candidate concepts and selection of an optimum concept; development of specifications and user requirements; modelling, simulation, reality checks; design work; qualification and acceptance tests; documentation. Case histories. A Formal Design Methodology - Common features of formal design methodologies. IBM's Rational Unified Process. Phases and iterations - inception, elaboration, construction, transition. Disciplines - business modelling, requirements gathering, analysis and design, implementation, testing, deployment, project management, configuration and change management, environment. History of Engineering Design and Synthesis (EDS); Conceptual changes in EDS in 1990's and 2000's; Predictive analysis of future development. Students working individually as well as in groups will tackle a design topic, leading to the submission of design projects.
Lecture times: 1st Sem: Mon, Wed, Thurs, Fri, 1st period
2nd Sem: Tues, Wed, Thurs, Fri, 4th period
DP requirements: Pass ECSA ELO 3 (Engineering Design)
Assessment: 1st sem: Design Assignment I (50%), June Examination (50%); 2nd sem: Design Assignment I (50%), September Examination (50%)

EEE4051F   NEW VENTURE PLANNING
8 NQF credits at HEQSF level 8
Convener: Professor P Martinez
Course entry requirements: EEE2038W, EE2039W or equivalent, EEE3073S, MAM2084S
Co-requisites: EEE4006F
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 5
Assessment: Test (10%), Business Plan (60%). Two hour exam (30%).

EEE4084F   DIGITAL SYSTEMS
20 NQF credits at HEQSF level 8
Convener: Dr S Winberg
Course entry requirements: CSC3021F, EEE3064W or EEE3017W (>70%).
Course outline:
This advanced course in digital systems aims to develop an understanding of the design of high performance and special-purpose digital computing systems. Topics include: design and programming of parallel processors, reconfigurable computing, and application-specific parallel processing accelerators with consideration of intellectual property and VLSI aspects of these products. The course is divided into two parts, one part per term. Part 1 covers parallel computing principles and techniques; part 2 involves designing and prototyping application accelerators using Hardware Description Languages (HDLs) and FPGA platforms. This course has a significant portion of project-based learning, together with theory delivered in lectures. There are four practicals: Part 1 practicals cover Pthreads, the CUDA graphics processing unit coding framework, and OpenMP and Cloud Computing. Part 2 has one practical involving the Verilog HDL and

familiarizing students with an FPGA platform. There are two projects in this course: Part 1 has a smaller project concerning the design of special-purpose processor architecture. The Part 2 is a larger project and involves the design and prototyping of an FPGA-based accelerator implemented using a FPGA evaluation platform. The lecture sessions include presentations by lecturers, seminars and workshops during which students learn fundamental theories, brainstorm ideas, and discuss influential and recent publications in the field.
Lecture times: Tues 2nd & 7th periods; Thurs 6th & 7th periods
DP requirements: Coursework assessment mark of at least 40%.
Assessment: Tutorials & Laboratories (10%), Projects (20%), Class Test (20%), Other (10%), June Examination (40%). **Website:** http://www.rrsg.uct.ac.za/EEE4084F

EEE4086F   MICROWAVE ENGINEERING
16 NQF credits at HEQSF level 8
Convener: Associate Professor RH Geschke
Course entry requirements: Prerequisites: EEE3086F or EEE3069W
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: Mon, Wed, Thurs, Fri, 5th period. Practicals Mon 2pm to 3.45pm
DP requirements: Submission of practical assignment and satisfactory attendance of practicals
Assessment: Class test (20%), Practical assignments (30%), June Examination (50%).

EEE4087F   MOBILE BROADBAND NETWORKS
20 NQF credits at HEQSF level 8
Convener: Associate Professor O Falowo
Course entry requirements: EEE3055W or EEE3063F; EEE3085S, EE3083F, EEE3084W, EEE3086F or equivalent.
Course outline:
This advanced course aims to develop an understanding of mobile broadband networks and includes selected topics in (1) wireless and fixed access networks (16 lectures), (2) mobile broadband transport and services (16 lectures), and (3) broadband networks (16 lectures).

Wireless and Fixed Access Networks: Lecturer: Associate Professor O Falowo
Wireless Network Fundamentals (architecture and components, protocols and standards, cellular concept and cellular system fundamentals, call splitting and sectoring). Wireless Access Technologies (GSM and General Packet Radio Service 2.5G Wireless, 3G Wireless, 4G Wireless, and 5G Wireless Networks. Wireless LAN, Bluetooth Network, Ad hoc Networks, Sensor Area Networks, and Heterogeneous Wireless Networks). Fixed Access Networks, Radio Resource Management, and Mobility Management.

Broadband Networks: Lecturer: Ms J Mwangama
TCP Traffic Control, Traffic and Congestion Control in ATM Networks, Performance Evaluation of Communication Networks, QoS in Packet Networks, QoS Metrics, IP QoS Functional Requirements, IP Integrated Services and Differentiated Services, QoS in ATM networks; IP Traffic Engineering; Router Architectures and IP Address Lookup Algorithms; Quality of Service Routings; Deploying Quality of Service. Network Convergence; Network Trends; Evolution and Market Internetworking; Hierarchical TDM networks, Internet, LAN/SOHO and Access Networks, WAN application requirements; Software Defined Networks.

Networks and Services Management: Lecturer: Dr A Murgu

Mathematical Analysis, Computer Simulations and Markov Analysis, Networks on Queues, Traffic Characterisation for Broadband Services ,QoS; Service Platforms, AAA, VoIP, API (Parlay, JAIN); Next Generation Networks; Multiservice platforms, Soft-switch, Data Plane Technology, Multiplexing, Routing, MPLS, Routing and Traffic Engineering with MPLS, L2/L3/L4, switching; Control Plane Technology, Signalling, Call Set Up and Connection Control (SS7, H.323, SIP, MGCP); Applications: Telephony, Packet voice, Streaming.

Lecture times: Mon 2nd, Tues, Thurs, Fri, 3rd periods

DP requirements: 1) 100% Tutorial submission and lab attendance. 2) Pass ECSA ELO evaluations in the projects. 3) 50% Lab Mark.

Assessment: Tutorials, Laboratory and Projects (35%), Class Test (15%), June Examination (50%).

EEE4088F   COMMUNICATION ENGINEERING

16 NQF credits at HEQSF level 8; Practical exercises and tutorials as required, and design projects..

Convener: Associate Professor M Dlodlo

Course entry requirements: EEE3086F or equivalent.

Course outline:

The course aims to enhance an understanding of and competence in analysing and possibly designing contemporary digital communication systems, and to extend the study of principles of communication engineering towards current topics including selections from: Elements of information theory, error-control coding, random processes and spectral analysis, sources, source coding and baseband signalling, bandpass modulation and demodulation/detection, synchronisation, resource allocation, communication link analysis, and examples of system design.

Lecture times: Mon 5th; Wed,Thurs, Fri, 2nd period

DP requirements: Minimum 40% class marks in completion of coursework

Assessment: Semester mark (40%), June Examination (60%).

EEE4089F   POWER DISTRIBUTION & TRANSMISSION NETWORKS

20 NQF credits at HEQSF level 8

Convener: Mrs K Awodele

Course entry requirements: EEE3057S

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, electrification, delivery process and pricing, substations, distributed generation, power system protection, high voltage engineering, and power system reliability and power quality.

Lecture times: Wed 3rd & 4th; Thurs & Fri4th periods

DP requirements: 1) 100% Laboratory attendance and submission. 2) At least 50% mark for laboratories.3) Pass ECSA ELO 1 & evaluations, 4) 100% attendance of site visits

Assessment: Laboratory Assignments (10%), Project and Site Visits (10%), Class Tests (20%), June Examination (60%).

EEE4090F   POWER SYSTEMS ANALYSIS, OPERATION & CONTROL

20 NQF credits at HEQSF level 8

Convener: Professor KA Folly

Course entry requirements: EEE3057S

Course outline:

Lecturers: Professor KA Folly and Dr D Oyedokun

This course aims to develop an advanced understanding of power systems analysis, operation and control. Topics include: Load flow studies, fault calculation, power system operations, power

system stability and control, grid connections of distributed generator (DG) high voltage DC transmissions systems and electricity market.

Lecture times: Monday, 2nd & 8th period; Tuesday, 1st & 3rd period

DP requirements: 1) Satisfactory completion of coursework 2) Continuous assessment mark of at least 40% based on test marks

Assessment: Projects (16%), Class Test (24%), June Examination (60%).

EEE4093F   PROCESS CONTROL & INSTRUMENTATION

20 NQF credits at HEQSF level 8

Convener: Mr MS Tseou

Course entry requirements: EEE3069W or equivalent

Course outline:

Lecturers: Professor E Boje, Professor KA Folly, Mr MS Tseou, Ms R Verrinder

This course aims to provide an integrated view of the principles and practice of modern industrial control and its applications. Topics include: measurement of physical variables, industrial transducers, integration of programmable logic controllers (PLCS), supervisory control and data acquisition (SCADA) systems and management information systems (MIS), signal transmission and conditioning, microcontrollers, computer interfacing, realtime multitasking in computer control, nonlinear and advanced control methods.

Lecture times: Mon 6th, Wed 6th, Fri 6th and 7th period.

DP requirements: 1) 100% Laboratory attendance and submission. 2) Completion of all assigned class work 3) Pass ECSA ELO 1 & 2 evaluations.

Assessment: Project (20%),   Assignments & Class Tests (20%), June Examination (60%)

EEE4096F   NEURAL, FUZZY & EVOLVING SYSTEMS

8 NQF credits at HEQSF level 8; Project/s..

Convener: Emeritus Professor J Greene

Course entry requirements: All third year core courses

Course outline:

This advanced course aims to develop an understanding of neural, fuzzy and evolving systems. Topics include: an introduction to pattern recognition, machine learning and stochastic optimisation. In addition the course provides practical hands-on introduction to programming in Matlab with additional introductory tutorials for those unfamiliar with Matlab.

Lecture times: Tuesday &Wednesday, 6th period

DP requirements: 80% submission of all assignments, satisfactory completion of hands-on proficiency test.

Assessment: November examination 2 hours

EEE4099F   ELECTRICAL MACHINES & POWER ELECTRONICS

20 NQF credits at HEQSF level 8

Convener: Associate Professor M A Khan

Course entry requirements: EEE3031S or EEE3057S or equivalent.

Course outline:

Lecturers: Associate Professor MA Khan, Professor P Pillay

This course aims to develop an advanced understanding of electrical machines and power electronics. Topics include: Switching and conduction losses of power semi-conductor devices. Uncontrolled and controlled naturally commutated/converters. DC to DC converters; Power & Power factors in non-sinusoidal systems. Unipolar and bipolar pulse width modulated schemes. Space vector modulation, Half-bridge and full-bridge configurations for single and three phase converters. The analytical models of DC and AC machines are analysed and methods of achieving speed control are discussed. The characteristics of each machine under variable speed operation are studied. Modern four-quadrant DC and AC Drive topologies are discussed together with their control objectives and performance. Topics on specialised electrical machines are also presented.

Lecture times: Mon 3rd & 4th; Thurs & Fri 5th
DP requirements: 1) 100% Laboratory attendance and submission. 2) 50% mark for laboratories
Assessment: Project (5%), Class Tests (35%), June Examination (60%).

EEE4101F   NUCLEAR POWER ENGINEERING
20 NQF credits at HEQSF level 8; 3 Lab sessions.
Convener: Associate Professor MA Khan
Course entry requirements: EEE3057S or EEE3044S
Course outline:
Lecturers: Emeritus Professor CT Gaunt, Associate Professor MA Khan, Mrs R Smit, Ms R Verrinder, Professor DG Aschman, Dr S Petersen

Common discipline component (24 lectures)
This advanced course aims to develop an understanding of nuclear power engineering. Topics include: Development of nuclear engineering: atomic models, relativity, x-rays, nuclear reactions Introduction to nuclear engineering: radioactivity, nuclear and neutron physics, radiation protection, fission and fusion reactor concepts. Nuclear fuel cycle: production, handling and use of nuclear fuel and the safe disposal of waste Nuclear reactor theory: introduction to neutron diffusion theory, neutron moderation, conditions for criticality of nuclear reactors, heat extraction, reactor statics and dynamics, shut down and restart. Materials in nuclear engineering: interaction of radiation with matter Radiation protection: theory and practice of radiation dosimetry, Reactor engineering and design. Environmental aspects: evaluation of effects of radioactivity added to the environment by human activities Regulatory: reactor operator licensing, nuclear safety, and reactor operations.

