

# MISSION STATEMENT

*Our mission is to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society.*

*Educating for life* means that our educational process must provide:

- \* a foundation of skills, knowledge and versatility that will last a lifetime, despite a changing environment;
- \* research-based teaching and learning;
- \* critical inquiry in the form of the search for new knowledge and better understanding; and
- \* an active developmental role in our cultural, economic, political, scientific and social environment.

*Addressing the challenges facing our society* means that we must come to terms with our past, be cognisant of the present, and plan for the future. In this, it is central to our mission that we:

- \* recognise our location in Africa and our historical context;
- \* claim our place in the international community of scholars;
- \* strive to transcend the legacy of apartheid in South Africa and to overcome all forms of gender and other oppressive discrimination;
- \* be flexible on access, active in redress, and rigorous on success;
- \* promote equal opportunity and the full development of human potential;
- \* strive for inter-disciplinary and inter-institutional collaboration and synergy; and
- \* value and promote the contribution that all our members make to realising our mission.

*To equip people with lifelong skills* we must and will:

- \* promote the love of learning, the skill of solving problems, and the spirit of critical inquiry and research; and
- \* take excellence as the benchmark for all we do.

We are committed to academic freedom, critical scholarship, rational and creative thought, and free inquiry. It is part of our mission to ensure that these ideals live; this necessarily requires a dynamic process of finding the balance in a range of choices: choices between freedom and responsibility, rights and obligations, autonomy and accountability, transparency and efficiency, and permanence and transience; and of doing this through consultation and debate.

# UNIVERSITY OF CAPE TOWN

## FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

### 2007

**Postal Address:** University of Cape Town  
Private Bag X3  
7701 RONDEBOSCH

**Dean's & Faculty Offices:** Room 600, Menzies Building  
Engineering Mall  
Upper Campus

**Office Hours:** Mondays to Fridays: 08h30 - 12h30; 13h30 - 16h30

**Fax:** (021) 650 3782

**Telephones:** Dean's Office (021) 650 2702  
Faculty Office (021) 650 2699  
Accounts and Fees (021) 650 1704/4076  
Admissions (021) 650 2129

**Internet:** UCT's Home Page <http://www.uct.ac.za>  
Engineering & Built  
Environment Home Page <http://www.ebe.uct.ac.za>  
Dean's Office [dean@ebe.uct.ac.za](mailto:dean@ebe.uct.ac.za)  
Faculty Office [faculty@ebe.uct.ac.za](mailto:faculty@ebe.uct.ac.za)  
International Academic  
Programmes Office [iapo@world.uct.ac.za](mailto:iapo@world.uct.ac.za)

The Registrar's and General Enquiries offices are located in the Bremner Building and remain open during the lunch hour. The Cashier's Office, in the Kramer Building, is open from 09h00 to 15h30.

#### **This handbook is part of a series that consists of**

- Book 1:** Information for applicants for undergraduate degrees and diplomas  
**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  
**Books 6-11:** Handbooks of the Faculties of Commerce, Engineering & the Built Environment, Health Sciences, Humanities, Law, Science  
**Book 12:** Student fees  
**Book 13:** Financial assistance for undergraduate students  
**Book 14:** Financial assistance for postgraduate students

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The University has made every effort to ensure the accuracy of the information in its handbooks. However, we reserve the right at any time, if circumstances dictate, to

- (i) make alterations or changes to any of the published details of the opportunities on offer; or
- (ii) add to or withdraw any of the opportunities on offer.

Our students are given every assurance that changes to opportunities will only be made under compelling circumstances and students will be fully informed as soon as possible.

## 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 (see below) each of which has a particular focus. The sections are interlinked by cross-references where relevant.

- (a) *General Information:* This section includes information on the professional status and recognition of the Faculty's degrees, its links with professional bodies and the list of qualifications offered. It also includes lists of the various prizes, medals and scholarships awarded on academic merit and contains information on the criteria for the Dean's Merit Lists.
- (b) *Rules for degrees:* This section covers the Faculty rules for each of the various degree programmes. These rules should be read in conjunction with the general University rules in the General Rules and Policies Handbook (Handbook 3). 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. *Important rules:* All students must familiarise themselves with the Degree Rules in this Handbook. In addition, students must refer to Handbook 3, General Rules and Policies and particularly take note of the following:
- rules relating to registration and examinations;
  - rules relating to changes of curriculum;
  - rules relating to leave of absence;
  - rules on Academic Conduct, N.B. the rules concerning dishonest conduct and plagiarism.
- Detailed information on the undergraduate entrance requirements can be found in the University Prospectus. The PhD Degree rules are published in *Handbook 3, General Rules and Policies*.
- (c) *Departments and Programmes:* This section contains entries for each department in the Faculty. Each lists members of staff, a summary of laboratory, workshop and other facilities, the research entities, and the programmes of study administered by each department. The curriculum for each programme (list of required courses) is set out in table form. The curriculum tables must be read together with (cross-referenced to) the lists of courses in the Courses Offered section which is described under (e) below.
- (d) *Centres/Units established in the Faculty and Centres, Departments, Schools and Units Established in other Faculties:* There are entries for the principal Faculty entities/units which do not fall directly under academic departments e.g. the Centre for Research in Engineering Education and the Continuing Professional Development Programme and entries for the centres, units and departments in other faculties which offer courses for students registered in the Faculty. This is cross referenced to the list of courses offered in section (e).
- (e) *Courses Offered:* The full list and descriptions of courses offered by the Faculty, both undergraduate and postgraduate, is set out in this section in alpha-numeric order (ie based on course code prefix which identifies the department offering the course and the course number. The courses offered by other faculties which are more commonly taken by students in the Faculty of Engineering & the Built Environment are also listed and described. N.B. A key (guide) to the course code system, the credit system and terminology (definitions) is set out at the beginning of this section.



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# GENERAL INFORMATION

## Officers in the Faculty of Engineering & the Built Environment

### Academic

**Dean of the Faculty:**

Professor CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell*  
FSAIMM FSAICHe FSAAE FRSSAf

**Deputy Deans:**

Professor MG Alexander, PrEng BSc(Eng) MSc(Eng) PhD *Witwatersrand* FSAICE FSAAE,  
MASSAf MICT  
Professor BJ Downing, MSc *Bradford* PhD *Sheffield* F(SA)IEE

**Assistant Dean:**

Professor DMcK Fraser, BSc (Chem Eng) PhD *Cape Town* MSAICHe

**Heads of Departments:****Architecture, Planning and Geomatics:**

Professor L le Grange, BArch *Cape Town* MArch(UD) *Rice* MIArch CIA

**Chemical Engineering:**

Professor E van Steen, MSc(Eng) *Eindhoven* PhD *Karlsruhe* FSAICHe

**Civil Engineering:**

Professor GA Ekama, BSc(Eng) PhD *Cape Town* SFWISA FRSSAf FSAAE MASSAf MWEF  
MIWA

**Construction Economics and Management:**

Associate Professor KS Cattell, BSc(QS) *UPE* MPhil *Cape Town* PrQS PMAQS MRICS MCEASA  
MSAFMA

**Electrical Engineering:**

Professor CT Gaunt, BSc(Eng) *Natal* MBL *SA* PhD *Cape Town* FIEE F(SA)IEE

**Mechanical Engineering:**

Professor RB Tait, PrEng BSc(Hons) *Rhodes* MA *Oxon* BSc(Eng) PhD *Cape Town* M(SA)IMEchE

**Co-ordinator and Senior Lecturer - Professional Communication Studies:**

Ms J English, BA MPhil *Cape Town*

### Academic Administration

**Faculty Manager (Academic Administration):**

Mr JR Galvin, BA (Hons) *Rhodes* MA *Queens, Kingston*

**Senior Administrative Officer:**

Mrs SD Donald, BCom *Cape Town*

**Administrative Officer:**

Mrs J Buxey

## 2 GENERAL INFORMATION

### **Administrative Assistant:**

Ms A Burmeister, BA *UNISA*

### **Administrative Assistant and Statistician:**

Ms H Leather, BSc(Hons) *Witwatersrand*

### **Senior Secretary:**

Ms J Willey

### **Senior Secretary - Receptionist:**

Ms S Reizenburg

### **Communications, Marketing and Development Manager:**

Ms M Hilton

## **Finance**

### **Faculty Finance Manager:**

Mrs G Osborne

### **Senior Finance Officer:**

Ms L Kallam

### **Finance Officers:**

Mrs M Hyland

### **Finance Assistant:**

Mrs B Bailey

### **Faculty IT Manager:**

Mrs E Hagenkötter

## **Human Resources**

### **Human Resources Manager:**

Mr L Toerien, BA *Cape Town*

### **Human Resources Officer:**

Ms Z Matthews, BAdmin *UWC*

### **Administrative Assistant to the Dean**

Mrs EA Schulschenk

## **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 Life Fellows and Sometime Fellows who are currently on the Faculty's staff:

### **Life Fellows**

Professor MG Alexander	(Civil Engineering)
Professor D Dewar	(Architecture, Planning and Geomatics)
Professor GA Ekama	(Civil Engineering)



Professor CT O'Connor (Chemical Engineering)  
 Professor H R  ther (Architecture, Planning and Geomatics)

## **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 Bachelor of Architecture degree (BArch) is a professional degree. It confers eligibility for registration, under Act No.44 of 2000, for membership of the Institute of South African Architects (MIA). The final examinations have the approval of the South African Council for the Architectural Profession and confer eligibility, under Act No. 44 of 2000, for registration as an Architect within the Republic of South Africa (ArchSA). The Bachelor of Architecture course merits exemption from Parts 1 and 2 of the Royal Institute of British Architects', and the Commonwealth Association of Architects', own examination in Architecture.

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 Council of South Africa Town and Regional Planners (TRP(SA)). Registration with the Council, which is a statutory requirement to practise, can occur after two years of supervised practical experience.

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

## 4 GENERAL INFORMATION

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**

The Education Advisory Committee of the South African Council for Professional and Technical Surveyors, recognises the BSc(Geomatics) degree as a suitable theoretical qualification for the conditions set out in Section 20 of Act 40 of 1984, for registration as a Professional Land Surveyor, 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 (at present about 15 months) with a practising Professional and to undertake a test of professional competence. 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 in most parts of the world.

### **Institutes of Professional Land Surveyors**

Holders of a degree in Geomatics, after completing an articleship of about 15 months and passing a practical test of professional competency and an examination, may proceed to registration as a Professional Surveyor. The registering body is the South African Council for Professional and Technical Surveyors, P O Box 62041, Marshalltown, 2107.

Registered surveyors, at their request, will be admitted to membership of the South African Geomatics Institute.

### **Construction Economics and Management**

The BSc(Construction Studies) degree and the BSc(Hons) degrees in Quantity Surveying and Construction Management are accredited by the South African Council for the Quantity Surveying Profession (SACQSP) and the Royal Institution of Chartered Surveyors (RICS). In addition the BSc(Hons) in Construction Management degree is accredited by the Chartered Institute of Building (UK). The difference, from an accreditation point of view, between the BSc(Construction Studies) degree and the BSc(Hons) degrees in Quantity Surveying and Construction Management is that the requirements in respect of post graduation professional in-service training done prior to registration with the accrediting organisation will differ.

The BSc(Property Studies) degree and BSc(Hons) in Property Studies degrees are accredited by the South African Council for the Property Valuers Profession (SACPVP) and the Royal Institution of Chartered Surveyors (RICS).

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 without further examination.

Address: The Director, ASAQS, PO Box 3527, Halfway House 1685.

### **South African Council for the Quantity Surveying Profession**

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 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**

The South African Council for the Project and Construction Management Professions registers professionals and candidates in the project and construction management professions. Application will be made for accreditation of the BSc(Hons) programmes in Construction Management and Quantity Surveying, and the MSc in Project Management, once they have formulated their education framework. 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 Valuers 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.

#### **Property Council of South Africa (PROCSA)**

The Property Council of South Africa (PROCSA), founded in 1999, is an umbrella body for a number of property-related organisations in South Africa. The role of PROCSA as a registering authority is unclear at present, but application will be made to the relevant SA authority for accreditation of the BSc and BSc (Hons) degrees in Property Studies in future, if appropriate.

Address: The Director, PROCSA, PO Box 78544, Sandton 2146.

## **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.

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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: 165-171 Railway Terrace, Rugby, Warks. CV21 3HQ, UK.

### **The South African Institution of Chemical Engineers**

Graduates in Chemical Engineering may be admitted to membership, without further examination. Address: P O Box 808, Pinetown, 3198.

### **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/](http://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: 18a Gill Street, Observatory, Johannesburg, 2198.

### **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.

## Lecture Timetable

Lecture timetable details are available from the offices of the respective heads of departments in the Faculty of Engineering & the Built Environment.

## Minimum Requirements for Admission

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

The minimum requirements for admission for Certificate, Postgraduate Diploma and Masters 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.

Further detailed information on Faculty entrance requirements can be found in the *Undergraduate Prospectus*. Refer to the University's web page: <http://www.uct.ac.za>

## 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 Masters 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](mailto:gradcentre@uct.ac.za). or visited at [www.pgfo.uct.ac.za](http://www.pgfo.uct.ac.za).

## 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 President for 2006/2007 is Ms Portia Gama.

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 2006/2007 Chair is John Morkel and the Vice Chair is Lester Chihoro. They can be contacted through their respective departments, Civil Engineering and Mechanical Engineering, or at room 338 Menzies Building.

## Scholarships, Prizes, Class Medals and Dean's Merit List

### Scholarships/Awards

Details of scholarships and awards available are given in the Financial Assistance for Postgraduate Studies and Financial Assistance for Undergraduate Studies Handbooks available from the Registrar. The following is a selected list of scholarships and awards . Note that the scholarships on offer and the values are subject to change without notice.

## Architecture, Planning and Geomatics

### Architecture and Planning

**Hugh and Win Walker Scholarships:** Awarded with preference for degrees in Architecture and, thereafter, Planning undertaken at UCT. Applications to the Postgraduate Scholarships Office/Undergraduate Funding Office.

**National Development Fund for the Building Industry Postgraduate Scholarship:** Applications to the Director, National Development fund for the Building Industry, Box 1619, Halfway House, 1685, by 2 January.

**South African Council for the Architectural Profession:** For First year BAS students. Applications to SACAP by 31 March - via the Head of the First Year Studio. Applications to the Director, National Development fund for the Building Industry, Box 1619, Halfway House, 1685, by 2 January.

### Geomatics

**Twamley Undergraduate Scholarship (R1 000, tenure 1 year):** 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 (R3 000 pa, tenure 3 years maximum):** 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

**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.

**National Research Foundation:** Awarded on merit for Honours, full/part-time Masters and Doctoral Study. Applications to be submitted to the Postgraduate Scholarships Office by 15 August for Honours and 31 December for Masters study and 30 April for Doctoral study.

**National Research Foundation: NRF Prestigious Awards:** Awarded on merit for full-time registered Masters 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).

**Louw, Tobie, 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, P O 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, P O Box 3527, Halfway House, 1685 by 15 June.

**Queen Elizabeth II Jubilee Fund Scholarship:** Awarded to Bachelors and taught Masters students who are members of the CIOB. Applications to be submitted to the Scholarship Secretary,

Professional and Technical Directorate, CIOB, Englemere, Kings Ride, Ascot, England.

## Engineering

### General

**Klaus-Jurgen Bathé Scholarships (R10 000 available for one or more award - value variable; tenure 2 years maximum):** 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 (R2 000 pa, tenure 2 years):** 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 Steytlér Memorial Scholarship (Undergraduate) (R1 100, tenure 1 year):** Awarded to the student obtaining the highest weighted average in the First Year examinations.

**Twamley Undergraduate Scholarship (R1 000, tenure 1 year):** 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) (R2 500 pa, tenure 1 year):** 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) (7 500 x 2, tenure 2 years):** Awarded on examination results for the BSc(Eng) degree with preference for Civil Engineering, for undergraduate or postgraduate study. The candidate should have obtained First Class Honours and intend to undertake further study.

**Chris van Breda Scholarship (Postgraduate) (R8 500 pa, tenure 2 years):** Awarded on final examination results for the BSc(Eng) degree, with preference for Civil Engineering. The candidate should have obtained First Class Honours and intend to undertake further study

### Mechanical Engineering

**Duncan McMillan Scholarship (Undergraduate) (R500, tenure 1 year renewable for a maximum of 3 years):** 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:

APG1016S Geomatics

APG2022W Design and Theory Studio 2

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**APG3024W** Design and Theory Studio 3

**APG6002S** Studiowork ARCH6

### **Construction Economics and Management and Engineering**

Class medals may be awarded to the best students in each of the following first year core courses: CHE1004W, CIV1004W, CON1004W, CON1011F, CON1012S, CON1018W, CON1019F/S, EEE1004W, MEC1002W and MEC1004W.

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 (APG5036F or CON4034W).

**Joseph Arenow Prizes:** (two x R1000) (i) for the best Masters 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 BArch entailing the use of aluminium.

**Association of Consulting Town and Regional Planners Prize:** R750 and certificate for the best dissertation in the MCRP programme.

**Cape Institute of Architects Group Prize (Simulated Office):** R350 for group work undertaken showing a high standard of resolution or innovation.

**Barry Heymann Prize:** R5000 for the final year BArch student who shows the greatest progress in Architectural Design in the BArch programme.

**Cape Institute of Architects Measured Drawing Prize:** R250 for Measured Drawings of old works in the Cape Province.



**Cape Institute of Architects Prize:** R350 for the best student graduating in the BArch Degree Programme.

**Cape Institute of Architects Prize:** R350 for the best student in Design and Theory Studio 2.

**Cape Institute of Architects Prize:** R350 for the best student in Design and Theory Studio 3.

**Cement and Concrete Institute Prize:** Book and R500 voucher for the best use of concrete in final year design in the BAS programme.

**Cement and Concrete Institute Prize:** Book and R500 voucher for the best use of concrete in final year design in the BArch 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.

**Essay Prize:** R50 awarded to the BArch student who produces the best essay.

**General JBM Hertzog Prize:** R500 awarded annually to the best final year student in the BArch degree.

**Helen Gardner Travel Prize:** R10 000 awarded by UCT to a student who has completed the third year of the BAS degree but who has not yet been admitted to the Thesis Term of the BArch degree. Applications to the Director, School of Architecture and Planning.

**Institute of Landscape Architects of South Africa Prize:** R500 and certificate for the best student in second year in the Master of Landscape Architecture Programme

**Ivor Prinsloo Prize:** R450 for the best essay in Architectural Theory in the BArch programme.

**Ivor West Memorial Prize:** R500 for the best second or third year Geomatics student.

**John Perry Prize:** R400 for the best work done in the third year of study of the BAS degree.

**Mittal Steel Prize:** R1000 for the best innovative design using Mittal Steel products - any year of study.

**Molly Gohl Memorial Prize:** R750 for books or instruments to the best woman student completing the third year of study of the BAS degree.

**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.

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**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 BArch Student based on final two years of study.

**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:** R500 and certificate for the best first year student in the MCRP and MCPUD programmes.

**South African Planning Institute (Western Cape) Prize:** R500 and certificate for the best overall student work in 2nd year MCRP and MCPUD programmes.

**South African Planning Institute Prize:** R500 and certificate for the most improved student over the 2 year MCRP & MCPUD curricula.

**Urban Design Institute of South Africa (Western Cape) Prize:** Certificate for the best dissertation in the MCPUD Programme.

### **Construction Economics and Management**

**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:** R500, R500, R750 and R1000 for the best student in each year of study, respectively, for the BSc(Construction Studies) and the BSc(Hons) in Quantity Surveying.

**Bell-John Prize:** R780 for the best all-round student registered for BSc(Construction Studies) or BSc(Hons) in Quantity Surveying in any year of study.

**Bernard James Prize:** R300 for the BSc(Hons) in Quantity Surveying student obtaining the highest award (Minimum First Class Pass) in Research Report (CON4036W).

**The Chartered Institute of Building (CIOB) Book Prize:** R800 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:** R850 for MSc Project Management student who has achieved the highest average overall mark.

**The Chartered Institute of Building (CIOB) Book Prize:** R2000. Nomination for a national award for the best undergraduate dissertation from any qualifying institution.

**Clay Brick Association Prizes:** Two of R150 and R100 respectively for the best and second best students collectively in the subjects of Construction Technology 1, 2, 3 (CON1004W, CON2006W, CON3012W).

**Committee of the Western Cape Chapter of SA Quantity Surveyors' Prize:** R400 to the best all-round student in the final year of study of the BSc(Hons) in Quantity Surveying.

**George Strachan Prize:** R50 for the best final year student in the BSc(Hons) in Construction

Management.

**Grinaker-LTA Book Prizes:** R500 for the best student registered for the BSc(Hons) in Construction Management in Construction Management (CON4031F, CON4038F, CON4039S and CON4040S) (Minimum First Class Pass); R500 for the best student registered for the BSc(Hons) in Quantity Surveying in the subject of Measurement and Design Appraisal 3 (CON4032F and CON4037S) (Minimum First Class Pass).

**Master Builders Association of the Western Cape Prize:** for the best BSc(Construction Studies) or BSc(Hons) in Construction Management student in any year of study: R500 plus shield; best BSc(Construction Studies) student in third year of study: R500; and best BSc(Hons) in Construction Management student in fourth year of study: R500.

**Old Mutual Properties Prize:** R300 voucher for the best all round student in the second year of study for the BSc(Property Studies) degree.

**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 65% 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.

**Walters, Simpson and Du Toit Prize:** R300 for the best all round student in third year of study for the BSc(Construction Studies) degree.

## Engineering

### General

**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 4-year degree curriculum.

**George Menzies Prize:** R500 awarded on the results of the final examination to the best student in either Geomatics or Civil Engineering.

**Sammy Sacks Memorial Prize:** R500 for the best classwork in MEC1002W Engineering Drawing.

### Chemical Engineering

**African Rainbow Mineral's Prize:** R2000 for the student who obtains the highest combined mark for the course CHE4050F.

**Chevron Prize for Chemical Engineering Design:** R2000 for the student with the best overall performance in the course CHE4036Z.

**Malan Chemical Engineering Medals:** for the best students in each of the Second (bronze), Third (silver) and Final (gold) Years.

**Malan Prize:** (Perry's Chemical Engineering Handbook) for the most promising First Year student.

**Omnia Prize:** R2000 for the student pair completing the final year project (CHE4045Z) of the highest standard.

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**SA Institution of Chemical Engineers' Silver Medal:** for outstanding performance in project and practical courses.

**SASOL Achievement Medal and R1000:** for the best third year student completing the course CHE3046F Chemical Engineering Thermodynamics II.

**SASOL Achievement Medal and R1500:** for the best fourth year student completing the courses CHE3045S Reactor Design II and CHE4042F Process Dynamics and Control.

### **Civil Engineering**

**Arcus Gibb Prize for Transportation Engineering:** R500 for the best undergraduate student in the field of Transport Studies.

**Concrete Society of SA Award:** R500, certificate, a book and a year's membership of the Concrete Society for outstanding work in the field of concrete technology.

**Grinaker-LTA Prize:** R1000 for the best thesis in the final year.

**Jeffares & Green Award:** R750 for the Fourth Year Civil Engineering student with the highest overall achievement in professional communication.

**Joint Structural Division of SAICE and IStructE Prize:** R2000 for academic achievement in the field of structural engineering; with preference for final year Civil Engineering students.

**Liebenberg and Stander Prize:** R1000 for the graduating student with the best achievement over four years of study.

**Ninham Shand Prize for Water Engineering:** R1000 for the student with the highest aggregate score in the courses CIV2036F, CIV2038S, CIV3038F, CIV3041S.

**PPC Prize:** R500 and book for the best undergraduate concrete design project or dissertation on concrete technology.

**DC Robertson Memorial Prize:** (donated by the Western Cape Branch of the South African Institution of Civil Engineering): R500 for the student submitting the best work in the final year design project.

**SA Institute of Steel Construction Prize:** R1200 for the best structural steel design submitted in the final year as part of the coursework.

**South African Institution of Civil Engineering Professional Practice Prize:** R500 for the best overall individual performance in the CIV4033Z Professional Practice course.

### **Electrical Engineering**

**Siemens Prize:** R1000 for the final year Electrical Engineering student submitting the best thesis (EEE4058F/S).

### **Mechanical Engineering/Electro-Mechanical Engineering**

**Aluminium Federation of South Africa Prize:** (R1000) for the best thesis in MEC4061F/Z Individual Laboratory Research Project or MEC4091S Materials Science Laboratory Project involving the use or application of aluminium.

**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.

**SAIRAC Prize: (R1000):** for the student with the best performance in the course MEC4062Z Air Conditioning and Refrigeration.

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

**SASOL Achievement Medal and R1000:** for the best third year student in the course MEC3050W Mechanical Design.

**SASOL Achievement Medal and R1500:** for the best fourth year student completing the course MEC4087Z Failure Analysis.

**SASOL Achievement Medal and R2000:** for the postgraduate student who produces the best published paper in the field of metallurgy/materials/corrosion science.

**SASOL Achievement Medal and R2000:** for the best Masters dissertation in the field of Mechanical Engineering

## 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 and the newspaper of the Student Council. 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 criteria for inclusion in a particular year are as follows:

- an ASPECT student must be registered for not less than 96 credits and obtain a weighted average of not less than 75 per cent
- a student in any other undergraduate programme must be registered for not less than 132 credits of approved course work for the year in question and obtain a weighted average of not less than 70%.

For Dean's Merit List purposes an ASPECT student is defined as a student registered for the ASPECT Programme, or a student who is registered for the Second or Third year of study, having completed the First Year of the ASPECT Programme; and a Foundation Programme student is defined as a student registered for the Foundation Programme, or a student who is registered for the Second or Third year of study, having completed the First two years of the Foundation Programme.

## Degrees and Diplomas Offered in the Faculty of Engineering & the Built Environment

### Degrees

Bachelor of Architectural Studies .....	BAS
Bachelor of Architecture .....	BArch
Bachelor of Science in Construction Studies .....	BSc(ConstStudies)
Bachelor of Science in Engineering .....	BSc(Eng)
Bachelor of Science in Geomatics .....	BSc(Geomatics)
Bachelor of Science in Property Studies .....	BSc(PropStudies)
Bachelor of Science (Honours) in Construction Management .....	BSc(Hons)(CM)
Bachelor of Science (Honours) in Geographical Information Systems .....	BSc(Hons)(GIS)
Bachelor of Science (Honours) in Materials Science .....	BSc(Hons)(Mat Sc)
Bachelor of Science (Honours) in Property Studies .....	BSc(Hons)(PropStudies)
Bachelor of Science (Honours) in Quantity Surveying .....	BSc(Hons)(QS)
Master of Architecture .....	MArch
Master of City Planning and Urban Design .....	MCPUD
Master of City and Regional Planning .....	MCRP
*Master of Industrial Administration .....	MIndAdmin
Master of Engineering .....	MEng
*Master of Engineering Management .....	MEngMan
Master of Landscape Architecture .....	MLA
*Master of Science in Applied Science .....	MSc(ApplSc)
Master of Science in Construction Economics and Management .....	MSc(CEM)
Master of Science in Engineering .....	MSc (Eng)
Master of Science in Project Management .....	MSc(ProjMgmt.)
Master of Philosophy .....	MPhil
*Master of Philosophy in Housing Development and Management .....	MPhil(HDM)
Master of Philosophy in Transport Studies .....	MPhil(Transport Studies)
Master of Philosophy in Urban Infrastructure Design and Management .....	MPhil(UID&M)
Master of Science in Property Studies .....	MSc(PropStudies)
Doctor of Philosophy .....	PhD
Doctor of Architecture .....	DArch
Doctor of Science in Engineering .....	DSc(Eng)

### Diplomas

Postgraduate Diploma in Project Management .....	PGDip(ProjMgmt)
Postgraduate Diploma in Engineering .....	PGDipEng
Postgraduate Diploma in Engineering Management .....	PGDipEngMan
*Postgraduate Diploma in Industrial Administration .....	PGDipIndAdmin
*Postgraduate Diploma in Housing Development and Management .....	PGDip(HDM)
Postgraduate Diploma in Property Studies .....	PGDip(PropStudies)
Postgraduate Diploma in Transport Studies .....	PGDip(Transport Studies)

\* No new intake in 2007 (to be discontinued).

# RULES FOR DEGREES AND DIPLOMAS

## Undergraduate Degrees

**Bachelor of Architectural Studies (BAS)**

**Bachelor of Science in Construction Studies (BSc(ConstStudies))**

**Bachelor of Science in Property Studies (BSc(PropStudies))**

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

**Bachelor of Science in Geomatics (BSc(Geomatics))**

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(Const.Studies), BSc(Prop.Studies), 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 senior certificate with matriculation endorsement issued by the South African Certification Council; or
- (b) a certificate of complete or conditional exemption issued by the Matriculation Board or the Joint Matriculation Board; or
- (c) a matriculation certificate issued by the Joint 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(Const.Studies) and BSc(Prop.Studies) 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(Const.Studies), BSc(Eng), BSc(Prop.Studies) 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.

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- 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(Const.Studies), BSc(Eng), BSc(Prop.Studies) 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

*BAS candidates*

- FB5.1 A candidate's academic year of study shall be determined on the basis of the year in which the core courses, for which he or she is registered, are prescribed.

*BSc(Const.Studies), BSc(Eng), BSc(Prop.Studies) and BSc(Geomatics) candidates*

- FB5.2 A candidate's academic year of study shall be determined on the basis of the year-level of the majority of the core and elective-core course credits for which he/she is registered in the year concerned.

### Method of Assessment

*BAS, BSc(Const.Studies), BSc(Eng), BSc(Prop.Studies) 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 EEE1003W, END1007W and MEC1003F. 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 he or she, in the courses recognised for the degree fails:-

- (a) to obtain at least 80 credits at the end of the first year of registration or, if registered through the Academic Development Programme, ASPECT, at least 64 credits; or
- (b) to obtain at least 192 credits overall at the end of the second year of registration, or if registered through ASPECT, at least 144 credits; or
- (c) to obtain at least 288 credits overall at the end of the third year of registration with a minimum total of 160 credits for the sum of the second and third years or, in the case of a candidate who was first registered through ASPECT, to obtain at least 216 credits overall, with a minimum total of 128 credits for the sum of the second and third years; or
- (d) to obtain at least 384 credits overall at the end of the fourth year of registration, with a minimum of 160 credits for the sum of the third and fourth years or, in the case of a candidate who first registered through ASPECT, to obtain at least 288 credits overall, with a minimum total of 128 credits for the sum of the third and fourth years; or
- (e) to obtain at least 480 credits overall at the end of the fifth year of registration with a minimum total of 160 credits for the sum of the fourth and fifth years or, in the case of a candidate who first registered through ASPECT, to obtain at least 384

## 20 RULES FOR DEGREES

- credits overall, with a minimum total of 160 credits for the sum of the fourth and fifth years; or
- (f) to complete the degree at the end of the sixth year of registration or, in the case of a candidate who first registered through ASPECT, to obtain at least 480 credits overall, with a minimum total of 160 credits for the sum of the fifth and sixth years; or
  - (g) to complete the degree at the end of the seventh year of registration (applicable in the case of a candidate who first registered through ASPECT).

### *BAS, BSc(Const.Studies) and BSc(Prop.Studies) candidates*

- FB8.3 Except by permission of the Senate a candidate may not renew his or her registration if he or she in the examinations for the courses recognised for the degree fails: -
- (a) to obtain at least 72 credits at the end of the first year of registration; or
  - (b) to obtain at least 168 credits overall at the end of the second year of registration; or
  - (c) to obtain at least 264 credits overall at the end of the third year of registration, with a minimum total of 160 credits for the sum of the second and third year; or
  - (d) to obtain at least 360 credits overall the end of the fourth year of registration, with a minimum total of 160 credits for the sum of the third and fourth years; or
  - (e) to complete the degree at the end of the fifth year of registration.

### *BAS, BSc(Const.Studies), BSc(Eng), BSc(Prop.Studies) 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) a break in registration of one or more years will not be counted;
  - (c) neither years registered nor credit points obtained in other faculties or other institutions will be counted;
  - (d) 'major' refers to the Design and Theory Studio and Technology courses in the BAS curriculum.

### *BAS, BSc(Const.Studies), BSc(Eng), BSc(Prop.Studies) 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 3 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 possible, and, (ii) for first class honours obtain at least a first class pass for the thesis design/project or, (iii) for honours, a minimum of a second class pass in the thesis/design project.

### NOTES:

- (a) The award of the honours or first class honours will be assessed on the basis of a

student's credit weighted average for each or the four years of study, with a multiplication factor of 1 being applied to the credit weighted average of the first year, 2 for the second year, 3 for the third year and 4 for the fourth year. The overall weighted percentage mark required will be 68% for honours and 74% for first class honours.

- (b) The thesis/design project is defined as one of APG4003/CHE4045/CHE4036/CIV4036/EEE4058/MEC4061/MEC4091.
- (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(Const.Studies) and BSc(Prop.Studies) 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(Const.Studies), BSc(Eng), BSc(Prop.Studies) and BSc(Geomatics) candidates*

FB10 Any exemption or deviation from the rules requires the approval of Senate.

## Postgraduate Diplomas

Postgraduate Diploma in Engineering (PGDipEng)

\*Postgraduate Diploma in Industrial Administration (PGDipIndAdmin)

Postgraduate Diploma in Engineering Management (PGDipEngMan)

Postgraduate Diploma in Housing Development & Management (PGDipHDM)

Postgraduate Diploma in Project Management (PGDipProjMgmt)

Postgraduate Diploma in Property Studies (PGDipPropStudies)

Postgraduate Diploma in Transport Studies (PGDipTransport Studies)

\* No new intake from 2007: to be discontinued.

## Postgraduate Diploma in Engineering

(NOTE: The rules must be read together with the general rules for degrees, diplomas and certificates in Handbook 3 of this series.)

The Postgraduate Diploma in Engineering is offered by the Faculty through the Departments of Civil Engineering (programme: Structural Materials), Electrical Engineering (programme: Telecommunications) and Mechanical Engineering (programme: Engineering Management).

### Minimum Admission Requirements

FGA1 A person shall not be admitted as a candidate for the Postgraduate Diploma unless he or she

- (a) holds a four year bachelors degree or honours degree of the University or of any other university recognised for the purpose; or
- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or

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- (c) has passed at any university or institution recognized for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for a degree in terms of (a) above; or
- (d) has in any other manner attained a level of competence which in the opinion of Senate on the recommendation of the Faculty, is adequate for the purpose of admission as a candidate for the degree.

### **Selection**

FGA2 Selection is based on an applicant's academic record and experience.

### **Duration**

FGA3 The minimum duration of the Postgraduate Diploma Programme is one academic year.

### **Registration Requirements**

FGA4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FGA4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FGA4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

### **Obtaining the Postgraduate Diploma**

FGA5 A candidate shall comply with the curriculum requirements prescribed by Senate and shall complete approved coursework of a value not less than 120 credits, except if registered for the Postgraduate Diploma prior to 1 January 2004 in which case he/she shall complete approved coursework of a value not less than 144 credits in accordance with the rules applicable at the time of his/her first registration as a Postgraduate Diploma candidate.

A candidate who wishes to proceed to a Postgraduate Diploma after qualifying for a degree of Master shall be required to complete further approved coursework of a value not less than 120 credits before qualifying for a Postgraduate Diploma.

### **Courses Completed at this or another University/Institution**

FGA6.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Postgraduate Diploma shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FGA6.2 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 Report**

FGA7 A candidate shall submit a written report to the Programme Director by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### **Readmission**

FGA8 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned.

### **Examination**

FGA9 A candidate shall complete such examinations as are prescribed for the advanced level coursework.

### **Award of the Postgraduate Diploma**

FGA10.1 The Postgraduate Diploma is not awarded with Distinction.

FGA10.2 The University does not undertake to reach a decision on the award of the Postgraduate Diploma by any specific date.

### **Upgrading to Masters Degree Registration**

FGA11 Senate may, on the recommendation of the Programme Director, upgrade a candidate's registration to candidature for a Masters Degree and permit the candidate to count the courses completed toward the Postgraduate Diploma as credits for the Masters Degree.

## **Postgraduate Diploma in Industrial Administration and Postgraduate Diploma in Engineering Management**

(NOTE: The rules must be read together with the general rules for degrees, diplomas and certificates in Handbook 3 of this series.)

There will be no new intake for the Postgraduate Diploma in Industrial Administration from 2007. Candidates who registered prior to 2007 have the option of continuing or changing their registration to Postgraduate Diploma in Engineering Management.

### **Minimum Admission Requirements**

FGB1 A person shall not be admitted as a candidate for the Postgraduate Diploma unless he or she

- (a) holds a four year bachelors degree or honours degree of the University; or
- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
- (c) has passed at any University or at any institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to the examinations prescribed for a four year bachelors degree or honours degree at this University; or
- (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the Postgraduate Diploma.

### **Selection**

FGB2 Selection is based on an applicant's academic record and experience.

### **Duration**

FGB3 The minimum duration of the Postgraduate Diploma Programme is eighteen months.

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### Registration Requirements

FGB4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FGB4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FGB4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

### Obtaining the Postgraduate Diploma

FGB5 A candidate shall comply with the curriculum requirements prescribed by Senate and shall complete approved coursework of a value not less than 120 credits, except if registered for the Postgraduate Diploma prior to 1 January 2004 in which case he/she shall complete approved coursework of a value not less than 144 credits in accordance with the rules applicable at the time of his/her first registration as a Postgraduate Diploma candidate. (The curriculum requirements are obtainable on request from the Head of the Department concerned.)

### Courses Completed at this or another University/Institution

FGB6.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Postgraduate Diploma shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FGB6.2 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 Report

FGB7 A candidate shall submit a written report to the Programme Director by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### Readmission

FGB8 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned.

### Examination

FGA9 A candidate shall complete such examinations as are prescribed for the advanced level coursework.

### Award of the Postgraduate Diploma

FGB10.1 The Postgraduate Diploma is not awarded with Distinction.

FGB10.2 The University does not undertake to reach a decision on the award of the Postgraduate

Diploma by any specific date.

### **Upgrading to Masters Degree Registration**

FGB11 Senate may, on the recommendation of the Programme Director, upgrade a candidate's registration to candidature for a Masters Degree and permit the candidate to count the courses completed toward the Postgraduate Diploma as credits for the Masters Degree.

## **Postgraduate Diploma in Housing Development and Management**

This Postgraduate Diploma has been discontinued. Candidates who registered for this qualification prior to 2007 should refer to the Postgraduate Diploma rules in the 2006 edition of this Handbook.

## **Postgraduate Diploma in Project Management**

(NOTE: The rules must be read together with the general rules for degrees, diplomas and certificates in Handbook 3 of this series.)

The Postgraduate Diploma in Project Management is offered by the Faculty through the Department of Construction Economics & Management.

### **Minimum Admission Requirements**

- FGD1 A person shall not be admitted as a candidate for the Postgraduate Diploma unless he or she
- (a) holds a four year bachelors degree or honours degree of the University; or
  - (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
  - (c) has passed at any University or at any institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to the examinations prescribed for a four year bachelors degree or honours degree at this University; or
  - (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the Postgraduate Diploma.

### **Selection**

FGD2 Selection is based on an applicant's academic record and experience.

### **Duration**

FGD3 A candidate must be registered for the degree for at least two academic years.

### **Registration Requirements**

- FGD4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.
- FGD4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.
- FGD4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses or only a project.
- FGD4.4 Except with the permission of the Senate, a candidate may not withdraw from a course

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which he or she is repeating.

### **Obtaining the Postgraduate Diploma**

FGD5 A candidate shall comply with the curriculum requirements prescribed by Senate and shall complete approved advanced level coursework of a value of not less than 120 credits. The coursework and curriculum requirements are obtainable from the Head of Department.

### **Courses Completed at this or another University/Institution**

FGD6.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Postgraduate Diploma shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FGD6.2 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 Report**

FGD7 A candidate shall submit a written report to the Head of Department by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### **Readmission**

FGD8.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned and for which a result is available in that year.

FGD8.2 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma fails to complete a course after having been registered for it twice.

### **Examination**

FGD9 A candidate shall complete such examinations as are prescribed for the advanced level coursework.