Electrical engineering component (24 lectures) Nuclear energy: global and national energy requirements, integration of nuclear power with other sources. Nuclear power plant systems: conventional and advanced generation power reactors, coupling of reactor and power plant, nuclear simulators; electrical systems in nuclear engineering: design methodology, problem formulation, criteria, trade-off decisions and design optimization; case studies. Instrumentation: behaviour of various nuclear radiation detectors; design and application of radiation dosimeter systems for personnel monitoring, area radiation monitoring and accident situation, nuclear reactor flux distributions, temperatures and transients. Control systems: measurement and control of fundamental parameters for nuclear plant operation and safety.
Lecture times: Tuesday & Thursday, 2nd period Monday & Wednesday 5th period
DP requirements: 1) 100% Laboratory attendance and submission. 2) 50% mark for laboratories. 3) 100% Attendance of site visit where appropriate
Assessment: Tutorials, Labs, Projects and Assignments (10%), Class Test (15%), June Examination (75%).

EEE4103F   NUCLEAR POWER SOURCES
For Mechanical, Electro-mechanical and Chemical Engineering students only.
12 NQF credits at HEQSF level 8; 3 Lab sessions.
Convener: Associate Professor M A Khan
Course entry requirements: EEE3044S or 2nd year Chemical Engineering
Course outline:
Lecturers: Emeritus Professor CT Gaunt, Professor DG Aschman, Dr S Petersen
Module A of EEE4101F
This advanced course aims to develop an understanding of nuclear power sources. Topics include: Development of nuclear engineering: atomic models, relativity, x-rays, nuclear reactions Introduction to nuclear engineering: radioactivity, nuclear and neutron physics, radiation protection, fission and fusion reactor concepts. Nuclear fuel cycle: production, handling and use of nuclear fuel and the safe disposal of waste Nuclear reactor theory: introduction to neutron diffusion theory, neutron moderation, conditions for criticality of nuclear reactors, heat extraction, reactor statics and dynamics, shut down and restart. Materials in nuclear engineering: interaction of radiation with matter Radiation protection: theory and practice of radiation dosimetry, Reactor engineering and

design. Environmental aspects: evaluation of effects of radioactivity added to the environment by human activities. Regulatory: reactor operator licensing, nuclear safety, and reactor operations.
Lecture times: Monday & Wednesday 5th period
DP requirements: 1) 100% Laboratory attendance and submission, 2) 50% mark for laboratories, 3) 100% Attendance of site visit where appropriate.
Assessment: Tutorials, Labs, Projects, Assignments (10%), Class Tests (15%), Examination (75%).

EEE4104C   ELECTRICAL MACHINES & DRIVES
10 NQF credits at HEQSF level 8
Convener: Associate Professor P Barendse
Course entry requirements: EEE3069W, EEE3031S or EEE3057S.
Course outline:
This course is an advanced 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, Thurs, Frid, 2nd periods
DP requirements: No requirements
Assessment: Tutorial (10%), Projects (10%), Class Tests (20%), September Examination (60%).

MECHANICAL ENGINEERING

The Department offers the following Undergraduate Degree Programmes:

BSc(Eng) Degree Programmes in
Electro-Mechanical 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

Professor and Head of Department:
RD Knutsen, BSc PhD *Cape Town* MSAIMM MSAIMechE

Deputy Heads of Department:
Research: Professor GS Langdon, BEng PhD *Liverpool* MIMechE CEng
Teaching: Associate Professor CJ von Klemperer, BSc(Eng) MSc(Eng) PhD *Natal*

Professors:
T Bello-Ochende, PrEng B.Eng M.Eng *Ilorin* PhD *Duke* MASME.
PG Rousseau, PrEng BEng (Mech) MEng (Mech) PhD *Pret* OPM *HBS*
H Winkler, MSc, *Berkley* MA PhD *Cape Town*

Emeritus Professor:
KF Bennett, BSc(Eng) *Cape Town* MSc CNAA PhD *Cape Town* FSAIMechE
J Gryzagoridis, PrEng BSc(Eng) *Lamar* MSc(Eng) *Texas A&M* PhD *Cape Town* MSAIMechE M(SA)IRAC M(SA)INT M(SAAM) M(N.YORK) ACAD.SCIENCES
C Redelinghuys, PrEng BIng(Hons) *Stell* MS *Stanford* PhD *Stell* MSAIMechE
RB Tait, PrEng BSc(Hons) *Rhodes* MA *Oxon* BSc(Eng) PhD *Cape Town* MSAIMechE

Adjunct Professor:
L Jestin, MSc(Eng) PhD *Marseille* HDR Provence
ADB Yates, BSc(Eng) MSc(Eng) PhD *Cape Town* MSAIMechE

SARChI Professor in Industrial CFD:
AG Malan, PrEng BEng (Mech) MEng (Mech) *Pret* PhD *Swansea*

Honorary Professor:
D Karagiozova, PhD *Ukrainian Academy of Science*

Associate Professors:
BI Collier-Reed, PrEng MSc(Eng) PhD *Cape Town* FSAIMechE
R Kuppuswamy, BEng(Hons) MTech PhD *Singapore* SMSME
HD Mouton, BSc Eng *Pretoria* BSc *Unisa* B Eng Hons M Eng *Pretoria* PhD Eng *NWU*

Senior Lecturers:
S Chung Kim Yuen, BSc(Eng) MSc(Eng) PhD *Cape Town*
TJ Cloete, BIng *Stell* MIng *Stell*
C Findeis, NHD(Mech Eng) *Pret*
D Findeis, BSc(Eng) MSc(Eng) *Cape Town* MSAIMechE
WF Fuls, BSc(Eng) MSc(Eng) PhD(Eng)*NWU*

SL George, BSc(Eng) MSc(Eng) PhD *Cape Town*
R Govender, BSc(Eng) MSc(Eng) PhD *Cape Town*
EB Ismail, BSc(Eng) MSc(Eng) *Cape Town*
BC Kloot, BSc(Eng) MSc(Eng) PhD *Cape Town* (Academic Development Lecturer)
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) *Cape Town*
G Vicatos, PrEng BSc(MechElec)(Marine) *Newcastle* MSc(Aero) DIC *London* PhD *Cape Town*

Lecturers:
T Booysen*,* BSc(Eng) MSc(Eng) *Cape Town*
MN Ngoepe, BSc(Eng*)Cape Town,* DPhil *Oxon*

Part-Time Lecturers:
Adv J Evans, BA LLB *Cape Town*

Principal Technical Officers:
H Emrich
J Mayer
P Smith
H Tomlinson

Chief Technical Officers:
D Jacobs
R Whittemore

Senior Technical Officer:

Part-Time Technical Officer:
T Newins

Laboratory Attendants:
G Doolings
P Jacobs
W Slaverse

Departmental Manager
CM Thomas HED BSc *Unisa* BSc(Hons) *NWU* MSc(MCM) *Natal* PGDip in Educational
   Technology *Cape Town*

Administrative Assistant (Finance):
B Glass

Administrative Assistant (Undergraduate):
R Maree

Administrative Assistant (Postgraduate):
C Jordaan

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 Electro-Mechanical Engineering and Mechanical Engineering have a common first year curriculum.

Course Outlines

MEC1000X   PRACTICAL TRAINING I
0 NQF credits at HEQSF level 5
Convener: Dr S Chung Kim Yuen
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 vacation following the year of first registration in the Faculty. The evidence of completion must be submitted by 31 March of the next 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 practical drawing 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 practical drawing 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: Associate 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; 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 and satisfactory performance 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.
DP requirements: A minimum of 40% for both semester tests.A completed portfolio of assignments.
Assessment: Assessments during the Semester:2 tests during the semester which will assess skill and interpretation of mechanical drawings in various views.Weekly portfolio assignments will be assessed.**The class mark for the course will consist of the following:**Tests – 25%Portfolio – 15%Exam – 60% (2 hour exam in June examination period)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 as 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.
DP requirements: DP Requirement to Enter the Exam:A minimum of 40% for both tests and a completed portfolio of assignments
Assessment: Assessments during the Semester:1 Theory Test 1 CAD TestAssessed 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 examination period)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 as EXAM WITHOUT ATTENDANCE in the following year. The DP criteria mark may be considered and carried over for one year only.

MEC1017F   PROGRAMMING FOR MECHANICAL ENGINEERS
16 NQF credits at HEQSF level 5
Convener: EB Ismail
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to provide an introduction to programming and algorithms; 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; text files; recursion; and number systems.
Lecture times: 4 Lectures and 1 Tutorial per week.
DP requirements: 45% weighted average for lab / practical work
Assessment: Coursework 40%, Examination 60%

MEC2000X   PRACTICAL TRAINING II
0 NQF credits at HEQSF level 6
Convener: Dr 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 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, but 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.

MEC2022S   THERMOFLUIDS I

16 NQF credits at HEQSF level 6; Second year, second semester course..
Convener: Mr DM Findeis
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to develop an understanding of thermofluids. Topics include: fluids and their properties; basic concepts of thermodynamics; pressure and head; hydrostatics; buoyancy; properties of pure substances; the zeroth and first laws of thermodynamics; the energy equation and its application to closed systems and control volumes; introduction to heat transfer; motion of fluid particles; momentum equation and applications.
Lecture times: 4 Lectures and 1 Tutorial per week. 3 Practicals by arrangement.
DP requirements: At least 80% submission of pop quizzes, a minimum aggregate of 50% for laboratory reports and 40% for class tests.
Assessment: 3 hour November exam (70%); Pop quizzes (10%); 3 laboratory reports collectively (10%); 2 class tests collectively (10%). A subminimum of 40% is required in each section of the November exam.

MEC2023F/S   DYNAMICS I

16 NQF credits at HEQSF level 6; Second year, first semester course..
Convener: Dr B Kloot(Semester 1),Mr T.J.Cloete (Semester 2)
Course entry requirements: MAM1021F/S (or equivalent), MAM1042S, PHY1012F/S.
Co-requisites: None
Course outline:
The objective of this course is to review and extend the fundamental principles and formulations of kinematics and kinetics for Newtonian mechanics in the context of problems involving the dynamics of particles and rigid bodies. Topics include: particle kinematics; curvilinear coordinate systems; particle kinetics; Newton's laws; work and energy; impulse, momentum and impact; rigid body dynamics; plane kinematics and plane kinetics. This course aims to develop an understanding of dynamics.
Lecture times: 4 Lectures and 1 Tutorial per week.
DP requirements: 40% Class test average; Attendance of class & tutorial tests.
Assessment: 3 hour June examination (60%); Class tests (30%); tutorial tests (10%)

MEC2025F   MECHANICS OF SOLIDS I

12 NQF credits at HEQSF level 6; Second year, first semester course..
Convener: Mr S Parker
Course entry requirements: MAM1042S, MAM1021F/S (or equivalent) and PHY1012 F/S,
Co-requisites: None
Course outline:
This course aims to develop an understanding of the mechanics of solids. Topics include: statically determinate systems; free body diagrams; stress-strain relations; elastic constants; statically indeterminate systems; direct stress; shear stress; bending stress; torsional stress; bending moment diagrams; shear force diagrams; deflection of beams; twisting of shufts torsion and struts. Stress and strain transformations; complex stress in 2 dimensions; and Mohr's circle are also covered.
Lecture times: 3 Lectures and 1 Tutorial per week.
DP requirements: 35% class record made of class tests, assignments and participation in all class tests, tutorials.

Assessment: Class Tests 25%, Examination 75%, June examination 3 hours.

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.
Assessment: Assignments count 30%; class test counts 20%; theory examination written in November counts 50%.