### **Award of the Postgraduate Diploma**

FGD10.1 The Postgraduate Diploma is not awarded with Distinction.

FGD10.2 The University does not undertake to reach a decision on the award of the Postgraduate Diploma by any specific date.

### **Upgrading to Masters Degree Registration**

FGD11 Senate may, on the recommendation of the Head of Department, upgrade a candidate's registration to candidature for the Degree of Master of Science (Project Management) and permit the candidate to count the courses completed toward the Postgraduate Diploma as credits for the Masters Degree.



## Postgraduate Diploma in Property Studies

(NOTE: The rules must be read together with the general rules for degrees, diplomas and certificates in Handbook 3 of this series. Ministerial approval of this Postgraduate Diploma is pending.)

The Postgraduate Diploma in Property Studies is offered by the Faculty through the Department of Construction Economics & Management.

### Minimum Admission Requirements

- FGE1 A person shall not be admitted as a candidate for the Postgraduate Diploma unless he or she
- (a) holds a four year bachelors degree or honours degree of the University; or
  - (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
  - (c) has passed at any university or institution recognized for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for a degree in terms of (a) above; or
  - (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the Postgraduate Diploma.

### Selection

- FGE2 Selection is based on an applicant's academic record and experience.

### Duration

- FGE3 A candidate must be registered for the degree for at least two academic years.

### Registration Requirements

- FGE4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.
- FGE4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.
- FGE4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses or only a project.
- FGE4.4 Except with the permission of the Senate, a candidate may not withdraw from a course which he or she is repeating.

### Obtaining the Postgraduate Diploma

- FGE5 A candidate shall comply with the curriculum requirements prescribed by Senate and shall complete approved advanced level coursework of a value of not less than 120 credits. The coursework and curriculum requirements are obtainable from the Head of Department.

### Courses Completed at this or another University/Institution

- FGE6.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such

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courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Postgraduate Diploma shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FGE6.2 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 Report

FGE7 A candidate shall submit a written report to the Head of Department by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### Readmission

FGE8.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned and for which a result is available in that year.

FGE8.2 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma fails to complete a course after having been registered for it twice.

### Examination

FGE9 A candidate shall complete such examinations as are prescribed for the advanced level coursework.

### Award of the Postgraduate Diploma

FGE10.1 The Postgraduate Diploma is not awarded with Distinction.

FGE10.2 The University does not undertake to reach a decision on the award of the Postgraduate Diploma by any specific date.

### Upgrading to Masters Degree Registration

FGE11 Senate may, on the recommendation of the Head of Department, upgrade a candidate's registration to candidature for the Degree of Master of Science (Property Studies) and permit the candidate to count the courses completed toward the Postgraduate Diploma as credits for the Masters Degree.

## Postgraduate Diploma in Transport Studies

(NOTE: The rules must be read together with the general rules for degrees, diplomas and certificates in Handbook 3 of this series.)

The Postgraduate Diploma in Transport Studies is offered by the Faculty through the School of Architecture, Planning and Geomatics and the Department of Civil Engineering.

### Minimum Admission Requirements

FGF1 A person shall not be admitted as a candidate for the Postgraduate Diploma unless he or she

- (a) holds a four year bachelors degree or honours degree of the University and has achieved a level of numeracy satisfactory to the Senate\*; or

- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework and has achieved a level of numeracy satisfactory to Senate\*; or
- (c) has passed at any university or institution recognized for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for a degree in terms of (a) above; or
- (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the Postgraduate Diploma.

**\* NOTE:**

- (i) a first year (one semester) University course in Mathematics (pure or applied) or Statistics
- (ii) Mathematics at Senior Certificate level with a symbol of D or better at the Higher Grade, or a symbol of B or better at the Standard Grade; or
- (iii) applicants without the required level of numeracy specified in (i) and (ii) above will be required to demonstrate a satisfactory level of numeracy in a test.

**Selection**

FGF2 Selection is based on an applicant's academic record and experience.

**Duration**

FGF3 A candidate must be registered for the degree for at least two academic years.

**Registration Requirements**

FGF4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FGF4.2 A new candidate must register by not later than the date on which his/her first course starts.

FGF4.3 A continuing candidate must reregister by not later than 28 February.

FGF5 A candidate shall comply with the curriculum requirements prescribed by Senate and shall complete approved advanced level coursework of a value of not less than 120 credits. The coursework and curriculum requirements are obtainable from the Programme Convenor.

**Courses Completed at this or another University/Institution**

FGF6.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Postgraduate Diploma shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FGF6.2 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.

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### Minimum Number of Course Modules

FGF7 A candidate must register for at least two course modules, other than the dissertation or research project, per year, except where only one course module is required to complete the diploma.

### Readmission

FGF8 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the diploma, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned.

### Examination

FGF9.1 A candidate shall complete such examinations as are prescribed for the advanced level coursework.

FGF9.2 A candidate may be required to present himself or herself for an oral examination on an essay assignment.

### Award of the Postgraduate Diploma

FGF10.1 The Postgraduate Diploma is not awarded with Distinction.

FGF10.2 The University does not undertake to reach a decision on the award of the Postgraduate Diploma by any specific date.

## Postgraduate Degrees

Bachelor of Architecture (BArch)

Bachelor of Science (Honours) in Construction Management (BSc(Hons)(CM))

Bachelor of Science (Honours) in Geographical Information Systems (BSc(Hons)(GIS))

Bachelor of Science (Honours) in Materials Science (BSc(Hons)(MatSc))

Bachelor of Science (Honours) in Property Studies (BSc(Hons)(PropStudies))

Bachelor of Science (Honours) in Quantity Surveying (BSc(Hons)(QS))

Master of Architecture (MArch)

Master of City Planning and Urban Design (MCPUD)

Master of City and Regional Planning (MCRP)

Master of Engineering (MEng)

\*Master of Engineering Management (MEngMan)

\*Master of Industrial Administration (MIndAdmin)

Master of Landscape Architecture (MLA)

Master of Philosophy (MPhil)

\*Master of Philosophy in Housing Development and Management (MPhil(HDM))

Master of Philosophy in Transport Studies (MPhil(Transport Studies))

Master of Philosophy in Urban Infrastructure, Design and Management (MPhil(UID&M))

\*Master of Science in Applied Science (MSc(ApplSc))

Master of Science in Construction Economics and Management (MSc(CEM))

Master of Science in Engineering (MSc(Eng))

Master of Science in Project Management (MSc(ProjMgmt))

Master of Science in Property Studies (MSc(PropStud))

Doctor of Architecture (DArch)

Doctor of Science in Engineering (DSc(Eng))

Doctor of Philosophy (PhD)

\* NOTE: No new intake from 2007.

## Bachelor of Architecture

NOTE: This degree is being phased out. There will be no new first year intake from 2007. The degrees of BAS(Hons) and MArch(Professional) will be introduced from 2008 and 2009 respectively, subject to ministerial approval.

The BArch is a postgraduate professional degree offered by the Faculty through the School of Architecture, Planning and Geomatics. It confers eligibility for application for registration, under Act No.44 of 2000, with the registration body SACAP and for membership of the South African Institute of Architects (SAIA). The final examinations have the approval of the South African Council for the Architectural professions. The Bachelor of Architecture course merits exemption from Parts 1 and 2 of the Royal Institute of British Architects', and the Commonwealth Association of Architects', own examination in Architecture.

### Minimum Admission Requirements

- FPA1 A person may be considered as a candidate for the degree if he or she:
- (a) is a graduate of the Bachelor of Architectural Studies degree of this University; or
  - (b) is the holder of any three-year bachelor's degree recognised by the Senate as equivalent to the Bachelor of Architectural Studies degree of this University; or
  - (c) has completed three years of study at this or another university or institution which is, in the opinion of the Senate, the equivalent of the Bachelor of Architectural Studies degree of this University.

### Selection

FPA2 Admission into the BArch degree is limited and not automatic. Selection is at the discretion of the Admissions Committee. An applicant is required to submit the following:

- An A3 portfolio showing evidence of a creative and balanced interest in architecture. The portfolio should contain: any three design products of which he or she is the author/creator; the final design project submitted in the undergraduate programme (BAS or equivalent); and at least one CAD drawing, of which he/she is the author;
- all supporting documents are to be included in the front section of your A3 Portfolio document;
- all material should be hard copy: no material in the form of slides, CD's, videos or in any other electronic form will be considered;
- a certified copy of degree certificate\*;
- certified copy of transcript of results\*;
- a copy of his or her own academic writing that has been evaluated at previous institution;
- curriculum vitae with two contactable references\*;
- a one page letter of motivation by the candidate.

\* Not required by graduates of the Bachelor of Architectural Studies of this University.

### Duration of Degree

FPA3.1 The curriculum for the degree shall extend over a minimum of three academic years of study.

FPA3.2 Except with the permission of Senate, students who register for the Bachelor of Architecture degree, must register for and comply with the requirements of all three years of study.

### Obtaining the Degree and Validity of Credits

FPA4.1 The curriculum comprises six semesters consisting of two semesters (ARCH1 and

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ARCH2) of external experience and four semesters of Advanced Courses (ARCH3 to ARCH6). A candidate shall comply with the curriculum requirements prescribed by Senate which are published in the Programmes of Study and Courses Offered section of this Handbook.

- FPA4.2 **Experiential Training/External Experience Year:** The first year of the degree BArch 1&2) is a year of external experience. Students are required to hand in their photographic essay by 30 November of this year and are required to hand in their external experience documents by 31 January of the following year. It is not the responsibility of the University or the School of Architecture, Planning and Geomatics to procure work for the students in their external experience year.
- FPA4.3 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.
- FPA4.4 **Registration:** Second year students are required to register for all first and second semester core courses as well as first semester coursework electives in February. Second semester electives are to be finalised in July by completion of a "Change of Curriculum" form.

### Studiowork Courses

- FPA6 In the second half of the second year of study, studiowork BArch 4 consists of a Simulated Office Programme. This is mandatory for all students. The total work of the Simulated Office Programme consists of Studiowork APG5003S, Professional Practice, APG5036F and Practice Management, APG5037F courses. The studio work is subject to an oral examination and the course work to a written examination and assignments.

### Method of Assessment

*Courses within each semester will be assessed by formal examination or oral review or by satisfactory performance of the duly performed certificate (DP) requirements.*

*If a course is assessed by examination or review, a student may be refused permission (DPR) to sit for the examination or review if he or she fails to satisfy the Senate 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.*

#### FPA6.3 *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.

#### FPA6.4 *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. The result of the review is published as an ungraded Pass (PA) or a Fail (F) grade.

#### FPA6.5 *Duly Performed (DP) Certificate*

In DP courses the student 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). A DP certificate may be withheld unless: all parts of each studiowork project, tutorial or other assignments are completed to an acceptable standard and submitted for assessment at the stipulated times; there is satisfactory attendance (minimum of 80%), and a generally satisfactory participation in all sections of the courses.

## Formal Examinations

*Examinations or reviews are held at the end of each semester in which courses are offered.*

### FPA7.1 *Studiowork Examinations*

At the end of ARCH4, an examination of the Professional Practice and Practice Management parts of Studiowork, is held.

At the end of Semester ARCH5, an examination is held in the work of the Studiowork courses of Semesters ARCH3, ARCH4, (design part) and ARCH5. The student is required to submit a portfolio of all the Studiowork and, at the discretion of the examiners, other coursework completed during this period for presentation at an oral examination.

In awarding a result for the studiowork examination, all other coursework in the portfolio may be taken into consideration.

At the end of Semester ARCH6 an examination is held of the final major Design project.

### FPA7.2 *Examinations other than Studiowork*

(a) The examinations in History and Theory of Architecture (APG5005F) and Advanced Construction (Research) (APG5006F) are by means of term papers;

(b) The examination in APG5036F Professional Practice and APG5037F Practice Management is by means of two separate written examinations.

## Studiowork Reviews

FPA8.1 For the review of External Experience at the end of Semester ARCH2, a student is required to present all assignments carried out during the external experience period, together with evidence that he or she has acquired the requisite work experience.

FPA8.2 For the review of Studiowork ARCH3, a student is required to submit a portfolio of all studiowork projects and studio-related coursework done in the semester.

## Progress through the Degree

FPA9.1 Except with permission of the Senate, a student may not register for Semester ARCH3 without having handed in both requirements (annotated bound photographic essay (slides and CD) and bound time sheets) for APG4000Z in a suitable and presentable format.

FPA9.2 Except with the permission of Senate, a student may not progress from Arch 3 to Arch 4 without having completed APG4000Z.

FPA9.3 Except with permission of the Senate, a student may not register for Semester ARCH5 without having completed APG4000Z.

FPA9.4 Except with permission of the Senate, no student may register for any course between Semesters ARCH3 to ARCH5 more than twice.

FPA9.5 Except with permission of the Senate, students are required to complete an Advanced Theory essay or Advanced Technology essay in architecture.

FPA9.6 Except with permission of the Senate, students are required to complete three History/Theory courses, one Technology course and one course from Urban Design/Planning/Landscape.

FPA9.7 Except with permission of the Senate, all coursework must be completed prior to entry into ARCH6.

### Minimum Requirements for Readmission

- FPA10 Except with permission of the Senate, a candidate shall not be permitted to renew his or her registration for the degree if he or she has not completed at least:
- at the end of the second year of registration, one semester course in studiowork;
  - at the end of the third year of registration, two semester courses in studiowork;
  - at the end of the fourth year of registration, three semester courses in studiowork.
  - at the end of the fifth year of registration, completed the requirements for the degree.

### Distinction

FPA11.1 Except with the permission of Senate, a degree may only be awarded with distinction if the degree has been completed in the minimum period of time.

FPA11.2 *Award of Degree with Distinction and with Distinction in Design*

The degree may be awarded with distinction to a student who obtains a first class pass in the project component of the Semester ARCH6 Studiowork Examination, provided that he or she has obtained a mark of 75% or more in the ARCH5 examination, a first class pass in at least one other examination course, and at least an upper second in one further examination course.

FPA11.3 *Award of Degree with Distinction in Design* The degree may be awarded with distinction in design to a student who obtains a first class pass in the Semester ARCH6 Studiowork examination, where the examiners deem that the major Studiowork project submission is of special merit.

### Structure of the Curriculum

The curriculum comprises six semesters consisting of two semesters (ARCH1 and ARCH2) of external experience and four semesters of Advanced Courses (ARCH3 to ARCH6).

## Bachelor of Science (Honours) in Construction Management

(NOTE: The rules must be read together with the general rules for degrees and diplomas in Handbook 3 of this series.) Ministerial approval of this Degree is pending.

The Bachelor of Science (Honours) in Construction Management degree is offered by the Faculty through the Department of Construction Economics and Management.

### Minimum Admission Requirements

- FHC1 A person shall not be admitted as a candidate for the degree unless he or she:
- is a graduate of the BSc in Construction Studies degree of this University; or
  - is the holder of any three-year bachelor's degree of this, or any other university recognised for the purpose by the Senate as equivalent to the BSc in Construction Studies degree of this University; or
  - has in any other manner attained a level of competence which in the opinion of the Senate is adequate for the purpose of admission.

### Selection

FHC2 Selection is based on an applicant's academic record and experience. Completion of the Bachelors Degree with a weighted average of at least 60% (supplementary results are excluded) is the normal academic prerequisite for admission. Applicants may be required to attend an interview and/or write an entrance examination.



## Duration

FHC3 A candidate must be registered for a minimum of one academic year.

## Registration Requirements

FHC4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FHC4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FHC4.3 A candidate must register or reregister by not later than 31 March if taking only second semester courses.

## Curriculum

FHC5.1 A candidate:

- (i) 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; and
- (ii) must complete approved coursework of a value not less than 144 credits.

FHC5.2 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.

FHC5.3 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.

FHC5.4 Except by permission of Senate a candidate may not withdraw from a course which he or she is repeating.

## Recognition of Courses

FHC6 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.

## Method of Assessment

FHC7.1 *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.

FHC7.2 *Formal Examination*

Assessment by formal examination may be by means of written and/or oral examination,

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tutorials, class tests, term papers, notebooks or other course assignments. An external examiner is appointed for each course assessed by examination.

### FHC7.3 *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.

### FHC7.4 *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).

### FHC7.5 *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.

## Readmission Requirements

FHC8 Except by permission of the Senate a candidate may not renew his or her registration

- (i) if he or she, in the courses recognised for the degree fails to pass courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned;
- (ii) if he or she, in courses recognised for the degree fails to complete a course after having been registered for it twice.

## Award of the Degree in the First Class

FHC9 In order to be considered for the award of the degree in the first class, a candidate must obtain a minimum average mark of 75%.

## Exemption from or Modification of Rules

FHC10 Any exemption or deviation from the rules requires the approval of Senate.

## Bachelor of Science (Honours) in Geographical Information Systems

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

The Bachelor of Science (Honours) in Geographical Information Systems degree is offered by the Faculty through the School of Architecture, Planning and Geomatics

## Minimum Admission Requirements

FHG1 A person shall not be admitted as a candidate for the degree unless he or she:

- (a) is a graduate of the BSc degree of this University; or
- (b) is the holder of any three-year bachelor's degree of this, or any other university recognised for the purpose by the Senate as equivalent to the BSc degree of this University; or
- (c) has an approved first year (two semesters) University course in Mathematics OR an approved first year (one semester) University course in Mathematics and a first year (one semester) University course in Statistics; or
- (d) has in any other manner attained a level of competence which in the opinion of the

Senate is adequate for the purpose of admission.

### **Selection**

FHG2 Selection is based on an applicant's academic record and experience. Applicants may be required to attend an interview and/or write an entrance examination.

### **Duration**

FHG3 A candidate must be registered for a minimum of one academic year.

### **Registration Requirements**

FHG4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FHG4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course starts.

### **Curriculum**

FHG5.1 A candidate:

- (i) 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; and
- (ii) must complete approved coursework of a value not less than 144 credits.

FHG5.2 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.

FHG5.3 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.

FHG5.4 Except by permission of Senate a candidate may not withdraw from a course which he or she is repeating.

### **Method of Assessment**

FHG6.1 *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.

FHG6.2 *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.

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### FHG6.3 *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.

### **Readmission Requirements**

- FHG7 Except by permission of the Senate a candidate may not renew his or her registration
- (i) if he or she, in the courses recognised for the degree fails to pass courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned;
  - (ii) if he or she, in courses recognised for the degree fails to complete a course after having been registered for it twice.

### **Award of the Degree in the First Class**

FHG8 In order to be considered for the award of the degree in the first class, a candidate must complete the degree in one year and obtain at least 75% for the thesis project APG4003Z and an average of at least 75% for all coursework.

### **Exemption from or Modification of Rules**

FHG9 Any exemption or deviation from the rules requires the approval of Senate.

## **Bachelor of Science (Honours) in Materials Science**

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

The Bachelor of Science (Honours) in Materials Science degree is offered by the Faculty through the Department of Mechanical Engineering.

### **Minimum Admission Requirements**

- FHM1 A person shall not be admitted as a candidate for the degree unless he or she:
- (a) is a graduate of the BSc degree of this University; or
  - (b) is the holder of any three-year bachelor's degree of this, or any other university recognised for the purpose by the Senate as equivalent to the BSc degree of this University; or
  - (c) has in any other manner attained a level of competence which in the opinion of the Senate is adequate for the purpose of admission.

### **Selection**

FHM2 Selection is based on an applicant's academic record and experience. Applicants may be required to attend an interview and/or write an entrance examination.

### **Duration**

FHM3 A candidate must be registered for a minimum of one academic year.

### **Registration Requirements**

FHM4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FHM4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course

starts.

## Curriculum

FHM5.1 A candidate:

- (i) 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; and
- (ii) must complete approved coursework of a value not less than 144 credits.

FHM5.2 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.

FHM5.3 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.

FHM5.4 Except by permission of Senate a candidate may not withdraw from a course which he or she is repeating.

## Method of Assessment

FHM6.1 *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.

FHM6.2 *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.

FHM6.3 *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.

## Readmission Requirements

FHM7 Except by permission of the Senate a candidate may not renew his or her registration

- (i) if he or she, in the courses recognised for the degree fails to pass courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned;
- (ii) if he or she, in courses recognised for the degree fails to complete a course after having been registered for it twice.

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### **Award of the Degree in the First Class**

FHM8 In order to be considered for the award of the degree in the first class, a candidate must complete the degree in one year and obtain at least 75% for the thesis project MEC4091S and an average of at least 75% for all coursework.

### **Exemption from or Modification of Rules**

FHM9 Any exemption or deviation from the rules requires the approval of Senate.

## **Bachelor of Science (Honours) in Property Studies**

(NOTE: The rules must be read together with the general rules for degrees and diplomas in Handbook 3 of this series.) Ministerial approval of this Degree is pending.

The Bachelor of Science (Honours) in Property Studies degree is offered by the Faculty through the Department of Construction Economics and Management.

### **Minimum Admission Requirements**

FHP1 A person shall not be admitted as a candidate for the degree unless he or she:

- (a) is a graduate of the BSc in Property Studies degree of this University; or
- (b) is the holder of any three-year bachelor's degree of this, or any other university recognised for the purpose by the Senate as equivalent to the BSc in Property Studies degree of this University; or
- (c) has in any other manner attained a level of competence which in the opinion of the Senate is adequate for the purpose of admission.

### **Selection**

FHP2 Selection is based on an applicant's academic record and experience. Completion of the Bachelors Degree with a weighted average of at least 60% (supplementary results are excluded) is the normal academic prerequisite for admission. Applicants may be required to attend an interview and/or write an entrance examination.

### **Duration**

FHP3 A candidate must be registered for a minimum of one academic year.

### **Registration Requirements**

FHP4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FHP4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FHP4.3 A candidate must register or reregister by not later than 31 March if taking only second semester courses.

### **Curriculum**

FHP5.1 A candidate:

- (i) 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.
- (ii) must complete approved coursework of a value not less than 144 credits.

FHP5.2 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.

- FHP5.3 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.
- FHP5.4 Except by permission of Senate a candidate may not withdraw from a course which he or she is repeating.

### **Recognition of Courses**

- FHP6 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.

### **Method of Assessment**

- FHP7.1 *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.
- FHP7.2 *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.
- FHP7.3 *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.
- FHP7.4 *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).
- FHP7.5 *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.

### **Readmission Requirements**

- FHP8 Except by permission of the Senate a candidate may not renew his or her registration

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- (i) if he or she, in the courses recognised for the degree fails to pass courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned;
- (ii) if he or she, in courses recognised for the degree fails to complete a course after having been registered for it twice.

### **Award of the Degree with Distinction**

FHP9 In order to be considered for the award of the degree with distinction, a candidate must obtain a minimum average mark of 75%.

### **Exemption from or Modification of Rules**

FHP10 Any exemption or deviation from the rules requires the approval of Senate.

## **Bachelor of Science (Honours) in Quantity Surveying**

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

The Bachelor of Science (Honours) in Quantity Surveying degree is offered by the Faculty through the Department of Construction Economics and Management.

### **Minimum Admission Requirements**

- FHQ1 A person shall not be admitted as a candidate for the degree unless he or she:
- (a) is a graduate of the BSc in Construction Studies degree of this University; or
  - (b) is the holder of any three-year bachelor's degree of this, or any other university recognised for the purpose by the Senate as equivalent to the BSc in Construction Studies degree of this University; or
  - (c) has in any other manner attained a level of competence which in the opinion of the Senate is adequate for the purpose of admission.

### **Selection**

FHQ2 Selection is based on an applicant's academic record and experience. Completion of the Bachelors Degree with a weighted average of at least 60% (supplementary results are excluded) is the normal academic prerequisite for admission. Applicants may be required to attend an interview and/or write an entrance examination.

### **Duration**

FHQ3 A candidate must be registered for a minimum of one academic year.

### **Registration Requirements**

FHQ4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FHQ4.2 A candidate must register or reregister by not later than the end of Registration Week, or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FHQ4.3 A candidate must register or reregister by not later than 31 March if taking only second semester courses.

### **Curriculum**

- FHQ5.1 A candidate:
- (i) 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.

(ii) must complete approved coursework of a value not less than 164 credits.

FHQ5.2 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.

FHQ5.3 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.

FHQ5.4 Except by permission of Senate a candidate may not withdraw from a course which he or she is repeating

### **Recognition of Courses**

FHQ6 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.

### **Method of Assessment**

FHQ7.1 *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.

FHQ7.2 *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.

FHQ7.3 *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.

FHQ7.4 *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).

FHQ7.5 *Review*

Assessment by review consists of a review by the internal examiner(s) of the course

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work completed by means of written and/or oral class tests, tutorials, term papers, notebooks or other course assignments.

### Readmission Requirements

- FHQ8 Except by permission of the Senate a candidate may not renew his or her registration
- (i) if he or she, in the courses recognised for the degree fails to pass courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned;
  - (ii) if he or she, in courses recognised for the degree fails to complete a course after having been registered for it twice.

### Award of the Degree in the First Class

- FHQ9 In order to be considered for the award of the degree in the first class, a candidate must obtain a minimum average mark of 75%.

### Exemption from or Modification of Rules

- FHQ10 Any exemption or deviation from the rules requires the approval of Senate.

## Master of Architecture

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MArch is offered by the Faculty through the School of Architecture, Planning and Geomatics.*

### Minimum Admission Requirements

- FMA1 Except with permission of the Senate, a candidate for the degree must be a BArch graduate of this University, or a graduate of another University, who holds a degree recognised by Senate as being equivalent to a BArch degree in the University.

### Selection

- FMA2 Selection is based on an applicant's academic record and the availability of a suitable supervisor. Submission of a satisfactory research proposal may be required.

### Duration

- FMA3 A candidate must be registered for the degree for a minimum period of one academic year.

### Registration Requirements

- FMA4.1 Subject to the provisions of the Rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.
- FMA4.2 A candidate registering for the first time may register at any time during the year.
- FMA4.3 Returning candidates for the degree must reregister by not later than the last Friday of February of each year.

### Obtaining the Degree

- FMA5.1 A candidate shall present a dissertation (160 credits) incorporating any or all of the following:
- (a) a research project of a theoretical or practical nature;
  - (b) a critical review of a specified topic based upon a comprehensive search of

- literature or available data;
- (c) design of all or part of an architectural project or group of projects to a specification involving advanced concepts and theoretical principles;
- (d) development of a technique involving novel technological features or advanced design;
- (e) any other study acceptable to the Faculty of Engineering and the Built Environment.

FMA5.2 The candidate's supervisor shall submit written evidence to the Faculty Examinations Committee that the candidate has, with the approval of the supervisor, submitted a paper for presentation at a conference or for publication in a journal recognised by Senate.

### **Supervision**

FMA6.1 A candidate shall work under the guidance of a supervisor appointed by Senate and shall be required to attend at the University for a minimum period of at least one month per annum for supervision purposes for as long as he/she continues to be a candidate for the degree.

FMA6.2 A change of supervisor or a change to a candidate's field of study/research is subject to the approval of Senate.

### **Progress Report**

FMA7 A candidate shall submit a written report to the supervisor by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months the period that is relevant.

### **Readmission**

FMA8.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she fails to make progress with his/her research project or dissertation to the satisfaction of Senate.

FMA8.2 A candidate who is required by the Faculty Examination Committee to correct or revise his or her research dissertation shall complete the corrections/revisions within one year of the date of the Committee's decision, failing which he/she shall not be permitted to continue with or reregister for his/her degree without the special permission of Senate.

### **Submission of Dissertation and Paper**

FMA9.1 A candidate intending to submit a dissertation in the hope of the award of the degree in either June or December, must, in the year in which the dissertation is to be submitted, inform the Faculty Manager (Academic Administration) in writing of such intention by 15 February or 15 July respectively in the year in which the dissertation is to be submitted. The final date for receipt by the Faculty Manager (Academic Administration) of a Master's dissertation submitted in the hope of the award of the degree either in June or December is 31 March or 31 August respectively.

FMA9.2 After consultation with the supervisor, a candidate shall submit two copies of his/her dissertation in temporary bindings and two unbound copies to the Faculty Manager, (Academic Administration). Where more than two examiners are appointed a candidate may be required to submit an appropriate number of additional copies in temporary bindings.

FMA9.3 The candidate shall submit a summary of the key aspects of the dissertation, presented in the form of a paper which is, potentially, of publishable standard, approved by the

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supervisor. The final date for receipt of the paper by the Faculty Office shall be 30 April in the case of a candidate who submits a dissertation in hope of the award of the degree in June or 31 October in the case of a candidate who submits a dissertation in hope of the award of the degree in December. *Note:* The Paper requirement is intended to develop a candidate's skills in academic communication through exposure to the discipline of preparing a scholarly, succinct overview of the subject of the research topic, with due attention to structure, detail, clarity of expression and referencing.

FMA9.4 No dissertation or part thereof which has previously been submitted for examination for any degree at any university shall be accepted for a Masters' degree in the Faculty of Engineering & the Built Environment.

### Examination

FMA10.1 Examination is by dissertation unless otherwise stated. The dissertation must be satisfactory in arrangement and expression and must be typewritten or printed. Each candidate must comply with such other requirements as the Board of the Faculty of Engineering and the Built Environment, on the recommendation of the Director of the School of Architecture and Planning, may prescribe.

FMA10.2 A candidate may be required to present himself or herself for an oral examination on the subject of the dissertation.

FMA10.3 A candidate may not submit his/her dissertation for examination more than twice.

### Publication

FMA11.1 When presenting his or her dissertation the candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format.

FMA11.2 No publication may, without the prior permission of the University, contain a statement that the published material was or is to be submitted in part or in full for this degree.

### Award of the Degree

FMA12.1 The degree will not be awarded with distinction, except in the case of candidates registered for the degree prior to 1999 who may be considered in terms of the Rules applicable at the time of their first registration.

FMA12.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

### Upgrading to PhD

FMA13 The Senate may on the recommendation of the Faculty and the candidate's supervisor upgrade a candidate's registration to PhD on the grounds of the quality and development of the candidate's work.

## Master of City Planning and Urban Design

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MCPUD is offered by the Faculty through the School of Architecture, Planning and Geomatics.*

The increasingly large scale, complex, and diverse nature of cities demands the expansion of

traditional architectural capabilities to embrace an understanding of the structure and functioning, and three-dimensional design and management of, human settlements. The MCPUD degree curriculum comprises two years of full time study, open to graduates in Architecture from any recognised institution approved by Senate. However, in terms of rule FMB6.1, BArch graduates from the University who have completed prescribed work in the theory and studio work of City Planning and Urban Design while registered for that degree, may obtain credit for and exemption from one semester of the curriculum for the MCPUD degree. All students entering the programme must do so in the first semester of the year. Course work in the programme includes the theoretical and practical subject matter necessary to meet the requirements of the Certification of Environmental Assessment Practitioners in South Africa.

### Minimum Admission Requirements

- FMB1 A person shall not be admitted as a candidate for the degree unless
- (a) he or she is a graduate in Architecture of the University or of another University recognised by the Senate for the purpose; or
  - (b) he or she has passed at any University or at any Institution recognised by the Senate for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for the Bachelor of Architecture degree at the University; or
  - (c) he or she has in any other manner attained a level of competence which in the opinion of Senate, on the recommendation of the Faculty of Engineering and the Built Environment is adequate for the purposes of admission as a candidate for the degree. Candidates holding the Bachelor of Architectural Studies degree of the University may be accepted on evidence of demonstrated spatial design ability.

### Selection

- FMB2 Entry into the programme is limited. All applicants must submit a portfolio of design work, and other material as specified in the Application Form, for consideration by an Admissions Committee.

### Duration

- FMB3 The curriculum for the degree shall extend over a minimum of two academic years of study. (Credits will add up to two years of full time study).

### Registration Requirements

- FMB4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.
- FMB4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.
- FMB4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.
- FMB4.4 A candidate's registration for the second semester shall be provisional until he or she completes the work of the first semester.

### Obtaining the Degree

- FMB5 A candidate shall undertake advanced study by coursework and shall comply with the curriculum requirements prescribed by Senate. (The curriculum requirements are obtainable on request from the Programme Co-ordinator.)

### **Recognition of Courses Taken at this or another Institution**

- FMB6.1 The Senate may grant credit for and exemption from one semester of the curriculum to a Bachelor of Architecture graduate of the University who has completed prescribed work in the theory and practice of City Planning and Urban Design while registered for the Bachelor of Architecture degree.
- FMB6.2 The Senate may accept as part of the attendance of a candidate qualifying him or her for admission to the degree, periods of attendance at this or another University or Institution recognised by the Senate for the purpose, and may further accept examinations passed at this or another University or Institution approved by the Senate as exempting a candidate from examinations in and for the purpose of granting him or her credit for such courses prescribed for the degree as Senate may consider equivalent, provided that a candidate for the degree:
- (a) shall attend the University as a candidate for the degree for at least eighteen months;
  - (b) shall complete at least three quarters of the courses prescribed for the degree in the School of Architecture and Planning.
- FMB6.3 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.

### **Readmission**

- FMB7 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the theory courses recognised for the degree, fails to complete courses to the value of not less than 50% of the total theory credits for which he or she is registered in the year concerned or if he or she fails to make progress with his or her dissertation APG5050ZS to the satisfaction of Senate. With respect to studio work, the completion of APG4022F is a prerequisite for registration in APG4026S; the completion of APG4026S is a prerequisite for the registration of APG5055F; and completion of APG5055F is a prerequisite for registration of APG5050Z.

### **Submission of Dissertation**

- FMB8.1 A candidate must complete a dissertation on a subject approved by the Senate under the supervision of a member of staff appointed by the Senate by due date.  
Note. Detailed procedures for the dissertation will be made available to candidates at the time of registration. These procedures will give the dates for various stages, critically, the final date for submission. In exceptional cases the programme convener may allow a late submission, but in such cases a candidate will at best get a pass (third class) result.
- FMB8.8 The candidate must submit two permanently bound copies of the dissertation to the Programme Secretary by due date.  
Note. The work is examined by two examiners, one of whom is always external to the department, and one of whom is usually the supervisor. The external examiner retains his/her copy while the second copy is retained by the University after the examination result has been approved.

### **Publication**

- FMB9.1 When presenting any written work for examination, a candidate shall by so doing grant a free licence to the University to publish it in whole or in part in any format that the University deems fit.
- FMB9.2 Work produced as part of the requirements of courses prescribed for the degree remains

the property of the University.

### **Award of the Degree**

FMB10.1 A candidate who obtains first class passes in at least five theory courses (constituted as APG4020F, APG4021F, APG5024F, APG4028F and APG4029F in the first semester; APG4023S, APG4024S, APG4025S and APG4038S in the second semester; and APG5056F in the third semester) and two first class passes in studiodwork projects (constituted as APG4022F, APG4026S, APG5050Z and APG5055F), one of which must be APG5050Z, shall be awarded the degree with distinction.

FMB10.2 A candidate who, in terms of the rules, is permitted to complete the degree in three semesters, and does so, and who, as a candidate for the degree obtains at least four first class passes in theory courses (as defined in Rule FMB 9.1), one of which must be APG5056F, and two first class passes in studiodwork (as defined in Rule FMB 9.1), one of which must be APG5050Z, shall be awarded the degree with distinction.

FMB10.3 The University does not undertake to reach a decision on the award of the degree by any specific date.

### **Master of City and Regional Planning**

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MCRP is offered by the Faculty through the School of Architecture, Planning and Geomatics.*

In South Africa at the present time there exists a strong need to produce professional planners capable of operating at both the city and regional scales. The study of city planning and regional planning has therefore been integrated in a single comprehensive programme.

The MCRP degree programme has been structured so as to accommodate the basic differences and overlaps between the city and regional planning stream, and city planning and urban design stream. Coursework in the programme includes the theoretical and practical subject matter necessary to meet the requirements of the Certification of Environmental Practitioners in South Africa.

### **Minimum Admission Requirements**

FMC1 A person shall not be admitted as a candidate for the degree unless

- (a) he or she is a graduate of the University or of another University recognized by the Senate for the purpose; or
- (b) he or she has passed at any University or at any Institution recognized by the Senate for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for a degree at the University; or
- (c) he or she has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree of Master of City and Regional Planning.

### **Selection**

FMC2 Selection is based on an applicant's academic record. Entry into the programme is limited by the space available.

### **Duration**

FMC3 The curriculum for the degree shall extend over a minimum of two academic years of study.

### Registration Requirements

- FMC4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.
- FMC4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.
- FMC4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses or if registering only for a thesis or dissertation.
- FMC4.4 A candidate's registration for the second semester shall be provisional until he or she completes the work of the first semester.

### Obtaining the Degree

- FMC5 A candidate shall undertake advanced study by coursework and shall comply with the curriculum requirements prescribed by Senate. (The curriculum requirements are obtainable on request from the Programme Co-ordinator).

### Courses Completed at this or another University

- FMC6.1 The Senate may accept as part of the attendance of a candidate qualifying him or her for admission to the degree, periods of attendance at this or another University or Institution recognised by the Senate for the purpose, and may further accept examinations passed at this or another University or Institution approved by the Senate as exempting a candidate from examinations in and for the purpose of granting him or her credit for such courses prescribed for the degree as Senate may consider equivalent, provided that a candidate for the degree
- shall attend at the University as a candidate for the degree for at least eighteen months;
  - shall complete at least three quarters of the courses prescribed for the degree in the School of Architecture, Planning and Geomatics.
- FMC6.2 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.

### Readmission

- FMC7 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the theory courses recognised for the degree, fails to complete courses to the value of not less than 50% of the total theory credits for which he or she is registered in the year concerned or if he or she fails to make progress with his or her dissertation APG5051Z to the satisfaction of Senate. With respect to studio work, the completion of APG4022F is a prerequisite for registration in APG4026S; the completion of APG4026S is a prerequisite for the registration of APG5020F and APG5022F; and completion of APG5020F and APG5022F are prerequisites for registration of APG5051Z.

### Submission of Dissertation

- FMC8.1 A candidate must complete a dissertation on a subject approved by the Senate under the supervision of a member of staff appointed by the Senate by due date.  
Note. Detailed procedures for the dissertation will be made available to candidates at the time of registration. These procedures will give the dates for various stages, critically, the final date for submission. In exceptional cases the programme convener may allow a late



submission, but in such cases a candidate will at best get a pass (third class) result.

FMC8.2 The candidate must submit two permanently bound copies of the dissertation to the Programme Secretary by due date.

Note. The work is examined by two examiners, one of whom is always external to the department, and one of whom is usually the supervisor. The external examiner retains his/her copy while the second copy is retained by the University after the examination result has been approved.

## Publication

FMC9.1 When presenting any written work for examination a candidate shall by so doing grant a free licence to the University to publish it in whole or in part in any format that the University deems fit.

FMC9.2 Work produced as part of the requirements of courses prescribed for the degree remains the property of the University.

## Award of the Degree

FMC10.1 A candidate who obtains first class passes in at least five theory courses (constituted as APG4020F, APG4021F, APG4028F and APG4029F in the first semester; APG4023S, APG4024S, APG4025S and APG4038S in the second semester; and APG5023F in the third semester) and three first class passes in studio/work projects (constituted as APG4022F, APG4026S, APG5020F, APG5022F and APG5051Z), one of which must be APG5051Z, shall be awarded the degree with distinction.

FMC10.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## Master of Engineering

*This degree is offered through the Faculty for programmes in Structural Engineering and Structural Materials (Department of Civil Engineering), Telecommunications (Department of Electrical Engineering) and Transport Studies (jointly by the Department of Civil Engineering and the School of Architecture, Planning and Geomatics).*

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

## Minimum Admission Requirements

FMD1 A person shall not be admitted as a candidate for the degree unless he or she:

- (a) holds a four year bachelors degree or honours degree of the University or of any other university recognised for the purpose; or
- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
- (c) has passed at any university or institution recognized for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for a degree in terms of (a) above; or
- (d) has in any other manner attained a level of competence which in the opinion of Senate on the recommendation of the Faculty, is adequate for the purpose of admission as a candidate for the degree.

### **Selection**

FMD2 Selection is based on an applicant's academic record and the availability of a suitable programme and research project supervisor. Submission of a satisfactory research topic may be required.

### **Duration**

FMD3 A candidate shall be registered for the degree for a period of not less than one year.