MEC2042F   MATERIALS SCIENCE IN ENGINEERING
12 NQF credits at HEQSF level 6
Convener: Professor RD Knutsen
Course entry requirements: CEM1008F or CEM1000W.
Co-requisites: None
Course outline:
This course is an introduction to the science of engineering materials and the relationships between structure and properties. Topics include: Testing for strength, hardness, toughness, fatigue and creep; interpretation of data; elastic and plastic deformation of solids; fracture; visco-elastic and time dependent behaviour; the structure of crystalline, semi-crystalline and amorphous materials; phase equilibrium diagrams; equilibrium and non-equilibrium structures; heat treatment; elements of corrosion science; deterioration and degradation of materials; the principles of reinforcement and design on the properties of composites; the selection of materials; and case studies.
Lecture times: 3 Lectures and 1 Tutorial per week.
DP requirements: 35% minimum of class record.
Assessment: Class record (30%), June examination 3 hours (70%).

MEC2043F   ELECTRICAL & MECHANICAL MATERIALS
12 NQF credits at HEQSF level 6
Convener: Professor R D Knutsen
Course entry requirements: PHY1010W
Co-requisites: None
Course outline:
This course aims to develop an understanding of electrical and mechanical materials. Topics include: models of electrical conduction - development of band theory in metals; semi-conductors and insulators; Semi-conductors - importance of impurities; operation of the p-n junction with reference to materials parameters; utilisation of the band structure of a semi-conductor to produce novel devices; an introduction to engineering materials and the relations of mechanical, electrical and chemical properties to the structure.
Lecture times: 3 Lectures per week.
DP requirements: Write 6 out of 10 class tests.

Assessment: Class tests, June examination 3 hours.

MEC2044S   MACHINE ELEMENT DESIGN I
16 NQF credits at HEQSF level 6
Convener: Dr R Govender
Course entry requirements: MAM1020F/S, MAM1021F/S, PHY1012F/S, PHY1013F/S, MEC1006W, MEC1005W, MAM1042S, MEC2025F. MEC2042F DP requirements met. This course is only available to Mechanical and Electro-Mechanical Engineering students.
Co-requisites: MEC2023S, MEC2022S
Course outline:
This course introduces the basic engineering design process, applied to selection of simple machine components and development of basic machine assemblies. It draws on basic engineering sciences (Solid Mechanics, Materials Science, Dynamics) and applied engineering topics (Manufacturing Processes) to understand how machine components are selected and sized, depending on the required application and function. Computer Aided Modelling and Design (CAD) principles, which are introduced in first year, are developed further in the modelling and analysis of more realistic and complex machine assemblies. Topics to be covered during the course will include: Elementary Design Process; manufacturing processes; tolerances of size and geometry; bearing type selection and sizing; gear type selection and kinematics; flexible drive selection and kinetics; fasteners and Sealing; and design for static strength and stiffness
Lecture times: 2 Lectures and 1 Tutorial per week.
DP requirements: All class tests and all assignments. The weighted average of the class tests and assignments must be 45% or greater to achieve DP. The CAD test will carry a sub-minimum of 35%. Assignments will have highlighted key course outcomes, such as assembly requirements, machining feasibility and engineering drawing conventions. If these outcomes are not met satisfactorily, there will be one opportunity to resubmit. If the resubmission is not to standard, the status will be DPR.
Assessment: Coursework 50%, Examination 50%.

MEC3023F   MECHANICS OF SOLIDS II
12 NQF credits at HEQSF level 7
Convener: Dr R Govender
Course entry requirements: MEC2025F, MAM2083S, MAM2084S (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.
DP requirements: Satisfactory progress in class tests & laboratory reports.
Assessment: Class tests, laboratory reports, June examination 3 hours.

MEC3031S   DYNAMICS II
16 NQF credits at HEQSF level 7
Convener: Dr S Chung Kim Yuen
Course entry requirements: MEC2020W or equivalent, MEC2023F/S, MEC2025F.
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: 3 Lectures per week.
DP requirements: Participation in all tests and assignments and submissions 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; 4 Laboratory sessions.
Convener: Associate Professor G Vicatos
Course entry requirements: MEC2022S
Course outline:
This course on thermofluids aims to develop a more advanced understanding of different types of 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; the velocity of pressure waves in pipes; laminar and turbulent flows in pipes; the Moody diagram; the Pelton wheel, 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.
DP requirements: Attendance for all laboratory sessions; minimum average of 50% for the report writing; participation in all tests and a minimum average class mark of 40%.
Assessment: Class tests, homework tutorials, laboratory assignments, June examination 2 papers: 3 hours for Thermodynamics and 2 hours for Fluids. A subminimum of 40% required for both exams.

MEC3035F   COMPUTER INTEGRATED MANUFACTURE & ROBOTICS
For Electro-Mechanical Engineering students only.
8 NQF credits at HEQSF level 7
Convener: Ms T Booysen
Course entry requirements: MEC1017F
Course outline:
This course aims to develop an advanced understanding of computer integrated manufacture and robotics. The 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. **Tutorials:** Four tutorials will be run to assist students with their programming project.
DP requirements: 1) Attendance at all tutorials.2) Submission of all projects.3) Demonstration of the ELO project to an examiner.4) 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 June examination. This exam is divided into two sections held on the same day. The first hour counting 60% is on the written theory. The second hour is a practical examination and counting 40% of the exam. Class mark is made up of homework and projects. The final mark: 50% class mark, 50% examination mark.

MEC3035S   COMPUTER INTEGRATED MANUFACTURE AND ROBOTICS

For Mechatronics students in their third year of study only.
8 NQF credits at HEQSF level 7
Convener: Ms T Booysen
Course entry requirements: CSC1017F or an equivalent programming course
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.**Practical:** One practical will run in the afternoon for one hour. **Tutorials:** Two tutorials will be run to assist students with their programming project.
DP requirements: 1) Attendance at all tutorials2) Submission of all projects.3) A minimum of 40% class mark.
Assessment: One 2 hour November examination. This exam is divided into two sections held on the same day. The first hour counting 60% is on the written theory. The second hour is a practical examination and counting 40% of the exam. The class mark is made up of homework and projects. The final mark is made up of: 50% class mark + 50% exam mark.

MEC3037S   PROFESSIONAL COMMUNICATION

For Electro-Mechanical 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: None
Assessment: Class test, 3 hour written examination, presentation examination. (Written examination 25%, Oral examination 25%, projects and class test 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 and positive displacement 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; Practical sessions as well.
Convener: Dr SL George
Course entry requirements: None
Co-requisites: None
Course outline:
This course aims to develop an advanced understanding of experimental methods. Topics include: terminology; standards; data analysis; uncertainty; dimensional analysis; displacement; strain; pressure; flow and temperature measurements. Classical flow visualization techniques using electrical measurement techniques will be investigated as well as non- destructive evaluation techniques.
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 test; pass the final examination; satisfactorily achieve each of the ECSA ELO's associated with the course.
Assessment: Class test 10%; Laboratory/practical reports 20%; Examination 70%.

MEC3060F   MATERIALS UNDER STRESS
8 NQF credits at HEQSF level 7
Convener: Dr SL George
Course entry requirements: MEC2042F
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 (2 class tests). Students must attend both 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
Co-requisites: None
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, lot size as well as the ability to automate a manufacturing process.
Lecture times: 2 lectures per week.

DP requirements: 40% subminimum for homework assignment and 40% subminimum for class test.
Assessment: 2 hour theory examination: 60%; homework assignment: 20%; class test: 20%

MEC3071S   MEASUREMENT & CONTROL OF ELECTRO-MECHANICAL SYSTEMS I
Not offered in 2015, 2016
16 NQF credits at HEQSF level 7; 4 lectures, 12 tutorials/practicals. Third-year, second-semester course.
Convener: TBA
Course entry requirements: EEE3062F Digital Electronics
Course outline:
This course aims to enable students to take measurements and capture the data of signals from electro-mechanical systems; process these measurements, and understand the control of electro-mechanical systems. The ability of an Electro-Mechanical engineer to take measurements and use these measurements to control an electro-mechanical system is one of the pillars of the degree. This course is the first part of a two part course (MEC3071S and MEC4112F) that will develop the knowledge and introduce the basic techniques for selecting appropriate sensors to take measurements and design and build the supporting electronics to interface with a microcontroller. The microcontrollers will be used for low level control and the interface block between the signal from the electro-mechanical system and the PC performing the high level control along with the data storage.
DP requirements: None
Assessment: Coursework (40%), Examination (60%)

MEC3072F   MECHANICAL ENGINEERING MACHINE ELEMENT DESIGN II
8 NQF credits at HEQSF level 7
Convener: Associate Professor Chris von Klemperer
Course entry requirements: MEC2044S, DP in MEC2023S, MEC2025F, MEC2042F
Co-requisites: MEC3023F, STA1008F, MEC3045F (Mech), MEC3035F (Elec 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: Attendance at all class tests (Doctors' certificates will be required for tests missed on medical grounds.)
Assessment: One Class test (2 hours); 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: A/Prof Chris von Klemperer
Course entry requirements: DP in MEC3XXXF (Mechanical Engineering Machine Element Design 2), DP in MEC3023F, DP in STA1008F, DP in MEC3045F (Mech), DP in MEC3035F (Elec Mech), DP in MEC3033F, MEC2022S.

Co-requisites: MEC3037S, MEC2026S, MEC3031S
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: Attendance at all class tests (Doctors' certificates will be required for tests missed on medical grounds.)
Assessment: Two class tests (2.5 hours each) 3 Design and / or CAD hand in Assignments (~75 marks each) One examination in the June 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%

MEC4022Z   INDUSTRIAL LAW
8 NQF credits at HEQSF level 8
Convener: Dr C. Shaw
Course entry requirements: None
Course outline:
This course aims to develop an understanding of elements of the law of contract; agency; partnership; companies; patents; and Labour law.
Lecture times: 4 Lectures per week.
DP requirements: None
Assessment: September examination (2 hours).

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 MAM2082F
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 copstone 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: None
Assessment: June examinations 3 hours

MEC4047F   MECHANICAL VIBRATIONS
12 NQF credits at HEQSF level 8
Convener: Mr EB Ismail
Course entry requirements: MEC3031S
Co-requisites: MAM2082F
Course outline:
This course aims to introduce students to the modelling of vibration in machines and structures. This will include single- and multi-degree of freedom models; analytical and numerical solution techniques; and practical applications. Formulation of equations of motion for single- and multi-

degrees of freedom by Newton's laws and energy methods; solution techniques for equations of motion via analytical and numerical methods; modal analysis; application of techniques to analysis and design; and continuous systems.

Lecture times: 3 Lectures and 1 Tutorial. **Practical:** One major practical is run, potentially over multiple sessions.

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%.

MEC4053Z   MEASUREMENT AND CONTROL IN ENGINEERING SYSTEMS

16 NQF credits at HEQSF level 8; Fourth year course.

Convener: Associate Professor H Mouton

Course entry requirements: EEE3062F, EEE3070S, MEC3050W.

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, micro-processors, PCs, PLCs, 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 AC and DC electric motors, and control heaters, valves, and flow rates etc.

Lecture times: 2 Lectures and 1 Tutorial per week.

DP requirements: Attendance of 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 two mandatory practicals. A solution set for the two take-home tutorials. One class test held midway through the term. One 2 hour written examination and one 2 hour practical examination held in June. Class mark is made up of tutorials and practicals and the class test. The final mark: 30% class mark + 70% exam mark.

MEC4063C   INDUSTRIAL ECOLOGY

8 NQF credits at HEQSF level 8

Convener: Dr H Pearce

Course entry requirements: Completion of 3rd 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: 2 lectures per week.

DP requirements: None

Assessment: Project, essays and assignments.

MEC4103F   PRODUCT DESIGN

12 NQF credits at HEQSF level 8
Convener: Associate Professor R Kuppuswamy
Course entry requirements: 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.
DP requirements: None
Assessment: Coursework 100%, Examination 0%

MEC4104F   MANUFACTURING & NANOTECHNOLOGY

8 NQF credits at HEQSF level 8
Convener: Associate Professor R Kuppuswamy
Course entry requirements: MEC2044S or equivalent
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 method (FEM) 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: Coursework 50%, Examination 50%

MEC4107S   FUNDAMENTALS OF CONTROL SYSTEMS

8 NQF credits at HEQSF level 8; And computer lab sessions.
Convener: Associate Professor H Mouton
Course entry requirements: MEC2023F/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 transient analysis; frequency response of systems; the effect of introducing proportional and integral control; z - transform for digital control; and Bode plot design of control systems.
Lecture times: 2 Lectures and 1 Tutorial per week.
DP requirements: 60% for assigned homework and 40% for class mark
Assessment: Coursework 50%, Examination 50%

MEC4108S   SYSTEM DESIGN

12 NQF credits at HEQSF level 8; 75 hours assignments.
Convener: Dr WF 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 exams 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 three levels, namely Individual 65%, Group 25%, and Peer Review 10%. Pass will be a combined score of 50% or above, provided a subminimum of 50% is attained for the Individual mark Peer Review component which indicates 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.
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: Associate Professor B Collier-Reed; Mrs C Findeis
Course entry requirements: MEC3050W

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 20%; oral presentation 5%; final report 75%.

MEC4113F   HEAT TRANSFER AND PSYCHROMETRY
12 NQF credits at HEQSF level 8
Convener: Professor T Bello-Ochende and Associate Profess 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 laws of thermodynamics to analyse the components of compression and absorption refrigeration, as well as the use of graphical methods for the design synthesis of the refrigeration cycles. The course will also 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%.

ACADEMIC DEVELOPMENT IN THE FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

ASPECT Co-ordinator:
H T Pearce, BSc(Eng) *Cape Town* PhD *Illinois*

ASPECT Deputy Co-ordinator:
P le Roux, BSc(Eng) PGDipEd(HES) *Cape Town*

Senior Lecturer:
T S Craig, PhD *Cape Town*

Lecturers:
K Nathoo, BSc(Eng) MSc(EngMan) *Cape Town*
A Campbell, Bsc(Hons) Applied Maths HDE *Natal* MSc *UKZN*

Part Time Lecturer:
E Vicatos, BA(Hons) STD *Cape Town*

Administrative Staff:
L Nkomo

Course Outlines

END1008Z   INTRODUCTION TO COMMUNICATION
Administered by the ASPECT coordinator.
8 NQF credits at HEQSF level 5; First-year semester course.
Convener: E Vicatos
Course outline
The course develops content-specific academic literacy skills for engineering students. It concentrates on academic reading, academic writing, listening skills, research skills and oral communication skills. Students are prepared for communication in engineering courses, as well as for the demands of the engineering profession.
Lecture times: Tuesday 3rd & 4th periods or Thursday 1st & 2nd periods.
DP requirements: Completion of assignments.
Assessment: June or November examination 3 hours counts 50%, class assignments count 50%.

END1019L/P   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
Course outline:
This is an elective offering open to students from all departments and faculties, and can contribute to the Complementary Studies B requirement of engineering students. 'Social infrastructures' recognises that development is a socio-technical process, giving rise to particular relationships between households and communities, and materials and technologies, shaped by the institutional and political context. Drawing on this understanding, this course provides for classroom-based learning together with community-engaged learning as a means to engage communities long denied access to aspects of social infrastructures. We focus on engaging the issues of 'service', community and change, in the context of development and social justice. We look particularly at how we, as

students and emerging professionals, might engage with and learn from communities in our local context.

Lecture times: Winter term and summer term

DP requirements: 80% attendance at all sessions

Assessment: Coursework 50%, Final examination 50%. **Enrolment capacity:** Entrance is limited to 100 full-time students (90 EBE, 10 other faculties)

END1020F/S   MATHEMATICS 1A FOR ENGINEERS EXTENDED

Administered by the ASPECT coordinator.

18 NQF credits at HEQSF level 5; First-year single semester course; run in both first and second semester..

Convener: K Nathoo

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: 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%.

END1021F/S   MATHEMATICS 1B FOR ENGINEERS EXTENDED

Administered by the ASPECT coordinator.

18 NQF credits at HEQSF level 5; First-year second semester course.

Convener: K Nathoo

Course entry requirements: END1020F/S or MAM1020F/S

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, Wednesday & Friday 1st& 2nd periods; Tuesday 3rd or 4th period.**Workshops:** Wednesday 6th – 8th periods.

DP requirements: 35% in class record

Assessment: Class record (tests, problem sets) 50%, Final examination 50%.

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) is a UCT Signature Theme established in 2007 to serve as a platform for interdisciplinary urban research - both theoretical and applied - across UCT. As a new generation knowledge institution, ACC's specific mission is to engage in collaborative research and develop imaginative policy discourses and practices to promote vibrant, just and sustainable cities. The ACC works in Cape Town, across southern Africa, and continentally, partnering with academics, city officials and practitioners. The co-produced research advances novel ways of thinking about and understanding urbanism across the global South, yet is rooted in the realities of African urban spaces. In 2015 ACC hosted 25 research initiatives. Africa-wide projects include African urban knowledge hubs, turn-around cities, urban food insecurity, urban risk knowledge, and infrastructure and land. ACC is one of two research platforms in the MISTRA Urban Futures network. The policy arm of WIEGO (Women in Informal Employment, Globalizing and Organizing) is based in ACC. The Director has used ACC research while leading the urban policy element of South Africa's National Planning Commission. ACC's 2016 CityLabs in Cape Town will focus on human settlement upgrading, safety and violence, political ecologies and public culture. The ACC supports an MPhil programme in Urban Infrastructure and Design: this equips built environment professionals with the knowledge to conduct sustainable urban development in a fast changing world. ACC's urban knowledge dissemination features edited books, the magazine Cityscapes, the UrbanAfrica.net portal, and regular academic and public forums for engagement on critical urban related public policy issues.

Professor and Director:
E Pieterse, BA(Hons) *UWC* MA Development Studies *ISS* PhD *LSE*

Professor and Deputy Director:
G Pirie, BA (Hons) MA PhD *Wit*s

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W Smit, BSc MCRP PhD *Cape Town*

Research Finance Manager:
I Najaar, BCom *UWC*

Administrative Officer:

M Joubert

Administrative Assistants:
V Mafanya
M Waglay, BSocSc (Hons) *Cape Town*

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. It 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 at the postgraduate level with key expertise to excel in careers in the bioprocess arena, both in research and in the 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.

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, 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, 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 *UCT* PhD *Cambridge*
CJ Fenner, BSc(Hons) *Rhodes* PhD *Cape Town*
R Huddy, BSc(Hons) PhD *Cape Town*
M Johnstone-Robertson, *BSc (Eng) Chem* PhD *Cape Town*
J Petersen, BSc(Eng)Chem *Wits* PhD *Cape Town* MSAIMM
RP van Hille, BSc(Hons) PhD *Rhodes*
S Tai,BSc(Hons) *UMIST* MSc(Biochemical Engineering) PhD(Industrial Microbiology) *TU Delft*

Technical Staff:
TM Goleka, NDip BTech *Cape Penisula*
J Mwase, MSc *Cape Town*
E Ngoma, BTech *TUT*
S Rademeyer, NDip (Chem Eng) *CPUT*
T Samkanga, NITC NTC NHD *Harare Polytechnic* MBA *Rhodes*

Postdoctoral Researchers:
PP Diale, BSc (Eng) Chem *Johannesburg* PhD *Wits*
E Govender, BSc (Eng) Chem PhD *Cape Town*

A Kotsiopoulous, BSc(Eng) PhD *Cape Town*
M Smart, BSc (Hons) MSc *Stellenbosch* PhD *Cape Town*

Research Associates:
C Bryan, BSc(Hons) *Nottingham* PhD *Bangor*
C Garcian, BSc(Eng) PhD *Cape Town*
MJ Griffiths, BSc (Hons) *Cape Town* MPhil *Cambridge* PhD *Cape Town*
RP van Hille, Bsc (Hons) PhD *Rhodes*

Administrative Staff:
SH Jobson, BA *Rhodes* HDE *Cape Town*
C Mazzolini, BA Print Journalism *Cape Town*
LD Mostert, BSc(Eng*)* Chem *Cape Town*
S Christian, NSC *Pretoria Tech*

Website: www.ceber.uct.ac.za

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.

Professor and Director:
JCQ Fletcher, BSc(Eng)Chem PhD *Cape Town* MACS FSAAE

Associated Academic Staff:
S Blair, PhD Materials Chemistry *Simon Fraser(Canada)*
W Böhringer, DiplChem *Karlsruhe*
R Brosius, PhD (Eng) *Leuven* Dr (Eng) *Cape Town*
M Claeys, Dipl.Ing. (Chem Eng) Dr.-Ing.*Karlsruhe*
N Fischer, MSc PhD (Eng) Dr (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*
CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAIChE FSAAE FRSSAf
S Roberts, BSc(Eng)Chem MSc(Eng)Chem *Cape Town*
S Tanaka, BSc(Eng) MSc(Eng) *Kyoto*
E van Steen, MSc(Eng) *Eindhoven* PhD *Karlsruhe* FSAIChE FSAAE

Administrative Officer:
E Williams

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.

Professor and Director:
BD Reddy, OMB BSc(Eng) *Cape Town* PhD *Cantab* FRSSAf FSAAE MASSAf

Members:
T Chinyoka, MSc *Zimbabwe* PhD *Virginia Tech*
DA Deglon, BSc(Eng) *Wits* MBA PhD *Cape Town* MSAIMM
F Ebobisse Bille, BSc(Hons) *Yaounde' l Cameroon* PhD *Pisa*
I Govender, BSc *UDW* HDE *UNISA* BSc(Hons) PhD *Cape Town*
S Skatulla, Dipl Ing *Karlsruhe* PhD *Adelaide*
A Mainza, BSc(Eng)Chem *UNZA* PhD *Cape Town*

Associate members:
TJ Cloete, MIng *Stell*
T Franz, PhD *Bremen*
EB Ismail, BSc(Eng) MSc(Eng) *Cape Town*
JE van Zyl, PrEng, BEng MEng *RAU* PhD *Exeter* MSAICE MASCE FWISA

Senior Research Officer:
AT McBride, MSc, PhD, *Cape Town*

Administrative Assistant:
N Bent

Website: *www.cerecam.uct.ac.za*

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*

Visiting Lecturers:
T Becker, BSc(Eng) MSc(Eng) PhD *Cape Town*
M Topic, BSc *Belgrade* PhD *Cape Town*
CD Woolard, BSc (Hons) PhD *Cape Town* MSc *London*

Emeritus Professor:
RB Tait, PrEng BSc(Hons) *Rhodes* MA *Oxon* BSc(Eng) PhD *Cape Town* MSAIMechE

Senior Technical Officers:
P Park-Ross, BSc(Hons) *Cape Town*

Part-time Technical Officer:
T Newins

Secretary:
B Glass

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, MSc *Cape Town*
M Becker, MSc *Cape Town* PhD *Pret*
P Bepswa, BSc(Eng) *Cape Town*
K Corin, MSc PhD, *Cape Town*
I Govender, BSc *UDW* HDE *UNISA* BSc(Hons) PhD *Cape Town*
MC Harris, MSc(Eng) *Cape Town*
A Mabentsela, BSc (Hons) *Cape Town*
A Mainza, BSc(Eng) *UNZA* PhD *Cape Town*
B McFadzean, MSc PhD *NMMU*
CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAIChE FSAAE FRSSAf
T Rampai, BSc(Hons) MSc(Eng) *Cape Town*
J Sweet, BSc(Eng) MSc *Cape Town* MSAIMM
A van der Westhuizen, BIng *Stell* MSc(Eng) *Cape Town* MSAIMM
J Waters, BTech *Cape Technikon*

JG Wiese, MSc *Cape Town*

Honorary Adjunct Professors:
P Dempsey, BSc *UNISA*
S Lambert, BSc(Eng) BSc(Hons) *Strathclyde*
J Mann, BSc(Eng) *Wits* MBL *UNISA*

Administrative Staff:
H Sundström
N Davies
C Pomario
L Jacobs

Centre for Research in Engineering Education (CREE)

CREE was founded in 1996 with the aim of establishing and promoting engineering education as a viable research field at UCT and in the broader academic community. In the sixteen years since then, considerable progress has been made towards meeting this objective and the research area is now well established at UCT, as evidenced in peer-reviewed research output, as well as the number of CREE researchers who are working towards postgraduate qualifications in this area. CREE also has a strong national profile which is sustained through its own publications and involvement in co-hosting national conferences on engineering education. A key development over this time has been the growth of CREE to incorporate what is now a sizable proportion of researchers working in the science disciplines. This has been a very natural and logical progression, and has emerged from shared concerns, contextual features and research methodologies. The 'home' of CREE remains in the Faculty of Engineering and the Built Environment, and half of the members of the management team are located in this faculty.