### **Registration Requirements**

FMD4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FMD4.2 A new candidate must register by not later than the date on which his or her first course starts. A continuing candidate must reregister by not later than 28 February.

### **Obtaining the Degree**

FMD5 A candidate shall undertake advanced study by coursework to the value of a minimum of 120 credits and a research project to the value of 60 credits.

### **Courses Completed at this or another University/Institution**

FMD6.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FMD6.2 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.

### **Examination**

FMD7.1 A candidate for the degree shall complete prescribed courses to the value of 120 credits and a project report on the subject of the research project to a value of 60 credits.

FMD7.2 A candidate shall not be permitted to submit his/her research report for examination more than twice.

FMD7.3 A candidate may be required to present himself or herself for an oral examination on the research project, or an essay assignment.

### **Readmission**

FMD8 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her dissertation and/or research project to the satisfaction of Senate).

### **Submission of Project Report**

FMD9.1 A candidate intending to submit a project in the hope of the completion of the requirements for the award of the degree in either June or December, must, in the year in

which the project is to be submitted, inform the supervisor in writing of such intention by 15 March or 15 August respectively in the year in which the report is to be submitted. The final date for receipt of a Master of Engineering project report submitted in the hope of the award of the degree either in June or December is 30 April or 30 September respectively.

- FMD9.2 After consultation with the supervisor, a candidate shall submit two copies of his/her project report in temporary binding to the supervisor who is responsible for appointing an external examiner of the project report. Where more than two examiners are appointed a candidate may be required to submit an appropriate number of additional copies in temporary bindings.
- FMD9.3 No project report or part thereof which has previously been submitted for examination for any degree at any university shall be accepted for a Masters' degree in the Faculty of Engineering & the Built Environment.

### **Publication**

- FMD10 When presenting his or her project report the candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format that the University deems fit.

### **Award of the Degree**

- FMD11.1 The degree is not awarded with distinction.
- FMD11.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

### **Changing to MSc(Eng) or MSc(Appl Sci)**

- FMD12 The Senate may on the recommendation of the Faculty and the candidate's supervisor upgrade a candidate's registration to MSc(Eng) or MSc(Appl Sci) on the grounds of the quality and development of the candidate's work. Upgrading an MEng to PhD is not possible.

## **Master of Engineering Management**

Note: There will be no new intake of candidates for this Degree from 2007 as it is being discontinued. Candidates registered prior to 2007 will have the option of continuing or registering for the Degree of Master of Engineering. Candidates from 2007, will be registered for the Degree of Master of Engineering. Candidates who are continuing should refer to the Degree rules in the 2006 edition of this Handbook. A copy is available from the Faculty Office.

## **Master of Industrial Administration**

Note: There will be no new intake of candidates for this Degree from 2007 as it is being discontinued. Candidates registered prior to 2007 will have the option of continuing or registering for the Degree of Master of Engineering. Candidates from 2007, will be registered for the Degree of Master of Engineering. Candidates who are continuing should refer to the Degree rules in the 2006 edition of this Handbook. A copy is available from the Faculty Office.

## **Master of Landscape Architecture**

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MLA is offered by the Faculty through the School of Architecture, Planning and*

*Geomatics.*

### **Minimum Admission Requirements**

- FMG1 A person shall not be admitted as a candidate for the degree Master of Landscape Architecture unless he or she:
- (a) is a graduate holding the degree of Bachelor of Architectural Studies from the University, or;
  - (b) has passed at any university or at any Institution recognized by the Senate for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examination prescribed for the Bachelor of Architectural Studies degree at the University; or
  - (c) has in any other manner attained a level of competence which in the opinion of Senate, on the recommendation of the Faculty of Engineering and the Built Environment is adequate for the purposes of admission as a candidate for the degree. Candidates holding non-design Bachelors degrees will be required to complete, for non degree purposes, an initial year of design studies via the Bachelor of Architectural Studies Programme before commencing the courses for the MLA programme.

### **Selection**

- FMG2 Selection is based on the applicant's academic record (which must be of a standard sufficient to admit the student to Honours level studies), motivation, submission of a portfolio of design work (if available), critical response to a polemical article on landscape architecture, and consideration of the views of referees. The number of students accepted into the Programme in any year is restricted by the number of workspaces available.

### **Duration**

- FMG3 The degree programme shall extend over a minimum of two academic years of study.

### **Registration Requirements**

- FMG4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.
- FMG4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.
- FMG4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses or if registering only for a thesis or dissertation.
- FMG4.4 A candidate's registration for the second semester shall be provisional until he or she completes the work of the first semester.

### **Obtaining the Degree**

- FMG5 A candidate shall undertake advanced study by coursework and shall comply with the curriculum requirements prescribed by Senate. (The curriculum requirements are obtainable on request from the Programme Co-ordinator).

### **Courses Completed at this or another University**

- FMG6.1 The Senate may accept as part of the attendance of a candidate qualifying him or her for admission to the degree, periods of attendance at this or another University or Institution recognised by the Senate for the purpose, and may further accept examinations passed at

this or another University or Institution approved by the Senate as exempting a candidate from examinations in and for the purpose of granting him or her credit for such courses prescribed for the degree as Senate may consider equivalent, provided that a candidate for the degree

- (a) shall attend at the University as a candidate for the degree for at least eighteen months;
- (b) shall complete at least three quarters of the courses prescribed for the degree in the School of Architecture and Planning.

FMG6.2 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.

### Readmission

FMG7 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned

### Publication

FMG8.1 When presenting any written work for examination, a candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format that the University deems fit.

FMG8.2 Work produced as part of the requirements of courses prescribed for the degree remains the property of the University.

### Award of the Degree

FMG9.1 A candidate who obtains first class passes in five or more courses, of which at least two shall be in theory courses and two in studio work courses, and who completes the degree within the prescribed two year period, shall be awarded the degree with distinction.

FMG9.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## Master of Philosophy

NOTE: The degree of MPhil will normally be awarded for a dissertation or for a combination of coursework and dissertation.

*The Degree of MPhil is offered by the Faculty for work of an inter-disciplinary nature.*

### Minimum Admission Requirements

- FMH1 A person shall not be admitted as a candidate for the degree unless he or she
- (a) holds a four year bachelors' degree, or honours degree of the University or of any other university recognised by the Senate for the purpose; or
  - (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
  - (c) has passed at any university or institution recognized for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for an approved degree in terms of (a) above; or
  - (d) has in any other manner attained a level of competence which in the opinion of

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Senate on the recommendation of the Faculty, is adequate for the purpose of admission as a candidate for the degree.

### Selection

FMH2 Selection is based on an applicant's academic record and the availability of a suitable supervisor. Submission of a satisfactory research proposal may be required.

### Duration

FMH3 The degree programme shall extend over not less than one year.

### Registration Requirements

FMH4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FMH4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FMH4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

FMH4.4 A candidate, other than one registering for the first time, must reregister by not later than 28 February if registering only for the dissertation. A candidate who is registering for the degree for the first time and only for the dissertation, may register at any time during the year.

### Supervision

FMH5 A candidate may obtain the degree in one of the following ways:

### Obtaining the Degree

FMH6.1 A candidate may obtain the degree in one of the following ways:

- (i) by completing a dissertation (180 credits) which may incorporate any or all of the following:
  - design of all or part of a project to a specification involving advanced concepts and theoretical principles applicable to some branch of the built environment.
  - a research project of a theoretical or practical nature
  - a critical review of a specified topic based upon a comprehensive search of the literature or available data
  - development of an item of equipment or a technique involving novel features or advanced design; or
  - any other study acceptable to the Faculty.
- (ii) by completing advanced study by coursework (as prescribed) of a minimum value of 60 credits (some programmes may require more) AND a dissertation (120 credits) which may incorporate any or all of the elements referred to in subparagraph (i) above.

**NOTE: Option (ii) may not be offered by all Departments.**

FMH6.2 The candidate's supervisor shall submit written evidence to the Faculty's Examinations Committee that the candidate has, with the approval of the supervisor, submitted a paper for presentation at a conference or for publication in a journal recognised by Senate, provided that this requirement shall not apply to a candidate who undertakes a structured programme of coursework to a value of 120 credits and a research project to a value of

60 credits.

### **Courses Completed at this or another University/Institution**

- FMH7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.
- FMH7.2 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.

### **Examination**

- FMH8.1 A candidate shall complete
- (a) a dissertation on the subject of the research project (180 credits); or
  - (b) if proceeding by research and coursework, prescribed courses of a minimum value of 60 credits and a dissertation (120 credits) on the subject of the research project.
- FMH8.2 A candidate shall not be permitted to submit his/her dissertation for examination more than twice.

### **Progress Report**

- FMH9 A candidate shall submit a written report to the supervisor by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### **Readmission**

- FMH10.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her dissertation to the satisfaction of Senate).
- FMH10.2 A candidate who is required by the Faculty Examination Committee to correct or revise his or her research dissertation shall complete the corrections/revisions within one year of the date of the Committee's decision, failing which he/she shall not be permitted to continue with or reregister for his/her degree without the special permission of Senate.

### **Submission of Dissertation and Paper**

- FMH11.1 A candidate intending to submit a dissertation in the hope of the award of the degree in either June or December, must, in the year in which the dissertation is to be submitted, inform the Faculty Manager (Academic Administration) in writing of such intention by 15 February or 15 July respectively in the year in which the dissertation is to be submitted. The final date for receipt by the Faculty Manager of a Master's dissertation submitted in the hope of the award of the degree either in June or December is 31 March or 31 August respectively.
- FMH11.2 After consultation with the supervisor, a candidate shall submit two copies of his/her dissertation in temporary bindings and two unbound copies to the Faculty Manager, (Academic Administration). Where more than two examiners are appointed a candidate

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may be required to submit an appropriate number of additional copies in temporary bindings.

FMH11.3 The candidate shall submit a summary of the key aspects of the dissertation, presented in the form of a paper which is, potentially, of publishable standard, approved by the supervisor. The final date for receipt of the paper by the Faculty Office shall be 30 April in the case of a candidate who submits a dissertation in hope of the award of the degree in June or 31 October in the case of a candidate who submits a dissertation in hope of the award of the degree in December. *Note:* The Paper requirement is intended to develop a candidate's skills in academic communication through exposure to the discipline of preparing a scholarly, succinct overview of the subject of the research topic, with due attention to structure, detail, clarity of expression and referencing.

FMH11.4 No dissertation or part thereof, which has previously been submitted for examination for any degree at any university shall be accepted for a Masters degree in the Faculty of Engineering and the Built Environment.

### Publication

FMH12.1 When presenting his or her dissertation the candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format that the University deems fit.

FMH12.2 No publication may, without the prior permission of the University, contain a statement that the published material was or is to be submitted in part or in full for this degree.

### Award of the Degree

FMH13.1 The degree is not awarded with distinction.

FMH13.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

### Upgrading to PhD

FMH14 The Senate may on the recommendation of the Faculty and the candidate's supervisor upgrade a candidate's registration to PhD on the grounds of the quality and development of the candidate's work.

## Master of Philosophy in Housing Development and Management

*Note:* There will be no new intake of candidates for this Degree from 2007 as it is being discontinued. Candidates registered prior to 2007 will have the opportunity of completing their degrees.

## Master of Philosophy in Transport Studies

*NOTE:* These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MPhil in Transport Studies is offered by the Faculty through the School of Architecture, Planning and Geomatics and the Department of Civil Engineering.*

### Minimum Admission Requirements

FMI1 A person shall not be admitted as a candidate for the degree unless he or she:

- (a) is a graduate of the University with a four-year bachelor level or honours degree and has achieved a level of numeracy satisfactory to the Senate\*; or



- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework and has achieved a level of numeracy satisfactory to Senate\*; or
- (c) has passed at any University or at any Institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to a degree in terms of (a) above and has achieved a level of numeracy satisfactory to the Senate\*; or
- (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree.

\* NOTE:

- (i) a first year (one semester) University course in Mathematics (pure or applied) or Statistics
- (ii) Mathematics at Senior Certificate level with a symbol of D or better at the Higher Grade, or a symbol of B or better at the Standard Grade; or
- (iii) applicants without the required level of numeracy specified in (i) and (ii) above will be required to demonstrate a satisfactory level of numeracy in a test.

### **Selection**

FMI2 Selection is based on an applicant's academic record and experience.

### **Duration**

FMI3 A candidate must be registered for the degree for at least two academic years.

### **Registration Requirements**

FMI4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FMI4.2 A new candidate must register by not later than the date on which his or her first course starts.

FMI4.3 A continuing candidate must reregister by not later than 28 February.

### **Minimum Number of Course Modules**

FMI5 A candidate must register for at least two course modules, other than the dissertation or the research project, per year, except where only one course module is required to complete the degree.

### **Obtaining the Degree**

FMI6.1 A candidate may obtain the degree in one of the following ways:

- (a) by completing advanced coursework (as prescribed) of a minimum value of 120 credits and a research report on the subject of a research project of a minimum value of 60 credits; or
- (b) by completing advanced study by coursework of a minimum value of 80 credits and a dissertation (120 credits); or
- (c) by completing a dissertation (180 credits).

FMI6.2 A candidate with a three year entrance qualification or equivalent shall, in addition to FMI6.1 above, complete 144 credits of approved coursework.

### **Courses Completed at this or another University/Institution**

- FMI7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.
- FMI7.2 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.

### **Examination**

- FMI8.1 A candidate shall complete
- (a) prescribed courses to the value of 80 credits and a dissertation (120 credits), or
  - (b) prescribed courses to the value of 120 credits and a research report on the subject of the research project to a value of 60 credits, or
  - (c) a dissertation to the value of 180 credits.
- FMI8.2 A candidate shall not be permitted to submit his/her dissertation or research report for examination more than twice.
- FMI8.3 A candidate may be required to present himself or herself for an oral examination on the dissertation, research report, or an essay assignment.

### **Readmission**

- FMI9.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her dissertation and/or research project to the satisfaction of Senate).
- FMI9.2 A candidate who is required by the Faculty Examination Committee to correct or revise his or her research dissertation shall complete the corrections/revisions within one year of the date of the Committee's decision, failing which he/she shall not be permitted to continue with or reregister for his/her degree without the special permission of Senate.

### **Submission of Project Report**

- FMI10.1 A candidate intending to submit a project in the hope of the completion of the requirements for the award of the degree in either June or December, must, in the year in which the project is to be submitted, inform the supervisor in writing of such intention by 15 March or 15 August respectively in the year in which the report is to be submitted. The final date for receipt of a project report submitted in the hope of the award of the degree either in June or December is 30 April or 30 September respectively.
- FMI10.2 After consultation with the supervisor, a candidate shall submit two copies of his/her dissertation in temporary bindings and two unbound copies to the Programme Convenor. Where more than two examiners are appointed a candidate may be required to submit an appropriate number of additional copies in temporary bindings.
- FMI10.3 No project report or part thereof which has previously been submitted for examination for any degree at any university shall be accepted for a Masters' degree in the Faculty of

Engineering & the Built Environment.

### **Submission of Dissertation and Paper**

- FMI11.1 A candidate intending to submit a dissertation in the hope of the award of the degree in either June or December, must, in the year in which the dissertation is to be submitted, inform the Faculty Manager (Academic Administration) in writing of such intention by 15 February or 15 July respectively in the year in which the dissertation is to be submitted. The final date for receipt by the Faculty Manager (Academic Administration) of a Master's dissertation submitted in the hope of the award of the degree either in June or December is 31 March or 31 August respectively. This shall not apply in the case of a candidate who undertakes a structured programme of coursework to a value of 120 credits and a research project to a value of 60 credits.
- FMI11.2 After consultation with the supervisor, a candidate shall submit two copies of his/her dissertation in temporary bindings and two unbound copies to the Faculty Manager, (Academic Administration). Where more than two examiners are appointed a candidate may be required to submit an appropriate number of additional copies in temporary bindings.
- FMI11.3 The candidate shall submit a summary of the key aspects of the dissertation, presented in the form of a paper which is, potentially, of publishable standard, approved by the supervisor. The final date for receipt of the paper by the Faculty Office shall be 30 April in the case of a candidate who submits a dissertation in hope of the award of the degree in June or 31 October in the case of a candidate who submits a dissertation in hope of the award of the degree in December. *Note:* The Paper requirement is intended to develop a candidate's skills in academic communication through exposure to the discipline of preparing a scholarly, succinct overview of the subject of the research topic, with due attention to structure, detail, clarity of expression and referencing.
- FMI11.4 No dissertation or part thereof which has previously been submitted for examination for any degree at any university shall be accepted for a Masters' degree in the Faculty of Engineering & the Built Environment.

### **Publication**

- FMI12.1 When presenting his or her research report the candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format that the University deems fit.
- FMI12.2 No publication may, without the prior permission of the University, contain a statement that the published material was or is to be submitted in part or in full for this degree.

### **Award of the Degree**

- FMI13.1 The degree is not awarded with distinction.
- FMI13.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## **Master of Philosophy in Urban Infrastructure Design and Management**

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

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*This programme is offered by the Faculty through the Department of Civil Engineering.*

### **Minimum Admission Requirements**

- FMJ1 A person shall not be admitted as a candidate for the degree unless he or she:
- (a) is a graduate of the University with a four-year bachelor level or honours degree in a field related to the built environment; or
  - (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
  - (c) has passed at any University or at any Institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to a degree in terms of (a) above; or
  - (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree.

### **Selection**

- FMJ2 Selection is based on an applicant's academic record and experience.

### **Duration**

- FMJ3 A candidate must be registered for the degree for at least two academic years.

### **Registration Requirements**

- FMJ4.1 A candidate must be registered for the degree for at least two academic years.
- FMJ4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.
- FMJ4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.
- FMJ4.4 Except with the permission of the Senate, a candidate may not withdraw from a course which he or she is repeating.
- FMJ4.5 A candidate, other than one registering for the first time for the degree must reregister by not later than 28 February if registering only for a dissertation or only for a project. A candidate who is registering for the degree for the first time and, only for a dissertation, may register at any time during the year.

### **Minimum Number of Courses**

- FMJ5 A candidate must register for at least two courses, other than the dissertation or the research project, per year except where only one course module is required to complete the degree.

### **Obtaining the Degree**

- FMJ6 A candidate shall be required to complete advanced study by coursework (as prescribed) of a minimum value of 120 credits and a research report on the subject of a research project of a minimum value of 60 credits.

### **Courses Completed at this or another University/Institution**

- FMJ7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a

curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

- FMJ7.2 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.

### **Examination**

- FMJ8.1 A candidate shall complete prescribed courses to the value of 120 credits and a research report on the subject of the research project to a value of 60 credits.
- FMJ8.2 A candidate who fails the Research Report examination shall not be permitted to reregister for the Research Report.
- FMJ8.3 A candidate may be required to present himself or herself for an oral examination on the subject of the research report.

### **Progress Report**

- FMJ9 A candidate shall submit a written report to the Head of Department by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### **Readmission**

- FMJ10.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her dissertation and/or research project to the satisfaction of Senate).
- FMJ10.2 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree fails to complete a course after having been registered for it twice, or in the case of the Research Report, submits the report and fails the examination.
- FMJ10.3 A candidate who is required by the Faculty Examination Committee to correct or revise his or her research project report shall complete the corrections/revisions within one year of the date of the Committee's decision, failing which he/she shall not be permitted to continue with or reregister for his/her degree without the special permission of Senate.

### **Submission of Project Report**

- FMJ11.1 A candidate intending to submit a project in the hope of the completion of the requirements for the award of the degree in either June or December, must, in the year in which the project is to be submitted, inform the supervisor in writing of such intention by 15 March or 15 August respectively in the year in which the report is to be submitted. The final date for receipt of a Master of Engineering project report submitted in the hope of the award of the degree either in June or December is 30 April or 30 September respectively.
- FMJ11.2 After consultation with the supervisor, a candidate shall submit two bound copies of

his/her project report to the supervisor who is responsible for appointing an external examiner of the project report. Where more than two examiners are appointed a candidate may be required to submit an appropriate number of additional bound copies.

FMJ11.3 No project report or part thereof which has previously been submitted for examination for any degree at any university shall be accepted for a Masters' degree in the Faculty of Engineering & the Built Environment.

### **Publication**

FMJ12.1 When presenting his or her project report the candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format that the University deems fit.