Director:
TS Craig, PhD *Cape Town*

Associated Academic Staff:
BI Collier-Reed, Pr Eng MSc(Eng) PhD *Cape Town* MSAIMechE
AE Deacon, MSc *Stell*
B Kloot, BSc(Eng) *Wits* MSc(Eng) PhD *Cape Town*
K le Roux, BA(Hons) *Natal* HDEMPhil *Cape Town* PhD *Witwatersrand*
CB Shaw, BSc(Eng) MSc(Eng) HDE MPhil(EngMan) *Cape Town*
DL Taylor, BSc Hons HDE *UKZN* MSc PhD *Wits*
N Wolmarans, BSc(Eng) MSc(Eng) PGDipEd(HES) *Cape Town*

Administrative Staff:
D Chuter, BA HDE *Cape Town*

Centre for Transport Studies

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 MSASITS
M Zuidgeest, MSc PhD *Twente*

Research Officer:
H Schalekamp, BAS BArch MPhil *Cape Town*

Website: *www.cfts.uct.ac.za*

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*

DST Hydrogen Catalysis Competence Centre (Hy/SA Catalysis)

The Centre for Catalysis Research, together with Mintek, hosts the Department of Science and Technology's (DST) Hydrogen Catalysis Competence Centre. This virtual centre, established in 2007, is one of three Competence Centres that will 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 by 2020, thereby diversifying the applications of the nation's platinum group metal resources and promoting socio-economic benefits through value addition of its key natural resources.

Director:
S Blair, PhD Materials Chemistry *Simon Fraser(Canada)*

Energy Research Centre (ERC)

The Energy Research Centre was formed by amalgamating two existing energy research groups housed within the Faculty, namely the Energy Development Research Centre (EDRC) and the

Energy Research Institute (ERI) and is currently situated in the Department of Mechanical Engineering.

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 also have the option of registering for a Master's by dissertation only. This route opens opportunities for students who are unable to relocate to Cape Town to attend the structured courses, but who have a good energy background.

Professor and Director:
H Winkler, MSc *Berkeley* MA PhD *Cape Town*

Energy & Climate Change Group Leader:
K Altieri, MPP *Princeton University* PhD *Rutgers*

Energy, Poverty and Development Group Leader:
B Batidzirai, BSc(Eng)Elec *UZ* MSc (Energy) PhD *Utrecht*

Energy Efficiency Group Leader:
A Hibberd, MSc PGDipMan(Dist Com Info) *Cape Town*

Energy Modelling Group Leader:
AG Hughes, BIng *Stell* MSc (Eng) *Cape Town*

Renewable Energy Group Leader:
A Madlopha, BSc MSc *Malawi* PhD *Strathclyde*

Research Staff:
F Ahjum, MSc(Eng) *Cape Town*
MJ Boulle, BSc, BSc (Hons) *Rhodes* MPhil *Cape Town*
T Caetano, MSc(Eng) BCom (Hon) Economics *Cape Town*
J de Groot, BSc(Int Dev) *Wageningen* MA(Cult Antropology) *Leiden* MSc(Dev Studies) *Wageningen*
GC Gariseb, BTech
S Jenner, BSc MPhil *Cape Town*
W Kruger, BA(Policy Studies) BPhil(Sust Dev) MPhil(Sust Dev) *Stell,* MSc(Dev Studies) *Antwerp*
R Larmour, BSc(Eng) *Cape Town*
A Marquard, BA *Cape Town* BA(Hons) MA *Rhodes* PhD *Cape Town*
B Martin, Nat Dip Business *CPUT* PGDip: Climate Leadership *Wits*
B McCall, MSc(Eng) *Cape Town*
B Merven, MSc(Eng) MSc(FinMaths) *Cape Town*
M Moorlach, MSc *Eindhoven*
A Moyo, MSc in Applied Economics *Cape Town*
B Rennkamp, Diplom Regional Sciences Latin America *Cologne* PhD *Universiteit Twente Netherland*
D Sparks, MSc PhD *Cape Town*
A Stewart, MSc(Eng) *Cape Town*
M Torres Gunfaus, MSc Industrial Engineering *Germany*

HL Trollip, BSc (Elec Eng) *Wits* MSc (Elec Eng) *Wits*

Operations Manager:
F Babalwa

Administrator, Postgraduate & Human Resources:
F Harribi

Assistant Administrator:
B Matubatuba

Postgraduate Programme Coordinator:
J Burton, BA(Hons)*Rhodes,* MSc(Eng) *Cape Town*

Publications & Media Staff:
R Drummond, BSocSci MRCP *Cape Town* AAA DipCEA MSAPI MIEA
T James, BA *Wits* BA(Hons) *Cape Town* MA *Essex* PhD *Cape Town*

Blast Impact & Survivability Research Unit (BISRU)

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
• Sporting Equipment

Professor and Director:
GS Langdon, BEng PhD *Liverpool* MIMechE CEng

Honorary Professor:
D Karagiozova, PhD *Ukrainian Academy of Science*

Associated Academic Staff:
S Chung Kim Yuen, BSc(Eng) MSc PhD *Cape Town*
TJ Cloete, BIng *Stell* MIng *Stell*
R Govender, BSc(Eng) MSc(Eng) PhD *Cape Town*
GS Langdon, BEng PhD *Liverpool* MIMechE CEng
GN Nurick, PrEng MSc(Eng) *Natal* PhD *Cape Town* Hon FSAIMechE MASME FSAAE

Researchers:
VH Balden, MSc(Eng) *Cape Town*

Finance/Administrative Assistant:

L Starck

Website: *www.bisru.uct.ac.za*

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 MASSA
    fFSAAE FIChemE

Associated Academic and Technical Staff:
J Chivavava, BEng(Chem)*NUST* MSc(Chem) *Cape Town* AMIChemE

Website: www.crystal.uct.ac.za

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 expand the work to other researchers at UCT. There is a strong focus on sustainability, with research aimed at increasing the amount of mineral or metal extracted from ores, and at reducing the environmental and social impacts of mineral beneficiation operations. What makes the MtM initiative unique is that researchers focus on entire minerals processing flow sheets or production sequences (systemic approach), as well as on individual mineral extraction processes (fundamental approach). Members of the group have developed a new Master of Philosophy program specialising in Sustainable Mineral Resource Development, which was inaugurated in 2014. The programme is delivered jointly with the University of Zambia, as part of the Education for Sustainable Development in Africa project of the United Nations, and includes courses at the UCT Graduate School of Business and the Sustainability Institute at the University of Stellenbosch. Another major international collaborative activity is the Global Minerals Industry Risk Management Programme (G-MIRM), to train mining company executives and managers in safety risk management, to reduce accidents and fatalities on mines and mineral processing operations. The course is delivered in collaboration with the University of Pretoria, the University of the Witwatersrand and the University of Queensland in Australia. On the local front, Minerals to Metals has teamed up with The Green House, a niche

sustainability consultancy, to develop a minerals beneficiation strategy for the K-ZN Province, on behalf of the K-ZN Department of Economic Development, Tourism and Environment.

Professor and Director:
JL Broadhurst, BSc(Hons) MSc *Port Elizabeth* PhD *Cape Town*

Associated Academic Staff:
M Becker, BSc(Hons) MSc Geology *Cape Town* PhD *Pret*
A Black, BA *Cape Town* BA(Hons) *Sussex* MSocSc *Natal* PhD *Cape Town*
D Bradshaw, BSc(Eng) PhD *Cape Town* (SARChI (elect) in Minerals Beneficiation)
A Buffler, MSc PhD HDE *Cape Town*
B Cohen, BSc(Eng) 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
D Fuh, BSc(Hons) *Buea* MA *Botswana* PhD *Basel*
I Govender, BSc Hons PhD *Cape Town* HDE *Unisa*
STL Harrison, BSc(Hons) *Cape Town* PhD *Cantab* MSAIChE SASM FSAIMM FSAAE ASSAf FWISA
N Isafiade, BSc(Hons*) Ilorin* MSc(ChemEng) Ife PhD *Cape Town*
AE Lewis, PrEng BSc(Eng)Chem MSc(Eng) PhD *Cape Town* FSAIChE FSAIMM MASSA fFSAAE
A Mainza, BSc(Eng) UNZA PhD *Cape Town*
J Petersen, BSc(Eng) *Wits* PhD *Cape Town* MSAIMM
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

Nedbank Urban Real Estate Research Unit (URERU)

This is a new unit that has been approved by the UCT Council in June 2015 under the directorship of Associate Professor Francois Viruly and will be 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 between UCT, 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 will be driven by three broad thrusts:
• Urban Land Economics and Urban Management,
• Urban Real Estate Investment and Finance,
• Urban Real Estate Markets, Dynamics and Trends.

URERU will promote academic research and disseminate research to the private sector.
We will be developing 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 R 1 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 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*

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.

The CPD web address is 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.

Professional Communication Studies

Associate Professor and Convener:
J English, BA MPhil *Cape Town* PhD *Glasgow Caledonian*

Administrative Staff:
AJ Rumbelow, Diagnostic and Therapeutic RadDip *Cape Town*

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

DEPARTMENT IN OTHER FACULTIES AND COURSES OFFERED

Departments Established in the Faculty of Commerce

COLLEGE OF ACCOUNTING

Associate Professor and Head of Department:
M Graham, BBusSc MCom *Cape Town* CA(SA) ACMA

ACC1006F/S   FINANCIAL ACCOUNTING
18 NQF credits at HEQSF level 5
Convener: J Kew Associate Professor J Kew/ B Strauss
Course entry requirements: Admission to degree
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.
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: D Macdonald
Course entry requirements: A minimum 40% final mark for ACC1106F or ACC1006 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.
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 de Villiers
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.
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%.

SCHOOL OF ECONOMICS

Director of the School:
E Muchapondwa, BSc MSc *Zimbabwe* PHL PhD *Göteborg*

ECO1007S   ECONOMICS FOR ENGINEERS
This course is designed specifically for engineering students. It is aimed at providing a broad perspective on the subject, and concentrates more on an understanding of theoretical concepts and their application in practise as may impact on the professional life of an engineer.
16 NQF credits at HEQSF level 5; Lectures and tutorials.
Convener: I Woolard
Course entry requirements: Must be in the third year of an Engineering Programme.
Course outline:
Economics for Engineers (ECO1007S) is a one semester course that introduces students to the core concepts in both micro- and macroeconomics. As a one semester service course 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 some 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 specialization 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 common concepts as money, inflation, exchange rates and GDP.
DP requirements: All class tests and assignments/essays/projects to be completed. Attend at least 75% of tutorials. Satisfactory completion and timeous submission of at least 75% of tutorials. A weighted average mark of 30% for tests, tutorials, essays and assignments. Only students who have obtained DP certificates may write the final examination.
Assessment: Test 1: 20%; Test 2: 15%; Essay: 10%; Tutorials: 5%; Exam: 50%. The course outline will detail the breakdown for submission weightings and variation for exemptions and absences.

ECO1010F/S   MICROECONOMICS
18 NQF credits at HEQSF level 5; 10 tutorials, 45 lectures.
Convener: A Leiman (ECO1010F) C Mlatsheni (ECO1010S)
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: Students must be simultaneously enrolled for or have completed STA1001F/S or MAM1010F/S or MAM1000W.
Objective: Introduction to microeconomic theory and thought
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: All class tests and assignments/essays/projects to be completed. Only students who have obtained DP certificates may write the final exam.

Assessment: Test 1: 5%; Test 2: 15%; Test 3: 15%; Essay: 15%; Exam: 50%. The course outline will detail the breakdown for submission weightings and variation for exemptions and absences.