FMJ12.2 No publication may, without the prior permission of the University, contain a statement that the published material was or is to be submitted in part or in full for this degree.

### **Award of the Degree**

FMJ13.1 The degree is not awarded with distinction.

FMJ13.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## **Master of Science in Applied Science**

NOTE: Note: There will be no new intake of candidates for this Degree from 2007 as it is being discontinued. Candidates registered prior to 2007 will have the option of continuing or registering for the Degree of Master of Science in Engineering. From 2007 candidates, will be registered for the Degree of Master of Science in Engineering. Candidates who are continuing should refer to the Degree rules in the 2006 edition of this Handbook. A copy is available from the Faculty Office.

## **Master of Science in Construction Economics and Management**

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MSc(Const. Econ. & Mgmt.) is offered by the Faculty through the Department of Construction Economics & Management. The Department is currently developing a new programme to offer for this Degree. There will be no new intake of candidates in 2007. The rules below apply to candidates registered prior to 2007.*

### **Minimum Admission Requirements**

- FML1 A person shall not be admitted as a candidate for the degree unless he or she:
- (a) holds a four year bachelors degree or honours degree of the University or of any other university recognised for the purpose; or
  - (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
  - (c) has passed at any university or at any institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to a four year degree or honours degree of the University; or
  - (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of Faculty, is adequate for the purposes of admission to the degree.

### **Selection**

FML2 Selection is based on an applicant's academic record and experience.

### **Duration**

FML3 A candidate must be registered for the degree for a minimum period of at least two academic years.

### **Registration Requirements**

FML4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FML4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FML4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

FML4.4 Except with the permission of the Senate, a candidate may not withdraw from a course which he or she is repeating.

FML4.5 A candidate, other than one registering for the first time for the degree, must reregister by not later than 28 February.

### **Minimum Number of Courses**

FML5 A candidate must register for at least two courses other than the research report, per year, except in cases where only one course is required to complete the degree.

### **Obtaining the Degree**

FML6 A candidate may obtain the degree by completing advanced study by coursework (as prescribed) of a minimum value of 140 credits and a research report on the subject of a research project of a minimum value of 60 credits.

### **Courses Completed at this or another University/Institution**

FML7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FML7.2 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.

### **Examination**

FML8.1 A candidate for the degree shall complete prescribed courses to a value of 140 credits and a research report on the subject of the research project to a value of 60 credits.

FML8.2 A candidate who fails the research report examination shall not be permitted to reregister for the research report.

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FML8.3 A candidate may be required to present himself or herself for an oral examination on the research report.

### **Progress Report**

FML9 A candidate shall submit a written report to the supervisor by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### **Readmission**

FML10.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her research project to the satisfaction of Senate).

FML10.2 Except by the permission of Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree fails to complete a course after having been registered for it twice or, in the case of the research report, submits the report and fails the examination.

### **Award of the Degree**

FML11.1 The degree is not awarded with distinction.

FML11.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## **Master of Science in Engineering**

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MSc(Eng) is offered by the Faculty through the Departments of Chemical Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering; the School of Architecture, Planning and Geomatics; and through the Energy Research Centre.*

### **Minimum Admission Requirements**

FMM1 A person shall not be admitted as a candidate for the degree unless he or she:

- (a) is a graduate of the Faculty or of an engineering or geomatics programme of any other university recognized for the purpose; or
- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
- (c) has passed at any university or institution recognized for the purpose, such examinations as are, in the opinion of the Senate, equivalent to the examinations prescribed for the degree of BSc(Eng) or BSc(Geomatics) at the University; or
- (d) has in any other manner attained a level of competence which in the opinion of Senate on the recommendation of the Faculty, is adequate for the purpose of admission as a candidate for the degree.

### **Selection**

FMM2 Selection is based on an applicant's academic record and the availability of a suitable



supervisor. Submission of a satisfactory research proposal may be required.

### **Duration**

FMM3 The degree programme shall extend over not less than one year.

### **Registration Requirements**

FMM4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FMM4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FMM4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

FMM4.4 A candidate, other than one registering for the first time for the degree must reregister by not later than 28 February if registering only for the dissertation. A candidate who is registering for the degree for the first time and, only for the dissertation, may register at any time during the year.

### **Supervision**

FMM5 A candidate shall work under the guidance of a supervisor appointed by Senate and shall be required to attend at the University for a minimum period of at least one month per annum for supervision purposes for as long as he/she continues to be a candidate for the degree.

### **Obtaining the Degree**

FMM6.1 A candidate may obtain the degree in one of the following ways:

- (i) by completing a dissertation (180 credits) which may incorporate any or all of the following:
  - design of all or part of an engineering project to a specification involving advanced concepts and theoretical principles
  - a research project of a theoretical or practical nature
  - a critical review of a specified topic based upon a comprehensive search of the literature or available data
  - development of an item of equipment or a technique involving novel features or advanced design
  - any other study acceptable to the Faculty; or
- (ii) by completing advanced study by coursework (as prescribed) of a minimum value of 60 credits (some programmes require more) and a dissertation (120 credits) which may incorporate any or all of the elements referred to in sub-paragraph (i) above.

FMM6.2 The candidate's supervisor shall submit written evidence to the Faculty's Examinations Committee that the candidate has, with the approval of the supervisor, submitted a paper for presentation at a conference or for publication in a journal recognised by Senate.

### **Courses Completed at this or another University/Institution**

FMM7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other

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institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year

FMM7.2 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.

### Examination

FMM8.1 A candidate for the degree shall complete

- (a) a dissertation (180 credits) on the subject of the research project indicating an advanced study of applications, methods or theories, in some branch of engineering or geomatics; or,
- (b) if proceeding by research and coursework, prescribed courses of a minimum value of 60 credits (some programmes may require more) and a dissertation on the subject of the research project, (to the value of 120 credits).

FMM8.2 A candidate may be required to attend an oral examination on the subject of the dissertation or technical report.

FMM8.3 A candidate shall not be permitted to submit his/her dissertation for examination more than twice.

### Progress Report

FMM9 A candidate shall submit a written report to the supervisor by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### Readmission

FMM10.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her dissertation and/or research project to the satisfaction of Senate).

FMM10.2 A candidate who is required by the Faculty Examination Committee to correct or revise his or her research dissertation shall complete the corrections/revisions within one year of the date of the Committee's decision, failing which he/she shall not be permitted to continue with or reregister for his/her degree without the special permission of Senate.

### Submission of Dissertation and Paper

FMM11.1 A candidate intending to submit a dissertation in the hope of the award of the degree in either June or December, must, in the year in which the dissertation is to be submitted, inform the Faculty Manager (Academic Administration) in writing of such intention by 15 February or 15 July respectively in the year in which the dissertation is to be submitted. The final date for receipt by the Faculty Manager (Academic Administration) of a Master's dissertation submitted in the hope of the award of the degree either in June or December is 31 March or 31 August respectively.

FMM11.2 After consultation with the supervisor, a candidate shall submit two copies of his/her dissertation in temporary bindings and two unbound copies to the Faculty Manager, (Academic Administration). Where more than two examiners are appointed a candidate may be required to submit an appropriate number of additional copies in temporary

bindings.

FMM11.3 The candidate shall submit a summary of the key aspects of the dissertation, presented in the form of a paper which is, potentially, of publishable standard, approved by the supervisor. The final date for receipt of the paper by the Faculty Office shall be 30 April in the case of a candidate who submits a dissertation in hope of the award of the degree in June or 31 October in the case of a candidate who submits a dissertation in hope of the award of the degree in December. *Note:* The Paper requirement is intended to develop a candidate's skills in academic communication through exposure to the discipline of preparing a scholarly, succinct overview of the subject of the research topic, with due attention to structure, detail, clarity of expression and referencing.

FMM11.4 No dissertation or part thereof which has previously been submitted for examination for any degree at any university shall be accepted for a Masters' degree in the Faculty of Engineering & the Built Environment.

### **Publication**

FMM12.1 When presenting his or her dissertation the candidate shall by so doing grant a free licence to the University to publish it in whole or part at any time and in any manner or format that the University deems fit.

FMM12.2 No publication may, without the prior permission of the University, contain a statement that the published material was or is to be submitted in part or in full for this degree.

### **Award of the Degree**

FMM13.1 The degree is not awarded with distinction

FMM13.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

### **Upgrading to PhD**

FMM14 The Senate may on the recommendation of the Faculty and the candidate's supervisor upgrade a candidate's registration to PhD on the grounds of the quality and development of the candidate's work, provided that this shall not apply to a candidate registered for the 120 credit coursework/60 credit project option.

FMI4.4 Except with the permission of the Senate, a candidate may not withdraw from a course which he or she is repeating.

## **Master of Science in Project Management**

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MSc in Proj.Mgmt. is offered by the Faculty through the Department of Construction Economics & Management.*

### **Minimum Admission Requirements**

FMN1 A person shall not be admitted as a candidate for the degree unless he or she:

- (a) is a graduate of the University with a bachelors degree of a minimum duration of four years, or, an honours degree; or
- (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144

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- credits of approved coursework; or
- (c) has passed at any university or at any institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to a degree in terms of (a) above; or
  - (d) has in any other manner attained a level of competence which, in the opinion of Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree.

### Selection

FMN2 Selection is based on an applicant's academic record and experience.

### Duration

FMN3 A candidate must be registered for the degree for at least two academic years.

### Registration Requirements

FMN4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FMN4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FMN4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

FMN4.4 Except with the permission of the Senate, a candidate may not withdraw from a course which he or she is repeating.

FMN4.5 A candidate, other than one registering for the first time for the degree must reregister by not later than 28 February if registering only for a project.

### Minimum Number of Courses

FMN5 A candidate must register for at least two courses, other than the research project, per year except where only one course module is required to complete the degree.

### Obtaining the Degree

FMN6 A candidate may obtain the degree by completing advanced study by coursework (as prescribed) of a minimum value of 140 credits and a research report on the subject of a research project of a minimum value of 60 credits.

### Courses Completed at this or another University/Institution

FMN7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FMN7.2 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.

## Examination

- FMN8.1 A candidate shall complete prescribed courses to the value of 140 credits and a research report on the subject of the research project to a value of 60 credits.
- FMN8.2 A candidate who fails the Research Report examination shall not be permitted to reregister for the Research Report.
- FMN8.3 A candidate may be required to present himself or herself for an oral examination on the research report.

## Progress Report

- FMN9 A candidate shall submit a written report to the Head of Department by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

## Readmission

- FMN10.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her research project to the satisfaction of Senate).
- FMN10.2 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree fails to complete a course after having been registered for it twice, or in the case of the Research Report, submits the Report and fails the examination.

## Award of the Degree

- FMN11.1 The degree is not awarded with distinction.
- FMN11.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## Master of Science in Property Studies

NOTE: These rules must be read with the general rules for Masters degrees in Handbook 3 of this series.

*The Degree of MSc in Property Studies is offered by the Faculty through the Department of Construction Economics & Management.*

## Minimum Admission Requirements

- FMO1 A person shall not be admitted as a candidate for the degree unless he or she:
- (a) is a graduate of the University with a bachelors degree of a minimum duration of four years, or an honours degree, in a field related to the built environment; or
  - (b) holds an approved three year degree and (i) who has a minimum of five years experience relevant to the field in which he/she proposes to study, or (ii) who in addition to the standard programme requirement first completes a minimum of 144 credits of approved coursework; or
  - (c) has passed at any university or at any institution recognised by Senate for the purpose, such examinations as are, in the opinion of Senate, equivalent to a degree in terms of (a) above; or
  - (d) has in any other manner attained a level of competence which, in the opinion of

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Senate, on the recommendation of the Faculty, is adequate for the purposes of admission as a candidate for the degree.

### **Selection**

FMO2 Selection is based on an applicant's academic record and experience.

### **Duration**

FMO3 A candidate must be registered for the degree for at least two academic years.

### **Registration Requirements**

FMO4.1 Subject to the provisions of the rule on Readmission, below, a candidate must register annually unless granted leave of absence by Senate.

FMO4.2 A candidate must register or reregister by not later than the end of Registration Week if taking first semester courses or, if any of the courses begins earlier, by not later than the date on which the first course starts.

FMO4.3 A candidate must register or reregister by not later than 28 February if taking only second semester courses.

FMO4.4 Except with the permission of the Senate, a candidate may not withdraw from a course which he or she is repeating.

FMO4.5 A candidate, other than one registering for the first time for the degree must reregister by not later than 28 February if registering only for a project.

### **Minimum Number of Courses**

FMO5 A candidate must register for at least two courses, other than the research report, per year except where only one course module is required to complete the degree.

### **Obtaining the Degree**

FMO6 A candidate may obtain the degree by completing advanced study by coursework (as prescribed) of a minimum value of 140 credits and a research report on the subject of a research project of a minimum value of 60 credits.

### **Courses Completed at this or another University/Institution**

FMO7.1 For the purpose of granting credit for and/or exemption from a course prescribed as a curriculum requirement, the Senate may recognise a course or courses completed at this or another university or institution recognised for the purpose, provided that (i) such courses have not been counted for a qualification at the University or at any other institution and (ii) at least half the courses prescribed for the Degree shall be attended and passed at the University and (iii) the total period of attendance shall not be less than one year.

FMO7.2 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.

### **Examination**

FMO8.1 A candidate shall complete prescribed courses to the value of 140 credits and a research report on the subject of the research project to a value of 60 credits.

FMO8.2 A candidate who fails the Research Report examination shall not be permitted to

reregister for the Research Report.

- FMO8.3 A candidate may be required to present himself or herself for an oral examination on the research report.

### **Progress Report**

- FMO9 A candidate shall submit a written report to the Head of Department by 31 July each year, setting out, briefly, the progress made during the preceding twelve months or, if the period of registration is less than twelve months, the period that is relevant.

### **Readmission**

- FMO10.1 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree, fails to complete courses of a value of not less than 50% of the total credits for which he or she is registered in the year concerned (or if he or she fails to make progress with his or her research project to the satisfaction of Senate).
- FMO10.2 Except by permission of the Senate, a candidate may not renew his or her registration if he or she, in the courses recognised for the degree fails to complete a course after having been registered for it twice or, in the case of the Research Report, submits the Report and fails the examination.

### **Award of the Degree**

- FMO11.1 The degree is not awarded with distinction.
- FMO11.2 The University does not undertake to reach a decision on the award of the degree by any specific date.

## **Doctor of Architecture**

Note: Details of the preliminary screening, registration and examination procedures are obtainable on request from the Faculty Manager (Academic Administration).

The degree of Doctor of Architecture is the highest and most prestigious degree awarded in the fields of architecture, planning, urban design and construction economics and management by the University of Cape Town. It is awarded rarely, for substantial, original and scholarly contributions to knowledge, which would normally be the result of work carried out, built and/or published over a period of years.

### **Admission**

- FDA1 The degree of Doctor of Architecture may be conferred upon:
- (a) holders of Bachelor degrees in Architecture, and Honours degrees in Property Studies, Construction Management and Quantity Surveying of the University, of not less than five years standing.
  - (b) holders of Masters degrees in City and Regional Planning or City Planning and Urban Design of the University, of not less than five years standing.
  - (c) holders of equivalent degrees from other universities recognised by the Senate for the purpose, of not less than five years standing, provided a close and ongoing association with this University can be demonstrated.

### **Application for Admission**

- FDA2.1 Before a person may be registered as a candidate for the Degree he or she must submit a provisional application for admission, in confidence, to the Dean. The provisional

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application shall be accompanied by a *curriculum vitae*, six copies of the work to be submitted for the degree and also six copies of a brief summary of its contents and a statement as to how the work contributes to learning. A person submitting a provisional application shall also submit a written statement affirming

- that the work submitted is the original work of the applicant as sole author, and/or indicating the extent to which joint work is the original work of the applicant;
- that the work submitted has not been accepted for a degree at this or any other university.

FDA2.2 Senate may decide, having received the advice of a Committee of Assessors appointed for the purpose, either to accept or to refuse the application. If accepted, the Dean shall invite the applicant to formally apply and register as a candidate and examination of the work will proceed. If refused, the Dean shall inform the candidate in confidence and return the submitted material.

### Requirements for the Award of the Degree

FDA3.1 The work submitted shall comprise documentation of built and/or published work which shall constitute a substantial, original and important contribution to learning in the field of either architecture, planning, urban design or construction economics and management. A candidates may, in addition, submit any supporting collateral evidence. The work must be satisfactory in arrangement and expression.

FDA3.2 No work will be accepted which has been accepted by another university for the purpose of obtaining a degree.

FDA3.3 If, at the date of its presentation, any portion of the work submitted has not been published, or is not being published, in a manner satisfactory to the University, the candidate must grant the University in writing a free licence to reproduce the work in whole or in part for the purpose of research. The University may be prepared to waive the right so granted if the candidate subsequently makes arrangements for publication in a manner satisfactory to the University.

FDA3.4 The examination shall consist primarily of an assessment of the published work submitted by the candidate, but a candidate shall, if required by Senate, attend for written or oral examination on the subject of the work presented, and on any work undertaken under supervision.

## Doctor of Science in Engineering

Note: Details of the preliminary screening, registration and examination procedures are obtainable on request from the Faculty Manager (Academic).

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

The Degree of Doctor of Science in Engineering is a senior doctorate and is awarded for substantial and original contributions to knowledge in one or more fields of Engineering or Geomatics. Such contributions will normally be the result of work carried out and published over a period of years, and will normally be such as to have established the candidate's position as an authority in the field on the subject of the research project

### Admission

FDC1 The degree of Doctor of Science in Engineering may be conferred upon:

- (a) bachelors of science in engineering or geomatics of the University of not less than



- four years standing; and
- (b) graduates in engineering or geomatics of any other university recognised by Senate for the purpose of not less than five years standing.

### **Application for Admission**

- FDC2.1 Before a person may be registered as a candidate for the degree he/she must submit a provisional application for admission, in confidence, to the Dean. The provisional application shall be accompanied by a *curriculum vitae*, six copies of the work to be submitted for the degree, and a detailed synopsis of the contents of the work including a statement as to how the work contributes to learning. A person applying for admission shall also submit written statements affirming
- (i) that the work submitted is the original work of the applicant as sole author, and/or indicating the extent to which joint work is the original work of the applicant;
  - (ii) that the work submitted has not been accepted for a degree at this or any other university.
- FDC2.2 Senate may decide, having received the advice of a Committee of Assessors appointed for the purpose, either to accept or to refuse the application. If accepted, the Dean shall invite the applicant to formally apply and register as a candidate. If refused, the Dean shall inform the candidate in confidence and return the submitted material.

### **Requirements for the Award of the Degree**

- FDC3.1 The work submitted shall comprise published papers or other documents which shall constitute a substantial, original and important contribution to learning in one or more fields of engineering or geomatics. A candidate may submit other published and unpublished work as collateral testimony of fitness for the degree.
- FDC3.2 No work will be accepted which has been accepted by another university for the purpose of obtaining a degree.
- FDC3.3 The examination shall consist primarily of an assessment of the published work submitted by the candidate, but a candidate shall, if required by Senate, attend for written or oral examination on the subject of the work presented, and on any work undertaken under supervision.

### **Doctor of Philosophy**

NOTE: The rules for the degree of Doctor of Philosophy (PhD) are published in Handbook No.3 **General Rules and Policy**. Prospective candidates should consult the Head of the Department in which they propose to study/carry out their research, before making formal application. PhD candidates are asked to note that there is a limitation of 80 000 words for PhD theses. The special approval of the Dean is required if this limit is to be exceeded. Applications to exceed the limit must be addressed to the Dean and must have the endorsement of the supervisor and the Head of Department concerned.

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# DEPARTMENTS IN THE FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT:

## PROGRAMMES AND DEPARTMENTAL INFORMATION

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### ARCHITECTURE, PLANNING AND GEOMATICS

The School offers the following Degree Programmes:

**Bachelor of Architectural Studies**

**Bachelor of Science (Geomatics)**

#### Post Graduate Programmes in

Architecture

Landscape Architecture

City and Regional Planning

City Planning and Urban Design

Geomatics

Geographical Information Systems

Transport Studies (jointly with the Department of Civil Engineering)

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

### Staff

#### Professor and Director:

L le Grange, BArch *Cape Town* MArch(UD) *Rice* MIArch CIA

#### Professors:

D Dewar, BA(Hons) MURP PhD *Cape Town* TRP(SA) MSAPI BP Chair of Urban and Regional Planning

I Low, BArch *Cape Town* MArch(Urban Design)*Penn* PrArch MIArch CIA

J Noero, BArch *Natal* MPhil (Architecture) *Newcastle-Upon-Tyne* Hon DSc *Brighton* MIArch

H R  ther, Dipl-Ing Bonn PhD *Cape Town* PrS(SA) FRSSAf FSAAE

V Watson, BA(Hons) *Natal* MCRP *Cape Town* AA Dip *London* PhD *Witwatersrand* MSAPI SACP

#### Emeritus Professor:

F Todeschini, BArch *Cape Town* MCP MArch (Urban Design) *Penn* MIA MUDISA ArchSA

#### Associate Professors:

CL Merry, BSc(Surv) *Cape Town* PhD *New Brunswick*

PB Wilkinson, BSc(Eng) *Natal* MCRP *Cape Town*

#### Senior Lecturers/Studiomasters:

F Carter, BArch *Cape Town* PrArch, MIArch CIA

N Coetzer, BArch *Natal* MArch *Denver* PhD *London*

PF de Beer, BArch *Pret* MArch *Pratt Inst New York*

T Klitzner, BArch *Cape Town* MLA *Penn*

F Saidi, BArch *Copperbelt* MLD *Newcastle upon Tyne* PhD *Pretoria*

G Sithole, BSc Surveying(Hons) *Zim* MSc IGP *ITC(NL)* PhD *TU Delft(NL)* LSZ(*Zim*)  
 JL Smit, BSc(Surv) PhD *Cape Town*  
 A Steenkamp, MArch *Pretoria* PrArch  
 J Theron, BArch MCPUD *Cape Town*  
 JF Whittal, BSc(Surv) MSc(Eng) *Cape Town*, PrL(SA) MIPLS (*West Cape*)

**Lecturers:**

F Isaacs, BArch *Cape Town* MIP *Stuttgart*  
 S Spamer, BArch *Cape Town* MIA Arch SA  
 T Katzschner, BSocSci MCRP *Cape Town*

**Part Time Lecturers:**

CJ Cooke, BADipTA *Witwatersrand* MIA Arch SA  
 R Cronwright, BA MC & RP MBA *Cape Town* TRP(SA) MSA/TRP  
 R Fisher BSc (Min Eng) *London* BSc(Surv) *Cape Town* MPhil *Cantab*  
 B Gasson, BA BSc MURP *Cape Town* MSAPI TRP(SA)  
 BJ Oberholzer, BArch *Cape Town* MLA *Penn* MILA(SA)  
 CLM Rommelaere, BSc(Surv) MSc(Eng) *Cape Town* PrL(SA) MIPLS (*West Cape*)

**Chief Technical Officer:**

Mr J Coetzee  
 Mr D Matthee, NHD (Mechanical Eng.), ND (Surveying)

**Technical Officer:**

Mr P Chifamba

**Photographic Technician:**

Mr P Kanye

**Administrative Assistant:**

Mrs JM Thompsett

**Senior Secretaries:**

Mrs J Meyer  
 Ms N Pickover

**Print Room Manager:**

Mr T Swarts

**Departmental Assistants:**

Mr W Melenephy

**Laboratory Attendant:**

Mr S Smith

## Undergraduate Programme

### Bachelor of Architectural Studies (BAS)

The BAS degree is a stand alone exit degree which also provides for entry into a professional architectural course or into postgraduate programmes in city and regional planning, urban design or landscape architecture. Streaming into other career possibilities, such as construction and property economics provided for in other departments, is also possible. The assessment criteria for this BAS degree and the entry requirements for the BArch degree differ in as much as the BAS degree is an

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exit degree with a professional qualification and the BArch degree 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 BArch degree. Application to the BArch is through a portfolio. However, a limited number of places in the BArch degree will be guaranteed for BAS graduates with a credit weighted average of 70% and above in the following courses: APG3000F, APG3001S, APG3023W and APG3024W. The degree has stature in its own right for entry into the job market in architectural or 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 technologist.

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 R2000 worth of drawing equipment and materials in the first year. Students in upper years should budget for approximately R2500 per year for plan prints, photocopying, graphic and other materials.

### Programme Convenor:

To be announced

### First Year

#### Core Courses

Number	Course	Credits
APG1003W	Technology 1 (major course).....	24
APG1004F	History and Theory of Architecture 1 .....	8
APG1005S	History and Theory of Architecture 2 .....	8
APG1009S	Theory of Structures 2 .....	4
APG1014S	Representation 2 .....	4
APG1017F	Academic Development Class .....	0
APG1018S	Academic Development Class .....	0
APG1019W	Environment and Services 1 .....	8
APG1020W	Design and Theory Studio 1 (major course).....	76
APG1021W	Representation 1 .....	12

### Second Year

#### Core Courses

Number	Course	Credits
APG2000F	History and Theory of Architecture 3 .....	8
APG2003S	History & Theory of Architecture 4.....	8
APG2009F	Theory of Structures 3 .....	4
APG2011S	Theory of Structures 4 .....	4
APG2021W	Technology 2 (major course).....	24
APG2022W	Design and Theory Studio 2 (major course).....	72
APG2023F	Management Practice Law 1 .....	4
APG2024S	Management Practice Law 2.....	4
APG2025W	Representation 3 .....	8

<b>APG2028W</b>	Environment and Services 2 .....	8
<b>APG2027X</b>	Work Experience .....	0

### Third Year

#### Core Courses

Number	Course	Credits
<b>APG3000F</b>	History and Theory of Architecture 5 .....	8
<b>APG3001S</b>	History and Theory of Architecture 6 .....	8
<b>APG3008F</b>	Theory of Structures 5 .....	4
<b>APG3010S</b>	Theory of Structures 6 .....	4
<b>APG3023W</b>	Technology 3 (major course) .....	24
<b>APG3024W</b>	Design and Theory Studio 3 (major course) .....	84
<b>APG3026F</b>	Management Practice Law 3 .....	4
<b>APG3028X</b>	Independent Research .....	0
<b>APG3029W</b>	Environment and Services 3 .....	8

#### Notes

- (i) *Core courses are sequential.*
- (ii) *The Theory of Structures courses (APG1009S, APG2009F, APG2011S, APG3008F, APG3010S) are sequential.*
- (iii) *The CAD courses Representation 2 and 3 (APG1014S and APG2025W) are sequential.*
- (iv) *Mandatory Fieldwork: APG1003W Technology 1, APG2021W Technology 2, APG1020W Design and Theory Studio 1, APG2022W Design and Theory Studio 2 and APG3024W Design and Theory Studio 3, have a mandatory fieldwork component,*
- (v) *Non-core courses in a year may not lag behind core courses of the next year by more than twelve months.*

## Bachelor of Science (Geomatics)

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, Geoinformatics or Planning. The Surveying stream is targeted at students wishing to register as a Professional Practitioner with the South African Professional and Technical Surveyors organisation (PLATO); the Geoinformatics stream is targeted at students wishing to work in the spatial information industry and for registration as a Professional Geoinformatic Practitioner with PLATO; the Planning stream enables students to obtain both a Masters degree in Planning (MCRP) and a BSc(Geomatics) degree in five years and is targeted at students wishing to work register as a Professional Planner.

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 practise in the African and developing world context as well as in the developed world, while maintaining international standards of teaching and research.

**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 gyro-theodolites are

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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. A Geographic Information System (GIS) laboratory consisting of twenty workstations and a workstation using ARC/GIS, IDRISI and ERDAS software is available providing a GIS and Remote Sensing facility. A range of microcomputers equipped with peripherals such as an AO digitiser tablet and plotters are also available and computing facilities are connected to the campus network.

**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:** A laboratory is available for practical work in photogrammetry and remote sensing. Digital cameras, image processing equipment, a workstation and a number of dedicated computers as well as in-house software form the basis of digital photogrammetric and remote sensing research. One of the worlds leading digital photogrammetric workstations, the ZI Imaging Image-Z Station is the principal component of the digital mapping facility. A dedicated ERDAS workstation is available for teaching and research in Remote Sensing.

**Streams in Geomatics:** There are three streams in the Geomatics programme, and streaming only takes place at the start of year three. However, 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 geology, environmental and geographical science or computer science to third year level prior to registration as these options may affect your courses in first and second year.

**First and Second Years:** During the first two years students may take any courses they choose to make up a full year's workload (approx. 144 credits), subject to the approval of the Programme Convenor and the constraints of the time-table, and with the proviso that the following courses, or their equivalents, must be completed before entry to the third year of study.

### **BSc (Geomatics) : Surveying Stream**

**Professor:**

H R ther, Dipl-Ing Bonn PhD *Cape Town* PrS(SA) FRSSAf FSAAE

**Programme Convenor:**

JL Smit, BSc(Surv) PhD *Cape Town*

**First Year Core Courses**

Number	Course	Credits
<b>APG1016S</b>	Geomatics I .....	18
<b>CSC1015F</b>	Computer Science 1A (recommended only for those with prior computing or experience) .....	18
<i>or</i>		
<b>APG1015F</b>	Programming for Geomatics .....	18
<b>ERT1000F</b>	Introduction to Earth and Environmental Sciences .....	18
<b>MAM1000W</b>	Mathematics I .....	36
<b>PHY1031F</b>	Physics of Natural Systems 1 .....	18
<b>PHY1032S</b>	Physics of Natural Systems 2.....	18

Elective .....	18
Total credits .....	144

**OR**

<b>APG1016S</b> Geomatics I .....	18
<b>CSC1015F</b> Computer Science 1A (recommended only for those with prior computing or experience) .....	18

*or*

<b>APG1015F</b> Programming for Geomatics .....	18
<b>ERT1000F</b> Introduction to Earth and Environmental Sciences .....	18
<b>MAM1003W</b> Mathematics I .....	32
<b>PHY1010W</b> Physics 110 .....	32
Elective .....	26
Total credits .....	144

**Second Year Core Courses**

Number	Course	Credits
<b>APG2014S</b>	Geomatics II .....	24
<b>APG2015F</b>	Geographic Information Systems I .....	24
<b>APG2016W</b>	Surveying I .....	24
<b>APG2017X</b>	Basic Survey Camp .....	4
<b>APG2018X</b>	Geographic Information Systems Camp .....	4
<b>CHE3062S</b>	Professional Communication Studies .....	8
<b>MAM2080W</b>	Mathematics 280 .....	32
	Elective .....	24
<b>APG2019X</b>	Practical Training I	
	Total credits .....	144

**Third Year Core Courses**

Number	Course	Credits
<b>APG3011F</b>	Geographic Information Systems II .....	24
<b>APG3012S</b>	Geomatics III .....	24
<b>APG3013F</b>	Numerical Methods in Geomatics .....	16
<b>APG3014X</b>	Control Survey Camp .....	4
<b>APG3016C</b>	Surveying II .....	12
<b>APG3017D</b>	Surveying III .....	12
<b>APG3021W</b>	Land and Cadastral Survey Law .....	24
<b>APG3027Z</b>	Cadastral Survey and Registration Projects .....	14
	Elective .....	14
<b>APG3015X</b>	Practical Training I	
	Total credits .....	144

**Fourth Year Core Courses**

Number	Course	Credits
<b>APG4001S</b>	Geodesy. ....	24
<b>APG4002Z</b>	Land Use Planning and Township Design .....	16
<b>APG4003Z</b>	Geomatics Project .....	40
<b>APG4004A</b>	Remote Sensing .....	12
<b>APG4005B</b>	Engineering Surveying and Adjustment .....	12
<b>APG4006S</b>	Geomatics Practice and Land Management .....	12
<b>MEC4042Z</b>	Industrial Management .....	8
	Elective .....	20
	Total credits .....	144

**BSc (Geomatics) : Planning Stream****Professor:**H R ther, Dipl-Ing Bonn PhD *Cape Town* PrS(SA) FRSSAf FSAAE**Programme Convenor:**JL Smit, BSc(Surv) PhD *Cape Town*

First, Second and Third Year Core Courses are as in the Surveying Stream

**Fourth Year Core Courses**

Number	Course	Credits
APG4003Z*	Geomatics Project .....	40
APG4004A	Remote Sensing .....	12
APG4020F	Planning Theory and Practice .....	8
APG4021F	Urban Systems .....	12
APG4022F	Planning Project A .....	12
APG4023S	Urban Development Processes .....	12
APG4024S	Planning and Governmental Systems .....	12
APG4025S	Regulatory and Legal Framework .....	12
APG4028F	Aspects of City Design .....	12
	Options .....	2
APG4029F	Natural Systems .....	12
	Total credits .....	144

\*APG4003Z *to be co-supervised by Geomatics and Planning academic staff*

APG4025S may be substituted by additional options by those students not continuing with the Fifth Year, i.e. exiting with the BSc(Geomatics) in Planning only.

**Fifth Year Core Courses**

Number	Course	Credits
	Fifth Year MCRP Core Courses .....	160

**BSc (Geomatics) : Geoinformatics Stream****Professor:**H R ther, Dipl-Ing Bonn PhD *Cape Town* PrS(SA) FRSSAf FSAAE**Programme Convenor:**JL Smit, BSc(Surv) PhD *Cape Town*

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements. Students must choose a core elective option, which must be approved by the Programme Convenor.

**First Year Core Courses**

Number	Course	Credits
APG1016S	Geomatics I .....	18
CSC1015F	Computer Science 1A .....	18
<i>or</i>	(Recommended only for those with prior computing exposure or those who are likely to choose to complete a computer science major)	
APG1015F	Programming for Geomatics .....	18
ERT1000F	Introduction to Earth and Environmental Sciences .....	18



<b>MAM1000W</b>	Mathematics I .....	36
<b>PHY1031F</b>	Physics of Natural Systems 1 .....	18
<b>PHY1032S</b>	Physics of Natural Systems 2 .....	18
	Elective Core (e.g. 2nd Semester Computer Science, 1st year EGS or Geology) ..	18
	Total credits .....	144

*OR*

<b>APG1016S</b>	Geomatics I .....	18
<b>CSC1015F</b>	Computer Science 1A.....	18
	(Recommended only for those with prior computing exposure or those who are likely to choose to complete a computer science major)	

*OR*

<b>APG1015F</b>	Programming for Geomatics.....	18
<b>ERT1000F</b>	Introduction to Earth and Environmental Sciences .....	18
<b>MAM1003W</b>	Mathematics I .....	32
<b>PHY1010W</b>	Physics 110.....	32
	Elective Core (e.g. 2nd Semester Computer Science, 1st year EGS or Geology) ..	18
	Elective.....	8
	Total credits .....	144

### Second Year Core Courses

Number	Course	Credits
<b>APG2014S</b>	Geomatics II .....	24
<b>APG2015F</b>	Geographic Information Systems I .....	24
<b>APG2016W</b>	Surveying I .....	24
<b>APG2017X</b>	Basic Survey Camp .....	4
<b>APG2018X</b>	Geographic Information Systems Camp .....	4
<b>CHE3062S</b>	Professional Communication Studies .....	8
<b>MAM2080W</b>	Mathematics 280 .....	32
	Elective Core Geology specialisation CEM1000W .....	48
	Elective Core EGS or CSC specialisation 2nd Year CSC or EGS Course .....	24
<b>APG2019X</b>	Practical Training I .....	
	Total credits Geology specialisation .....	168
	Total credits EGS and CSC specialisation .....	144

### Third Year Core Courses

Number	Course	Credits
<b>APG3011F</b>	Geographic Information Systems II .....	24
<b>APG3012S</b>	Geomatics III .....	24
<b>APG3013F</b>	Numerical Methods in Geomatics .....	16
<b>APG3016C</b>	Surveying II .....	12
<b>APG3018W</b>	Land Law and Land Tenure Systems .....	16
<b>APG3020X</b>	Spatial Data Analysis Project .....	4
<b>APG3027Z</b>	Cadastral Survey and Registration Projects .....	14
	Elective core 2nd Year Computer Science or EGS .....	24
	Elective 2nd Year Computer Science or EGS .....	10
	Elective Geology .....	48
	Total credits Geology specialisation .....	168
	Total credits EGS and CSC specialisation .....	144
<b>APG3015X</b>	Practical Training II	

### Fourth Year Core Courses

Number	Course	Credits
<b>APG4002Z</b>	Land Use Planning and Township Design .....	16
<b>APG4003Z</b>	Geomatics Project .....	40

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<b>APG4004A</b>	Remote Sensing .....	12
<b>APG4006S</b>	Geomatics Practice and Land Management .....	12
<b>MEC4042Z</b>	Industrial Management .....	8
	Elective Core (e.g. 3rd Year Computer Science, EGS or Geology) .....	72
	Total credits .....	160

### Elective Courses

Students must take a sufficient number of elective courses which, together with the core and elective core courses, will comprise a total of not less than 576 credits.

A list of recommended electives is given below. It should be noted that timetable clashes might prevent the student from taking some of these courses, and that some of them have prerequisites not listed here.

Number	Course	Credits
<b>CSC1015F</b>	Computer Science IA .....	18
<b>CSC1016S</b>	Computer Science IB .....	18
<b>CSC2001F</b>	Computer Science 2A .....	24
<b>CSC2002S</b>	Computer Science 2B .....	24
<b>EGS1002S</b>	Human Geography .....	18
<b>GEO1006S</b>	Introduction to Minerals, Rocks and Structure .....	18
<b>MEC1002W</b>	Engineering Drawing .....	16
<b>SEA2000F</b>	Descriptive Physical Oceanography .....	24

### Curriculum for Technikon/University of Technology Transferees to the BSc (Geomatics) Programme

- Transferees must hold a Technikon/University of Technology National Diploma in Surveying and must have obtained:
  - An average of at least 70% in all prescribed final year University of Technology subjects.
  - A minimum of 75% for Mathematics II at the University of Technology.
  - A minimum of 70% for Physics I at the University of Technology.
- Students who satisfy the criteria listed above may be granted 144 credits (for the first year) and may be exempted from the courses: APG1016S, APG2016W, APG2017X, APG2019X, CHE3062S, MAM1003W, PHY1010W.
- Such students will be required to take the following courses (or their equivalents) in their first year of registration:

Number	Course	Credits
<b>APG2014S</b>	Geomatics II .....	24
<b>CSC1015F</b>	Computer Science .....	18
<i>or</i>		
<b>APG1015F</b>	Programming for Geomatics.....	18
<b>ERT1000F</b>	Introduction to Earth and Environmental Sciences .....	18
<b>MAM2080W</b>	Mathematics 280 .....	24

Plus at least **60 credits** of elective courses

- After completing the above courses, students will be required to complete the prescribed Third and Fourth years of study.
- 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.

## Postgraduate Programmes

### Honours in Geographical Information Systems

The curriculum of the BSc (Hons) in Geographic Information Systems programme is aimed at graduates intending to work in disciplines associated with the natural, geographical and computer sciences. The degree is intended to equip graduates with the practical skills and theoretical knowledge they need to incorporate GIS techniques in their every day work routine.

A candidate shall complete approved courses of a value required to bring the total to a minimum of 144 credits and shall comply with all the prescribed curriculum requirements.

#### Programme Convener:

JL Smit, BSc(Surv) PhD *Cape Town*

#### Core Courses

Number	Course	Credits
APG2026F	Elementary Surveying .....	16
APG4003Z	Geomatics Project.....	40
APG4004A	Remote Sensing.....	12
APG4006S	Geomatics Practice and Land Management.....	12
APG4007F	Introductory GIS.....	24
APG4008S	Advanced GIS .....	24
APG4009F	Programming for GIS.....	18
	Total credits.....	146

### Bachelor of Architecture (BArch)

NOTE: This degree is being phased out. There will be no new first year intake from 2007. The degrees of BAS(Hons) and MArch(Professional) will be introduced from 2008 and 2009 respectively, subject to ministerial approval.

The Bachelor of Architecture (BArch), consisting of three years, is a postgraduate degree which enables professional registration. The first year of this degree is a year of practical experience, comprising work in an architect's office and study travel. As in the BAS Programme the School's teaching/learning system is firmly based on the Studio. The School's objective is to develop in students the capacity to tackle problems imaginatively, to think rationally and to use self-initiative appropriately within the discipline of Architecture in the South African context. Lecture presentations are the other major means of communication with students. However, seminars and discussion groups are also used in the BArch programme.