ECO1011F / S   MACROECONOMICS

No student may be concurrently registered for ECO1010F and ECO1011F.
18 NQF credits at HEQSF level 5
Convener: J Chien (ECO1011F) and L Neethling (ECO1011S)
Course entry requirements: A minimum mark of 50% for ECO1010F/S/H/X or ECO1110H/F.
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.
Lecture times: 7 and 8 periods
DP requirements: All class tests and assignments/essays/projects to be completed. Attend at least 50% of tutorials. Satisfactory completion and timeous submission of at least 50% of tutorials. A weighted average mark of 30% for tests, tutorials, essays and assignments. Only students who have obtained DP certificates may write the final examination.
Assessment: Test 1: 15%; Test 2: 15%; Essay: 10%; Tutorials: 10%; 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: A Oyenubi
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.
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: Dates, times and venues of lectures, tutorials and tests, and of the prescribed and recommended books will be posted on the School of Economics notice board at the beginning of the semester.
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: Test 1: 15%; Test 2: 15%; Essay: 15%; Tutorials: 5%; 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; 4 lectures per week for a total of 12 weeks and 10 tutorials during the semester.

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.

Objective: The main objective of the course is to train students to think in a structured, analytically rigorous way about macroeconomic questions and to equip them to use macroeconomics as an analytical tool.

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: Monday to Thursday 9:00-9:45, 12:00-12:45, 13:00-13:45

DP requirements: Students must write the 2 tests and the essay. Also, they must attend at least 7 out of the 10 tutorials and submit at least 5 out of the 10 tutorials.A weighted average mark of 40% for the 2 tests and the essay. Only students who have obtained DP certificates may write the final examination.

Assessment: Test 1: 20%; Test 2: 20%; Essay: 10%; Exam: 50%

FINANCE AND TAX

Associate Professor and Head of Department:
C West, MCom PhD *Cape Town* CA(SA)

FTX2020F   BUSINESS FINANCE

NOTE: This course is NOT for students intending to major in Finance in the BBusSc degree and is not a substitute for FTX2024S as a course entry requirement for further studies in Finance.

18 NQF credits at HEQSF level 6

Convener: H Pamburai

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: Tuesday, Wednesday, Thursday and Friday, all 7th period.

DP requirements: 40% for coursework, completion of all required assignments and tests, attendance of 80% of the tutorials

Assessment: Tests and weekly assignments 40%; final examination 60%.

SCHOOL OF MANAGEMENT STUDIES

Head of Department:
A Schlechter, BSc(Hons) MA PhD *Stell*

BUS1036F/S   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 persuausively 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 occuring 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% and 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   MARKETING I
18 NQF credits at HEQSF level 6
Convener: TBA
Course entry requirements: ECO1010F & ECO1011S OR ECO1011F/H & ECO1111F OR BUS1036F/S (or BUS1010F/S)
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.
Lecture times: Monday, 2nd, 4th, 7th & 8th period; Tuesday, 1st, 4th, 5th, 7th & 8th period; Wednesday, 1st, 2nd, 3rd, 4th, 5th, 7th & 8th period; Thursday, 1st, 4th, 5th & 8th period; Friday, 1st, 2nd & 4th period
DP requirements: 50% 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

Associate Professor and acting Director of the School:
H O Garuba, MA PhD *Ibadan*

Administrative Officer:
TBA

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:
N Shepherd, PhD *Cape Town*

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, A W Mellon Chair in the Anthropology of the First 1000 Days of Life, 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 Acting Head of Section (January to June):
R Mesthrie, DST/NRF Chair in Migration, Language and Social Change, BPaed *UDW* BA(Hons) *Cape Town* BA(Hons) *Unisa* MA *Texas* 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: Associate Professor N ShepherdDr H Chitonge
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 life of professional practice. Broad-based and introductory, it is intended to satisfy the Complimentary 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 globalization 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 tutorials is compulsory, failing which students' papers may not be marked.
Assessment: Two assignments count 10% each; one group project counts 30%; one 2-hour examination counts 50% of the final mark.

PHILOSOPHY

Professor and Head of Department:
D Benatar, BSocSc(Hons) PhD *Cape Town*

PHI2040S   PHILOSOPHY OF SCIENCE
(Not offered in 2016)
24 NQF credits at HEQSF level 6
Convener: Dr J Ritchie
Course entry requirements: At least second year status.

Course outline:
The course aims to introduce the students to the epistemological, metaphysical and ethical issues that arise when science is considered from a philosophical perspective. Through the study of philosophers such as Popper, Kuhn and Feyerabend, among others, the following sorts of questions will be discussed: Do scientists employ a special method which sets them apart from non-scientists and gives their claims greater authority? Do electrons, genes and other entities that we can't see or touch really exist? Are scientists inevitably influenced by political and moral agendas or can pure science be value free?
Lecture times: 2nd period.
DP requirements: Regular attendance at lectures and tutorials; completion of all tests, submission of all essays and assignments by due dates, and an average mark of at least 35% for the coursework.
Assessment: Coursework counts 40%; November examination 3 hours 60%.

Departments Established in the Faculty of Law

COMMERCIAL LAW

Professor and Head of Department:
A Rycroft, BA *Rhodes* LLB *Natal* LLM *London* Attorney of the High Court

CML1001F/S   BUSINESS LAW I
18 NQF credits at HEQSF level 5
Convener: K Lehmann (first semester) and A Titus (second semester)
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. The course includes an introduction to the South African court structure, the sources of South African law, the general principles of contract and the law governing certain select contracts including the law of sale, lease and agency.

First or second semester course, Business Law I has one general course code (CML 1001F) for the first semester course and one general course code (CML 1001S) for the second semester. However, students are allocated to different groups on registration and to distinguish each group a class number is added to the general course code e.g. 74555. Under the University's General Rules (G16.1) students must attend the specific class in which they are registered. Only students registered for the BCom Accounting Programme streams and for the BBusSc Information Systems stream will be permitted to register for Business Law I in the second semester. Students who fail in the first semester are permitted to repeat Business Law 1 in the second semester.
DP requirements: A weighted average of 40% for the class test(s).
Assessment: Test(s) 40%; final examination 60%.

CML1001L   BUSINESS LAW I - THIRD TERM
Course offered during the THIRD TERM, only during the WINTER.
18 NQF credits at HEQSF level 5
Convener: Ms K Lehmann
Course entry requirements: None
Course outline:
Refer to course outline for CML1001F/S.
Lecture times: Lectures are offered on a daily basis for three hours over a four week period.
DP requirements: A weighted average of 40% for the class test(s)
Assessment: Test(s) 40%; final examination 60%.

CML2001F   COMPANY LAW
18 NQF credits at HEQSF level 6
Convener: Ms H Stoop
Course entry requirements: CML1001F/S (with the exception of graduate students studying towards the BCom Accounting Conversion Course). 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. Students are guided to understand the concept of separate legal personality and its consequences. Good corporate governance is also discussed. Students are encourages to apply the analytical abilities acquired in previous law courses and these skills are further developed. After the course students will be able to navigate the Companies Act 71 of 2008 and will be familiar with its core provisions and their practical impact.
DP requirements: A weighted average of 40% for the class test(s).
Assessment: Test(s) 40%; final examination 60%.

CML2001L   COMPANY LAW - THIRD TERM
Course offered during the THIRD TERM, only during the WINTER.
18 NQF credits at HEQSF level 6
Convener: Ms H Stoop
Course entry requirements: CML1001F. No undergraduate student in the first year of study may register for Company Law.
Course outline:
Refer to course outline for CML 2001F.
DP requirements: A weighted average of 40% for the class test(s)
Assessment: Test(s) 40%; final examination 60%

CML2005F   LABOUR LAW
18 NQF credits at HEQSF level 6
Convener: 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; the Skills Development Act; the Unemployment Insurance Act; Employment Equity Act; and the Occupational Health and Safety Act. The course will specifically focus on the following issues that commonly arise in the workplace: discipline and dismissals; unfair discrimination in employment and recruitment and selection; employment equity issues; collective bargaining; strikes and lock-outs; and dispute resolution.
DP requirements: A weighted average of 40% for the class tests.
DP requirements: A weighted average of 40% for the class tests.
Assessment: Test(s) 40%; final examination 60%.

CML2005L   LABOUR LAW – THIRD TERM
18 NQF credits at HEQSF level 6
Convener: E Fergus
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, eg. Business Law I.
Course outline:
Refer to course outline for CML2005F.

DP requirements: None
Assessment: Test(s) 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 (with the exception of graduate students studying towards the BCom Accounting Conversion Course). No undergraduate student in his/her first year of study may register for Business Law II.
Course outline:
Business law II is designed to give students an understanding of commercial transactions, how they are financed and the risks involved. The course covers methods of payment, credit agreements, the various forms of security that can be used to finance commercial transactions as well as insurance and insolvency. We briefly discuss intellectual property, focussing on its value as an asset and which can be used as security to finance transactions. By the end of the course, students should have an appreciation of various methods of payment, the law relating to credit agreements, the need for security in commercial transactions and the types of legal issues that commonly arise in financing transactions in order for creditors to best secure themselves in the event of non-payment and ultimately the risk of insolvency; as well as the benefits of insurance and the risks and possibility of the insurer rejecting a claim.

Students are allocated to different groups on registration and to distinguish each group, a class number is added to the general course code e.g. 1179. Under the University's General Rules (G16.1) students must attend the specific class in which they are registered
Lecture times: The course is an intensive one, with 5 lectures per week for the full semester.
DP requirements: A weighted average of 40% for the class test(s).
Assessment: Test(s) 40%; final examination 60%.

CML2010L   BUSINESS LAW II THIRD TERM
Course offered during the THIRD TERM, only during the WINTER.
18 NQF credits at HEQSF level 6
Convener: Ms J Franco
Course entry requirements: Business Law I or equivalent. 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: A weighted average of 40% for the class test(s)
Assessment: Test 40% and final examination 60%.

Departments Established in the Faculty of Health Sciences

HUMAN BIOLOGY

Associate Professor and Head of Department:
L A Kellaway, Bsc(Hons) MSc PhD *Cape Town*

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 Biomedical Engineering Unit 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: Assoc Prof T Franz Associate Professor T Douglas
Course entry requirements: None
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 the human body; the circulatory system, the electrical activity of the heart and the nervous system; biomechanics of the musculoskeletal system; medical instrumentation design considerations; medical imaging physics and applications and applied biophysics.
DP requirements: None.
Assessment: Class tests 40% (two tests, each worth 20%), June examination two-hours 60%.

HUB4007F   BIOMECH OF MUSCULOSKELETAL SYSTEM

12 NQF credits at HEQSF level 8
Convener: Dr S Sivarasu
Course entry requirements: Mathematics 2, Physics 2 or Applied Mathematics 2 or equivalent.
Co-requisites: HUB2022F Anatomy for Biomedical Engineering.
Course outline:
This advanced course aims to develop an understanding of the biomechanics of the musculoskeletal system. Topics include: body segment parameters; joint forces and torques; kinematic and kinetic data collection; computer techniques of data acquisition and analysis; aspects of electromyography; introduction to muscle, joint, and bone force optimization techniques; rheology of bones, cartilage and collagenous tissues; fracture mechanics; joint lubrication and wear; properties of biomaterials; stress analysis; design of artificial joints; tissue response to implanted materials; implant failure analysis; biomechanics of human gait (walking and running) in health and disease.
DP requirements: Completion of all assignments. Attend site visits
Assessment: Written examination at the end of the first semester. Work during the semester may contribute to the overall mark.

HUB4045F   INTRODUCTION TO MEDICAL IMAGING & IMAGE PROCESSING

12 NQF credits at HEQSF level 8
Convener: Prof T Douglas and Prof E Meintjes
Course entry requirements: Students must be in their fourth year of study.
Course outline:
This course provides an introduction to the physics and engineering principles involved in the acquisition and processing of medical images. Topics include: mathematical tools of image processing; computed tomography, ultrasound, and magnetic resonance imaging.
Assessment: Assignments, written assessment or a final project.

Departments and Units Established in the Faculty of Science

ASTRONOMY

Associate Professor of Astronomy and Head of Department:
PA Woudt, MSc *Groningen* PhD *Cape Town*

AST1000F INTRODUCTION TO ASTRONOMY
Three sessions are held in the Planetarium of Iziko Museums of Cape Town, plus five tutorial sessions and five practical sessions.
18 NQF credits at HEQSF level 5
Convener: Dr SL Blyth
Course entry requirements: None
Course outline:
The course introduces students to the subject of Astronomy and our place in the universe from the small scales of the Earth-Sun-Moon system to the large scales of distant galaxies. It aims to provide insight into how we study astrophysical objects via EM radiation and telescopes (theory) as well as providing a high-level overview of objects in the universe, moving outwards from our solar system, to stars and stellar remnants, our galaxy and others, dark matter and cosmology, and the study of the universe at the largest scales. The course is open to all interested students as well as providing a solid introduction to those wishing to continue in astrophysics.
Lecture times: Monday - Friday, 5th period
DP requirements: Satisfactory attendance at lectures and compulsory attendance at Wednesday afternoon sessions and submission of bi-weekly problem sets; class record of at least 35%.
Assessment: Class record: 50%, June examination 2 hours: 50%. Sub-minimum: 40% for final examination.

AST2002H ASTROPHYSICS
One fieldtrip to the South African Astronomical Observatory, Sutherland.
24 NQF credits at HEQSF level 6
Convener: Dr V A McBride
Course entry requirements: PHY1004W, MAM1000W
Course outline:
This course presents an introduction to the theoretical aspects of modern astrophysics. The key objective is to illustrate the application of physical laws in an astronomical context and to explain how we know what we do about the universe and its constituents. Subject matter broached includes: Celestial mechanics; radiation laws; blackbody radiation, Planck function and approximations; magnitudes; the hydrogen atom; stellar spectroscopy; stellar evolution and remnants; special relativity; the Earth-Moon system; the Solar system; extrasolar planets; stellar motions; the Milky Way and other galaxies; the extragalactic distance scale; large scale structure; Newtonian cosmology.
Lecture times: Mon, Wed, and Fri, 2nd period (no Friday lecture in second semester), Tutorials: 10 Compulsory tutorial/practical sessions over the year, Wed, 14h00-17h00
DP requirements: Satisfactory attendance at lectures and tutorials; class mark of at least 35%.
Assessment: Three class tests count 25%; 10 compulsory tutorials/practicals including a virtual observatory project, an essay and one presentation count 25%. One 2-hour final examination in November counts for 50%; subminimum requirement of 40% for final examination.

CHEMISTRY

Professor and Head of Department:
S A Bourne, BSc(Hons) PhD *Cape Town* CChem MRSC MSACI

CEM1000W   CHEMISTRY 1000

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%. In exceptional circumstances, a student who has passed a full suite of 1st year courses may register for CEM1000W without meeting the NSC Physical Science requirement. Such registration requires the permission of the Head of Department.
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: Mon to Wed and Fri, 2nd or 4th period. Tutorials: Thurs 2nd or 4th period. Practicals: Tue, Thur or Fri, 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 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

16 NQF credits at HEQSF level 5; 1 practical and/or tutorial per week..
Convener: Dr C Oliver
Course entry requirements: Physical Sciences at NSC level 5 (or senior certificate HG E/ SG C) and Mathematics at NSC level 6 (or senior certificate HG D/ SG B)
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 (particularly metal oxides), atomic structure and chemical bonding, with the emphasis on the structure of solids, chemical equilibrium and aqueous solution chemistry, acids and bases, thermochemistry, electrochemistry and corrosion of metals, polymers.
Lecture times: Mon to Wed & Fri 4th period. Tut/prac Mon 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 2 hours counts 60%, course record counts 40%.It is necessary to pass the theory examination and the whole course in order to secure a pass.

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: structure 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: Mon to Fri, 3rd period. Six tutorials by arrangement. Practicals, EBE: Tue, 14h00-17h00; Science: Thu, 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.

CEM3005W   CHEMISTRY 3005
72 NQF credits at HEQSF level 7
Convener: Professor R Hunter
Course entry requirements: CEM2005W (or CEM2007F and CEM2008S), 1000-level full course in Mathematics; completion of or concurrent registration for STA1000F/S is highly recommended.
Course outline:
This final course for the Chemistry major aims to develop understanding and integrated knowledge of the core disciplines in Chemistry. Lecture material includes topics in wave mechanics and spectroscopy, adsorption and heterogeneous catalysis, solid state chemistry and X-ray crystallography, dynamics, inorganic reaction mechanisms, organometallic chemistry, further topics in organic structure and reactivity, organic synthesis and organic dynamic stereochemistry. The practical course covers the same topics and aims to develop integrative and interpretive skills. A further aim is to develop skills on writing within the discipline, as well as introducing students to modern research methods.
Lecture times: Mon to Fri, 3rd period. Practicals: Wed and Fri, 14h00-17h00.
DP requirements: Attendance and completion of practicals, tests and tutorial exercises, and at least 50% for the class record.
Assessment: Class record (comprising tests, writing project and practicals) counts 50% and two 3-hour examinations written in November count 50% towards the final mark. 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: Dr M Keet
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, Mon, Tue or Wed, 14h00-17h30
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: Dr M Keet
Course entry requirements: CSC1015F (or supp for CSC1015F)
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, Mon, Tue or Wed, 14h00-17h30
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.

CSC2001F   COMPUTER SCIENCE 2001
24 NQF credits at HEQSF level 6
Convener: Associate Professor P Marais
Course entry requirements: CSC1015F and CSC1016S or CSC1010H and CSC1011H, MAM1000W or equivalent.

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, Mon - Fr, 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
24 NQF credits at HEQSF level 6
Convener: Associate Professor P Marais
Course entry requirements: CSC2001F (or supp for CSC2001F), MAM1000W or equivalent.
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, Mon - Fri, 14h00-18h00
DP requirements: Minimum of 45% aggregate in practical work and minimum of 50% in practical test.
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.

CSC2003S   COMPUTER GAMES
24 NQF credits at HEQSF level 6
Convener: Dr G Nitschke
Course entry requirements: CSC2001F, MAM1000W or equivalent.
Course outline:
This course introduces high-level game programming concepts and practical game construction. By the end of the course, students will be able to design and implement simple 2D games. The course begins with a basic introduction to games and game genres for students unfamiliar with gaming, before exploring the game development process. Appropriate terminology, methods, and tools for computer game development are introduced. Fundamental algorithms for 2D game development and implementation are covered, including pathfinding algorithms suited to tile-based games. Text-based games are also briefly explored using Inform7. This is a practical course where students design and implement a game using LibGDX, a Java-based game engine. The final deliverable is a fully functional 2D game which implements many of the techniques explored in lectures.
Lecture times: Monday - Friday, 3rd period, Practicals: One 4-hour practical per week, Mon - Fri, 14h00-18h00
DP requirements: Minimum of 45% aggregate in practical work, minimum of 50% in practical test and minimum of 40% in theory tests.
Assessment: Tests count for 16.7%; practicals, practical test and projects count 33.3%; one 3-hour paper written in November counts 50%. Subminima: 45% on weighted average of theory tests and examination.

CSC3002F   COMPUTER SCIENCE 3002

36 NQF credits at HEQSF level 7
Convener: Professor T Meyer
Course entry requirements: CSC2001F and CSC2002S.
Course outline:
The course provides an introduction to the three topics (1) structure and organization of operating systems; (2) introduction to functional languages and their basis in the λ-calculus. The approach has new relevance with the rise of multiple processors in computing; (3) a basic knowledge of computer networks. The course will take the student through the various logical layers of the Internet protocol suite.
Lecture times: Monday - Friday, 2nd period, Practicals: Two 4-hour practicals per week, Mon - Fri, 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

36 NQF credits at HEQSF level 7
Convener: Professor T Meyer
Course entry requirements: CSC2001F and CSC2002S, and either INF2009F or permission from the Head of Department to do compensation work to a satisfactory standard.
Course outline:
This a course on three advanced topics (1) advanced software design is about turning requirements into effective and efficient implementations in a systematic manner; (2) the compilers module is aimed at exposing students to the theory and practice of parsing and translating high level programming languages into executable code; (3) 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, Mon - Fri, 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.

CSC3020H   THREE DIMENSIONAL & DISTRIBUTED GAMES DESIGN

36 NQF credits at HEQSF level 7
Convener: Dr G Nitschke
Course entry requirements: CSC2001F, CSC2002S and CSC2003S.
Course outline:
This course covers design and development of simple 3D and networked games. The course describes the game development processes and introduces key terminology, methods, and tools of computer gaming. It includes Game Design, 3D Computer Graphics and software agents that can adapt to uncertain and constantly changing gaming environments, as well as techniques for multi-user and distributed games. This is a practical course: students collaborate with designers and artists to produce a full 3D multi-play game which builds on concepts covered in lectures.
Lecture times: CSC3020H and CSC3022H together occupy 3rd period daily, Practicals: 4 hours per week, by arrangement
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests count 16.7%; practical work counts 33.3%; examinations count 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations

CSC3023F COMPUTER SCIENCE 3023
24 NQF credits at HEQSF level 7
Convener: Professor T Meyer
Course entry requirements: CSC2001F, CSC2002S
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

Professor and Head of Department:
M E Meadows, BSc(Hons) *Sussex*, PhD *Cantab*, FSSAG

EGS1005F INTRODUCTION TO ENVIRONMENTAL ASSESSMENT & MANAGEMENT
12 NQF credits at HEQSF level 5
Convener: TBA
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: June examination 2½ hours, 50%.

GEOLOGICAL SCIENCES

Associate Professor and Head of Department:
C Harris, MA DPhil *Oxon*

GEO1006S INTRODUCTION TO MINERALS, ROCKS & STRUCTURE
18 NQF credits at HEQSF level 5
Convener: Professor C Harris
Course entry requirements: A minimum of 45% in GEO1009F or a pass in AGE1004S
Course outline:
This course introduces students to the Geology major and covers the essentials of the discipline as follows: crystals and minerals; igneous and metamorphic rocks; structural geology; mineral deposits and economic geology; palaeontology; the interpretation of geological maps. A three day field trip to the Western Cape serves as an introduction to field geology.
Lecture times: Monday - Friday, 5th period
DP requirements: An average of 30% in all marked classwork and tests.
Assessment: Class tests count 35%; field reports count 15%; one 2-hour theory examination written in November counts 50%. A subminimum of 40% is required in the theory examination paper.

GEO1008F   INTRO GEOLOGY FOR CIVIL ENGINEERS
12 NQF credits at HEQSF level 5
Convener: Dr B Kahle
Course outline:
This course introduces students in civil engineering to the structure of planet Earth and plate tectonics of the lithosphere. Physical and chemical properties of rock forming minerals. Clay minerals, their structure and properties. Petrology of igneous, sedimentary and metamorphic rocks. Weathering and applied geomorphology. Structural geology, geomechanical classification of jointed rock masses. Field and laboratory testing techniques. Case studies of problem soils throughout South Africa and problem soils in general.
DP requirements: None
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 who fail this course will be advised to register for AGE1004S (see entry in Department of Archaeology). Students are required to attend three half-day excursions in the Cape Peninsula.
18 NQF credits at HEQSF level 5
Convener: Associate Professor J S Compton
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 November.

MATHEMATICS AND APPLIED MATHEMATICS

Professor and Head of Department:
H-P Kunzi, MSc PhD *Berne*

Refer to the Science Faculty Handbook for details of other courses offered by the Department.

MAM1000W   MATHEMATICS 1000
36 NQF credits at HEQSF level 5
Convener: Dr J P Shock
Course entry requirements: A pass in NSC Mathematics with at least 70%, or at least a D symbol at A-level.*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 MAM1005H from week 7.*
Course outline:
The aim of this course is to introduce students to the fundamental ideas in calculus, linear algebra and related topics. It includes differential and integral calculus of functions of one variable,

differential equations, partial derivatives, vector geometry, matrix algebra, complex numbers, Taylor polynomials. This course is necessary for entry into second year mathematics.
Lecture times: Five lectures per week, Monday - Friday, 1st or 3rd period.
DP requirements: Minimum of 30% for class tests, minimum 30% for weekly online tests, and satisfactory tutorial work.
Assessment: Year mark counts 33.3%; two no longer than 3-hour papers written in October/November make up the balance.

MAM1020F   MATHEMATICS 1A FOR ENGINEERS
18 NQF credits at HEQSF level 5
Convener: Dr H Skokos
Course entry requirements: None
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 H Skokos
Course entry requirements: None
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 L 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 N R C RobertsonTBA
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%.

MAM1042S   ENGINEERING STATICS

16 NQF credits at HEQSF level 5; 4 lectures per week, 1 two hour tutorial per week.
Convener: Associate Professor C W Hellaby
Course entry requirements: None
Course outline:
This course introduces students to engineering statics. Topics include: review of vectors, position, displacement and force vectors, line of action and transmissibility, addition of forces at a point, normal reaction and friction, equilibrium for a particle, connected particles, limiting equilibrium, free body diagrams. Parallel and non-parallel coplanar forces, moment of a force, couples, principle of moments, addition of a force and a couple, resultant and equilibrium for a rigid body, internal forces, toppling and sliding, two-force and three-force systems, compound systems, trusses. Centre of mass of many particles, centre of mass of extended bodies, composite bodies. Distributed forces, pressure distributions. Moments of inertia for areas and masses, parallel axis theorem.
DP requirements: 35% for class record and high tutorial attendance.
Assessment: November examination 2.5 hours: 67%, year mark: 33%.

MAM2000W, MAM2002S, MAM2003Z, MAM2004H

MATHEMATICS II, 2000, 2002, 2003, 2004
Note: Modules under these codes may be taken. Refer to the Handbook of the Faculty of Science for details.

MAM2053S   NUMERICAL ANALYSIS AND SCIENTIFIC COMPUTING

This course is identical to module 2NA of MAM2046W for Science students. Note: Credit cannot be obtained for both MAM2053S and MAM3080F.
12 NQF credits at HEQSF level 6
Convener: Dr T Chinyoka
Course entry requirements: MAM2083 and MAM2084
Course outline:
The aim of this course is to introduce a selection of fundamental topics in Applied Mathematics. Non-linear equations and rates of convergence. Direct and iterative methods for solving linear systems, pivoting strategies, matrix factorization, norms, conditioning. Solutions to initial value problems including higher order ordinary differential equations. Interpolation and approximation theory, splines, discrete and continuous least squares. Numerical differentiation and integration. Error analysis and control.
Lecture times: 2½ lectures per week, 1 tutorial per week.
DP requirements: A class record of 30% or more is required in each module of the course.
Assessment: For each module the class record counts 30% and one 2-hour examination paper counts 70%.

MAM2082F   COMPUTER PROGRAMMING IN MATLAB
This course will not be offered in 2016.
8 NQF credits at HEQSF level 6
Convener: TBA
Course entry requirements: MAM1003Wor MAM1020F/S and MAM1021F/S.
Course outline:
The aim of this course is to introduce basic scientific programming in MATLAB.
Topics include: expressions, basic operations, script files, vector and matrix handling, loops, decisions, function files, reading and writing data, basic graphics, strings, basic numerical methods (e.g. applied to systems of linear equations, and roots of nonlinear equations), numerical solution IVP's (Euler's method & Runge-Kutta methods), numerical solution of BVP's(finite difference methods), further examples of interest to engineers (simulation, chaos, mechanical systems, fluid flow, heat transfer).
Lecture times: 1 lecture and 1 tutorial per week.
DP requirements: 30% Class record and high tutorial attendance.
Assessment: June examination no longer than 2 hours: 60%, year mark: 40%.

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: Dr E Fredericks
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: Dr J L Frith

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%.

MAM2085F/S   VECTOR CALCULUS FOR ASPECT
16 NQF credits at HEQSF level 6
Convener: Dr T Craig
Course entry requirements: END1020 and END1021
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
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%.

MAM3050S   NUMERICAL MODELLING
This course is identical to module 3AN of MAM3040W for Science students.
18 NQF credits at HEQSF level 7
Convener: Dr N Alexeeva
Course entry requirements: MAM2083 and MAM2084.
Course outline:
The aim of this course is to introduce a selection of advanced topics in Applied Mathematics. Topics include: Boundary-value problems. Numerical solutions of PDEs by the method of finite differences, finite elements and spectral methods.
Lecture times: 2½ lectures per week, 1 tutorial per week.
DP requirements: Class record of 30% or more.
Assessment: November examination no longer than 2 hours: 65%, year mark: 35%.

PHYSICS

Professor and Head of Department:
A Buffler, MSc PhD HDE *Cape Town*

Refer also to the Science Faculty Handbook.

PHY1012F/S   PHYSICS A FOR ENGINEERS
18 NQF credits at HEQSF level 5; First-year first or second semester course.
Convener: G Leigh
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%.

PHY1013F/S   PHYSICS B FOR ENGINEERS
18 NQF credits at HEQSF level 5; first-year, first or second semester course..
Convener: G Leigh
Course entry requirements: PHY1012F/S or PHY1014F/S
Co-requisites: MAM1020F
Course outline:
The course is the second semester 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%; one2-hour examination counts 50%.

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 theory examination paper.

PHY1015F/S   PHYSICS B FOR ASPECT
16 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 semester 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 theory examination paper.

PHY1031F   GENERAL PHYSICS A
18 NQF credits at HEQSF level 5
Convener: Dr S M Wheaton
Course entry requirements: At least 60% for NSC Physical Science*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: To be advised
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 3-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: To be advised
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: 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%.

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 during Monday, 2nd, Wednesday 1st or Friday 3rd period and one long workshop per week, Tuesday or Thursday during 6th and 7th period. Not compulsory but recommended.
18 NQF credits at HEQSF level 5
Convener: Dr L. Scott
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 is a service course 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%.

Assessment: The class record counts 30% (consists of the following components (and their contribution): Class test 1 (25%), class test 2 (25%), Excel test (30%) and weekly tutorial tests (20%). One 3-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 during 2nd (Monday, Tuesday, Thursday or Friday) or 4th (Tuesday or Thursday) period and a long workshop per week, Tuesday and Thursday during 6th and 7th period. Not compulsory but recommended.

18 NQF credits at HEQSF level 5

Convener: Dr 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 is a service course 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%.

Assessment: The class record counts 30% (consists of the following components (and their contribution): Class test 1 (25%), class test 2 (25%), Excel test (30%) and weekly tutorial tests (20%). One 3-hour examination counts 70%.

STA1001F   STATISTICS 1001

Note: No student will be permitted simultaneous credit for any equivalent or subsuming first year Mathematics course.

18 NQF credits at HEQSF level 5

Convener: TBA

Course entry requirements: A pass in matriculation Mathematics with at least 50% on HG or a C-symbol on SG, or 5 (NSC) in Mathematics, or MAM1014F and MAM1015S. For foreign students a pass at A-level or a C-symbol at O-level is required.

Course outline:

1) The Mathematics of Finance. 2) Functions and graphs; straight lines, polynomials, exponential and logarithmic functions. 3) Matrix algebra and linear programming. 4) Counting rules and Binomial Theorem. 5) Differential calculus. 6) Integral calculus. Emphasis will be placed on areas of interest to Business Science students, including applications to Economics.

Assessment: June/November examination 3 hours.

STA1008F   STATISTICS FOR ENGINEERS

12 NQF credits at HEQSF level 5

Convener: Dr J Stray

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.

STA2020F   APPLIED STATISTICS

24 NQF credits at HEQSF level 6

Convener: N Watson

Course entry requirements: (MAM1000W or MAM1004F/S or MAM1005H or MAM1010F/S or MAM1020F/S or STA1001F) and (STA1000F/S/P/L or STA1006S or STA1007S)

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 to Thursday, 1st or 5th period

DP requirements: At least 35% for class record and at least 50% for the project.

Assessment: Class record counts 40%. The class record consists of the following components (and their contribution): Class test 1 (35%), Class test 2 (35%) and Project (10%) and Tutorial test average (10%) and Practical test average (10%). One 3-hour examination counts 60%.

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's office. 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 scholarship: The full tuition fee for the BSc Honours in Property Studies. Awarded to the BSc Property Studies qualifier with the highest cumulative GPA above 70%. In the event of a tie, both candidates shall be awarded the full scholarship.

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

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.

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.

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).

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.

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.

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
Electro-Mechanical 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.

South African Association of Consulting Professional Planners (SAACPP) Prize: R2000 and certificate for the best dissertation in the MCRP programme.

Barry Heyman Prize: R5000 for the first year MArch(Prof) student who shows the greatest progress in Architectural Design in the MArch(Prof) programme.

Bruce Burmeister Architects Prize: R500 for the Best Student in the Technology 2 course.

Bruce Burmeister Architects Prize: R500 for the Most Improved Student in Technology 2.

Cape Institute for Architecture Measured Drawing Prize: R500 for Measured Drawings of old works in the Cape Province.

Cape Institute for Architecture Prize: R2000 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: R2000 for the best student in Design and Theory Studio III.

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 Africa Prize: R500 for the Best Student in Landscape Construction in the second year of the Master of Landscape Architecture.

CNdV Africa Prize: R500 for the Best Student in History and Theory of Landscape Architecture across first and second year in the Master of Landscape Architecture.

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.

Gibbs St Pol Landscape Architects Prize: R1000 and a certificate awarded to a BAS student for the finest BAS Major Project exploring Landscape Architecture.

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.

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.

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 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 MArch Professional Student.

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 MCRP and MCPUD programmes.

South African Planning Institute (Western Cape) Prize: R1000 and certificate for the best overall student work in 2nd year MCRP and MCPUD programmes.

South African Planning Institute Prize: R1000 and certificate for the most improved student over the 2 year MCRP & MCPUD 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 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 Faculty 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: R800, R1000, R1200 and R1500 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: R1000 to the best all-round student in the final year of study of the BSc(Hons) in Quantity Surveying.

Bell-John Prize: R1500 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 CON4048S)

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 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 Property Finance 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 Property Finance 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 Property Finance 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).

Old Mutual Corporate Real Estate 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: R4500 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 award includes an invitation to an event hosted by PMSA (WC) at which the recipient will be given the opportunity to present the findings of his/her research to leading stakeholders in the industry to which it applies. The decision of the award will be made in 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.

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.

Gerda van Rosmalen Award: (Book Prize)for the most promising CHE3066 Chemical Engineering student.

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%.

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, a book, and one year's membership of the Concrete Society of Southern Africa 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.

Mott MacDonald PDNA 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.

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.

Paterson & Cooke Prize: R2000 for the best work in the final year research project.

Jeffares & Green Award: 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.

PPC Cement Prize: R2500 voucher and a book for the best undergraduate project on concrete technology.

Prestedge, Retief, Dresner & Wijnberg Prize: R2000 for the best Water 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 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 EEE3017W.

Peralex Electronics prize: R1500 for the best student in EEE4001F.

Peralex Electronics prize: R1500 for the best student in EEE4084F.

Siemens Prize: R2500 for the final year Electrical Engineering student submitting the best thesis (EEE4022S/F).

Mechanical Engineering/Electro-Mechanical 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 MEC4091S Honours Research Project involving the use or application of aluminium.

Best Student in Dynamics 1: R500 awarded to the student with the top mark in Dynamics I

Best Student in Dynamics I1: R500 awarded to the student with the top mark in Dynamics II

Best Student in Solid Mechanics I: R500 awarded to the student with the top mark in Solid Mechanics I

Best Student in Solid Mechanics II: R500 awarded to the student with the top mark in Solid Mechanics II

Best Final-Year BScEng Project or BSc (Hons) Project: R1000 awardedfor the top mark in the final-year BScEng project or BSc (Hons) project in an Impact-Related topic.

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).

SAI Mech Eng Award: Floating trophy and certificate for the best student in the Mechanical Engineering design and laboratory project in the Final Year of study.

SASOL Prize for MEC2020W: Achievement Medal and R750 for the best second year student in the course MEC2020W, Design I

SASOL Prize for MEC3073S: Achievement Medal: and R1000 for the best third year student in the course MEC3073S, Design II

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%.

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 City Planning and Urban Design (MCPUD) 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.

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