This curriculum must be read together with the BArch rules in the General Information Section of this Handbook.

#### Professor and Programme Convener:

J Noero, BArch *Natal* MPhil (Architecture) *Newcastle-Upon-Tyne* Hon DSc *Brighton* MIArch

#### First Year (Semesters ARCH1 and 2)

Number Course

- APG4000Z External Experience (DP Course) consisting of:
- External Experience, being an approved combination of evidence of office work, field work, study travel or building work (confirmation from employer/s and time sheets required);
  - Research Assignment (work/travel report and photographic essay).

## External Experience Requirements

Except with permission of the Senate, a student who has completed the BAS degree, or equivalent recognized by Senate, on acceptance into the BArch programme, must register for the External Experience APG4000Z course as a BArch student for a minimum of twelve calendar months.

With the permission of the Director of the School, a student who has completed Design and Theory Studio 3, but who is carrying any BAS non-core course/s, may register concurrently for APG4000Z as an occasional student until such time that he or she completes the BAS Degree.

The twelve calendar months of External Experience must be taken as follows (except with the permission of Senate):

At least six months in an architectural office. A period of at least three months of this experience must be in the office of the same architect and no period of less than four weeks in any one office will be recognised for this purpose. The balance may be taken up as follows:

A period of up to six months, but not less than six weeks, may be spent in study travel, approved by Senate before departure; and/or

A period of up to four months on practical building work, approved by the Senate before the work is undertaken.

*Note: A guideline document on the external experience requirements is available from the School of Architecture, Planning and Geomatics.*

Submission of Work Report and Photographic Essay

At the conclusion of the External Experience period, each student must submit a full and acceptable report of experience gained. This is to be handed in by 31 January of the year following external experience. A student must submit, by 30 November the year of external experience, the completed photographic essay, for which the topic must be approved.

*Credit and Exemption from Semester ARCH1 & 2*

With permission of the Senate, a student may be exempted from, and granted credit for, Semester ARCH1 & 2 provided that the experience complies with the requirements set out above.

## Second Year

### Semester ARCH3

#### Studiowork Course

Number	Course	Credits
APG5002F	Studiowork ARCH3.....	48

#### Non-Studio Courses

The following courses are compulsory:

Number	Course	Credits
APG5005F	History and Theory of Architecture .....	12
APG5036F	Professional Practice.....	12
APG5037F	Practice Management.....	12

### Semester ARCH4

#### Studiowork Course

Number	Course	Credits
APG5003S	Studiowork ARCH4.....	48

#### Non-Studio Courses

Select three x 12-credit electives for the Second Semester from the following: (see note below)

Number	Course	Credits
APG4032S	Landscape Design.....	12
APG4034S	Terrain Analysis .....	12
APG5011S	Aspects of History and Theory 511 .....	12
APG5012S	Aspects of History and Theory 512 .....	12
APG5013S	Aspects of History and Theory 513 .....	12

<b>APG5016S</b>	Advanced Construction (Structures).....	12
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**Third Year****Semester ARCH5****Studiowork Course**

Number	Course	Credits
<b>APG6001F</b>	Studiowork ARCH5 .....	48

*Select three x 12-credit electives for the First Semester from the following: (see note below)\**

Number	Course	Credits
<b>APG4021F*</b>	Urban Systems.....	12
<b>APG4028F</b>	Aspects of City Design .....	12
<b>APG4029F*</b>	Natural Systems 1 .....	12
<b>APG4030F</b>	History and Theory of Landscape Architecture A .....	12
<b>APG4035F*</b>	Planning Techniques 1.....	12
<b>APG5006F</b>	Advanced Construction (Research) .....	12
<b>APG5008F</b>	Aspects of History and Theory 508 .....	12
<b>APG5009F</b>	Aspects of History and Theory 509 .....	12
<b>APG5010F</b>	Aspects of History and Theory 510 .....	12
<b>APG5014F*</b>	Introduction to Urban Design Theory .....	12
<b>APG5025F</b>	History and Theory of Landscape Architecture B.....	12

\* Prerequisites and numbers might be determined by relevant programme convenor.

Note: Students are required to complete three History/Theory courses, one Technology course and one course from Urban Design/Planning/Landscape.

**Semester ARCH6****Studiowork Course**

Number	Course	Credits
<b>APG6002S</b>	Studiowork ARCH6 .....	76

**Master of Architecture****Associate Professor and Programme Convenor:**

I Low, BArch *Cape Town* MArch(Urban Design)*Penn* MIA Arch SA

The Master of Architecture degree may be awarded to a candidate who shall present a dissertation incorporating any or all of the following:

- a research project of a theoretical or practical nature;
- a critical review of a specified topic based upon a comprehensive search of literature or available data;
- design of all or part of an architectural project or group of projects to a specification involving advanced concepts and theoretical principles;
- design of all or part of an architectural project or group of projects to a specification involving advanced concepts and theoretical principles;
- any other study acceptable to the Faculty of Engineering and the Built Environment.

**Master of City and Regional Planning and  
Master of City Planning and Urban Design**

The MCPUD and MCRP degree Programmes consist of either two years of full-time study or a three year extended programme. The extended programme is not 'part-time' in the usual meaning of the term. Rather, it enables candidates to undertake the first year of study over two years, by attending

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theory only in the first year and studiowork only in the second year. The material covered in the two year full-time and the three year extended programme is precisely the same. It is also possible for Architecture graduates to qualify after three semesters of full time study, provided that certain prerequisite theory course elements and studiowork projects have been successfully completed in semesters Arch3, Arch4 and Arch5. The curricula for both programmes comprise courses in theory and project work. However, because a great deal of both project and theory work is self- or group initiated, and is innovative in form, more than half of the content of the MCRP and MCPUD degree programmes can be described as research related.

Projects are selected for both academic utility and professional relevance and are carried out by students under staff supervision. The studio is a vehicle for exploration into development and planning in real situations. The programmes require considerable field work in the Cape Town area and in some cases field trips to other parts of the country are arranged. Each project culminates in the submission of a document and the oral presentation of project work. Assessment is based on project products. Theory courses are concerned with procedural and substantive theory. Planning skills are imparted and honed throughout the duration of the programmes.

In part of the third and all of the fourth semester, MCRP and MCPUD students undertake a dissertation. This may, under certain conditions specified in the year guide, allow students to undertake a topic incorporating both the relevant theory and project work, of their own choice. In these cases, the dissertation allows students the opportunity to undertake an assignment which incorporates their particular interests and concerns. However, the School reserves the right to replace this option with a topic selected by staff members, if this is considered to be in the best interests of the student. The dissertation is normally undertaken individually. In special cases, a group submission comprising no more than two students may, at the discretion of staff, be allowed.

### Master of City and Regional Planning

#### Professor and Programme Convenor:

D Dewar, BA(Hons) MURP PhD *Cape Town* TRP(SA) MSAPI BP Chair of Urban and Regional Planning

This curriculum must be read together with the Degree Rules in the General Information section of this Handbook. Candidates for the MCRP degree are required to complete the core courses listed below, totalling 168 credits in the first year and 180 credits in the second year.

#### First Year: first semester

Number	Course	Credits
APG4020F	Planning Theory and Practice .....	8
APG4021F	Urban Systems .....	12
APG4022F	Planning Project A .....	32
APG4028F	Aspects of City Design .....	12
APG4029F	Natural Systems .....	12
APG4035F	Planning Techniques 1 .....	12

#### First Year: second semester

Number	Course	Credits
APG4023S	Urban Development Processes .....	12
APG4024S	Planning and Governmental Systems .....	12
APG4025S	Regulatory and Legal Framework .....	12
APG4026S	Planning Project B .....	32
APG4038S	Planning Techniques 2 .....	4
STA5083Z	Introduction to Statistical Methods for Planners .....	8

#### Second Year: first semester

Number	Course	Credits
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<b>APG5020F</b>	Regional Planning Project .....	32
<b>APG5023F</b>	Regional Planning Theory .....	20
<b>APG5024F</b>	Planning Techniques 3 .....	8

**Second Year: second semester**

Number	Course	Credits
<b>APG5051Z</b>	MCRP Dissertation .....	120

**Master of City Planning and Urban Design****Programme Convenor:**

J Theron, BArch MCPUD *Cape Town*

This curriculum must be read together with the Degree Rules in the General Information section of this Handbook. Each student must complete all of the courses. (The curriculum may be taken over a period of three years by candidates in part-time employment.)

**First Year: first semester**

Number	Course	Credits
<b>APG4020F</b>	Planning Theory and Practice .....	8
<b>APG4021F</b>	Urban Systems .....	12
<b>APG4022F</b>	Planning Project A .....	32
<b>APG4028F</b>	Aspects of City Design .....	12
<b>APG4029F</b>	Natural Systems .....	12
<b>APG4035F</b>	Planning Techniques 1 .....	12

**First Year: second semester**

Number	Course	Credits
<b>APG4023S</b>	Urban Development Processes .....	12
<b>APG4024S</b>	Planning and Governmental Systems .....	12
<b>APG4025S</b>	Regulatory and Legal Framework .....	12
<b>APG4026S</b>	Planning Project B .....	32
<b>APG4038S</b>	Planning Techniques 2 .....	4
<b>STA5083Z</b>	Introduction to Statistical Methods for Planners .....	8

**Second Year: first semester**

Number	Course	Credits
<b>APG5024F</b>	Planning Techniques 3 .....	8
<b>APG5055F</b>	Urban Design Projects .....	35
<b>APG5056F</b>	Urban Design Theory .....	25

**Second Year: second semester**

Number	Course	Credits
<b>APG5050Z</b>	MCPUD Dissertation.....	120

**Master of Landscape Architecture Conversion Course**

**Purpose of the Conversion Course:** The conversion course is a 1-year preparation course for those students who are qualified to enter the MLA degree programme but who have a non-design background such as the environmental sciences, horticulture etc. including mature students with work experience in the landscape field.

The main focus of the conversion year is on design studio and on graphics, with additional courses on theory and technical aspects from the Bachelor of Architectural Studies (BAS) Programme. On satisfactory completion of the Conversion Course, students would enter the remaining 2-year full-

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time MLA Programme, or 3-year part-time programme.

Number	Course	Credits
APG1003W	Technology 1 (Examination) .....	24
APG1004F	History and Theory of Architecture 1 .....	8
APG1005S	History and Theory of Architecture 2 .....	8
APG1014S	Representation 2 .....	4
APG1019W	Environment and Services 1 .....	8
APG1021W	Representation 1 .....	12
APG2023F	Management Practice Law 1 .....	4
APG2024S	Management Practice Law 2 .....	4
APG3004W	Conversion Studio .....	68

### Master of Landscape Architecture

#### Programme Convenor:

F Saidi, BArch *Copperbelt MLD Newcastle upon Tyne PhD Pretoria*

#### Studiowork Courses

Studiowork, the central activity of the degree programme, requires students to exercise considerable initiative and undertake research, and consumes up to two-thirds of the students time allocation to the Programme. Projects are selected for both academic and professional relevance and will start at the smaller scale and work steadily towards the comprehension of larger and larger natural and urban systems. Fieldwork is an indispensable component of each project and involves trips into Metropolitan Cape Town and selected parts of the Western Cape region. Each project culminates in the submission of a document and an oral presentation. Assessment is based on a variety of project products and a Studiowork examination held at the end of each semester.

#### Lecture courses

Lecture courses focus on imparting values, knowledge, and skills of relevance to landscape architecture. Landscape skills and techniques are developed progressively throughout the duration of the study programme. Theory courses are accompanied by extensive reading lists and students are expected to undertake extensive structured reading. The courses are assessed through term papers, practicals, seminars and other forms of examination.

This curriculum must be read together with the Degree Rules in the General Information section of this Handbook. Each student must complete all of the courses.

#### First Year: first semester

Number	Course	Credits
APG4028F	Aspects of City Design .....	12
APG4029F	Natural Systems .....	12
APG4030F	History and Theory of Landscape Architecture A .....	12
APG4031F	Landscape Techniques 1 .....	12
APG4036F	Local Area Landscape Architecture Project .....	32

#### First Year: second semester

Number	Course	Credits
APG4025S	Regulatory and Legal Framework .....	12
APG4032S	Landscape Design .....	12
APG4033S	Landscape Techniques 2 .....	8
APG4034S	Terrain Analysis .....	12
APG4037S	Metro Landscape Project .....	36

#### Second Year: first semester



Number	Course	Credits
APG5025F	History and Theory of Landscape Architecture B .....	12
APG5026F	Landscape Construction .....	12
APG5029F	Landscape Architecture Project .....	36
APG5036F	Professional Practice.....	12
APG5053F	Plants and Design .....	12

**Second Year: second semester**

Number	Course	Credits
APG5052S	MLA Dissertation .....	100

**Master of Engineering in Transport Studies****Master of Philosophy in Transport Studies****Postgraduate Diploma in Transport Studies**

Offered jointly with the Department of Civil Engineering.

**Programme Convenor:**

R Behrens, BA MCRP PhD *Cape Town* TRP (SA) MSAPI

The primary aim of the Postgraduate Diploma, MEng and MPhil in Transport Studies is to produce diplomates and graduates with the necessary knowledge and skills to engage effectively with the challenge of creating affordable, efficient, sustainable, safe, equitable and environmentally sound urban transport systems. The emphasis of the Programme is on developing competence in the field of urban transport planning as it adapts to meet the requirements of new and demanding policy directives both locally and internationally. The content of the Programme curriculum is cross-disciplinary in orientation and exposes students to a broad range of the analytical, evaluative, planning and management issues they are likely to encounter in the field. A candidate for the Postgraduate Diploma in Transport Studies is required to complete core courses totalling not less than 80 credits plus an elective course or courses totalling a minimum of 40 credits, and to comply with the prescribed curriculum. A candidate for the MEng in Transport Studies is required to complete core courses totalling 180 credits (including a 60 credit Research project) and to comply with the prescribed curriculum. A candidate for the MPhil in Transport Studies is required to complete core courses totalling 140 credits (including a 60 credit Research project) plus elective courses totalling a minimum of 40 credits, and to comply with the prescribed curriculum.

**Core Courses**

Number	Course	Credits
CIV5017Z	Research Project (for MEng candidates only).....	60
END5035Z	Management of Transport Supply and Demand .....	20
END5036Z	Local Area Transport Planning, Management and Design .....	20
END5037Z	Research Project (for MPhil candidates only) .....	60
END5038Z	Integrated Land Use-Transport Planning .....	20
END5045Z	Public Transport Planning and Economics (for MEng candidates only) .....	20
END5047Z	Transport Demand Analysis and Project Assessment .....	20
END5048Z	Transport Modeling (for MEng candidates only).....	20

**Elective Courses (for MPhil candidates only)**

Number	Course	Credits
END5039Z	Non-motorised Transportation.....	20
END5045Z	Public Transport Planning and Economics .....	20
END5046Z	Rural Transport.....	20
END5048Z	Transport Modeling .....	20

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Subject to approval by the Programme Convenor, candidates for the Postgraduate Diploma and the MPhil are required to select an appropriate course or courses totalling a minimum of 40 credits as their elective. Candidates may nominate other courses offered at this or any other university for consideration in this regard.

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# CHEMICAL ENGINEERING

The Department offers the following Degree Programmes:

## **BSc(Eng) Programme in Chemical Engineering**

### **Postgraduate structured coursework in:**

Bioprocess Engineering  
Catalytic Process Engineering  
Hydrometallurgical Engineering

### **Research Entities:**

Bioprocess Research Unit  
Centre for Catalysis and DST-NRF Centre of Excellence  
Centre for Mineral Processing  
Precipitation and Crystallization Unit

The Department of Chemical Engineering is situated in the newly completed Chemical Engineering Building, which is at the Groote Schuur campus. Access to the Building is from South Lane, off Ring Road.

## **Staff**

### **Professor and Head of Department:**

E van Steen, MSc (Eng) *Eindhoven* PhD *Karlsruhe* FSAICHe

### **Professors:**

SG Burton, BSc (Hons) *Zimbabwe*, PhD *Rhodes*, SASBMB, IUBMB, ASM, SGB, AAAS (Director of Postgraduate Studies)  
JCQ Fletcher, BSc (Eng), PhD *Cape Town*, MSAICHe  
DMcK Fraser, BSc (Chem Eng) PhD *Cape Town* MSAICHe  
STL Harrison, BSc (Hons) *Cape Town* PhD *Cantab* MSAICHe SASM FSAAE  
AE Lewis, PrEng, BSc (Chem Eng) MSc (Eng) PhD *Cape Town*, MSAICHe  
CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAICHe FSAAE FRSSAf

### **Emeritus Professor:**

GS Hansford, BSc (Chem Eng) MSc *Cape Town* MSE PhD *Pennsylvania* CEng MIChemE FSAICHe FSAIMM

### **Associate Professors:**

DA Deglon BSc(Eng) *Witwatersrand* PhD *Cape Town* FSAIMM  
KP Möller, BSc (Eng), PhD *Cape Town* (Director of Undergraduate Studies)

### **Adjunct Professors:**

PG Gaylard, PrEng, BSc (Eng), *Witwatersrand*, FSAIMM, MSAICHe  
PJ Harris, BSc (Hons), PhD, *Witwatersrand*, MSACI

### **Honorary Professors:**

ME Dry, MSc *Rhodes* PhD *Bristol*  
J-P Franzidis, BSc (Chem Eng) MSc (Eng) *Cape Town*, PhD *Open*, MSAICHe FSAIMM  
JG Petrie, BSc(Eng) *Cape Town* MSc(Eng) *Houston* PhD *Cape Town* MSAICHe

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### **Honorary Associate Professors:**

DJ Bradshaw, BSc (Eng), PhD *Cape Town, MSAIMM*

M Claeys, Dipl.Ing (Chem Eng), DIng *Karlsruhe*

### **Senior Lecturers:**

JM Case, BSc(Hons) *Stell HDE Cape Town* MEd *Leeds* PhD *Monash*

A Chakraborty, BSc(Chem Eng) *Jadavpur* PhD *Illinois*

P Musonge, PhD *Imperial College* D.I.C. MCSE FSAICHe

R Rawatlal, BSc(Hons) PhD *KwaZulu-Natal*

HB von Blottnitz, BSc(Eng) *Cape Town* BSc(Hons) *Unisa*, MSc(Eng) *Cape Town*, Dr.-Ing. *RWTH Aachen*, MSAICHe, MESSA

### **Honorary Senior Lecturer:**

MC Harris, BSc (Eng), MSc (Eng) *Cape Town*

### **Principal Scientific Officer:**

Mr EW Randall, BSc *Cape Town*

### **Chief Technical Officers:**

Mr P Dobias

Mr HJ Macke

### **Administrative Staff:**

Ms D de Jager (Secretarial)

Ms N Dili (Receptionist)

Ms A Haddon (Academic)

Mrs Z Hartman (Financial)

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 80 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 centred on:

- Minerals processing research focused on the flotation of ores using various cell technologies
- Catalysis research aimed at the synthesis and characterisation of heterogeneous catalysts and their evaluation for a wide variety of reactions and reactor types
- Biological leaching of mineral ores, with work concentrated on the fundamental processes involved
- Bioprocess engineering focused on biocatalysis bioreactor design, process kinetics and the recovery of biological products
- Environmental process engineering, both at a conceptual and a practical level
- Process synthesis featuring the application of pinch technology to heat and mass transfer systems as well as the control of process systems
- Crystallisation and precipitation research focusing on metal recovery in mineral processing and metal removal for environmental protection
- Educational research aimed at improving the quality of undergraduate teaching and learning.

## **Undergraduate Programmes**

### **Chemical Engineering Programme**

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, 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 First, Second and Third Years, while Fourth Year practicals are of a project nature so as to emphasise chemical engineering fundamentals. Chemical Engineering Design is addressed in all years of study, culminating in an integrated Plant Design in the final year.

**Associate Professor and Programme Convenor:**

KP Möller, BSc (Eng), PhD *Cape Town*

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

**First Year Core Courses**

Number	Course	Credits
<b>CEM1000W</b>	Chemistry 100 .....	36
<b>CHE1004W</b>	Engineering I .....	32
<b>MAM1003W</b>	Mathematics 103 .....	32
<b>MEC1002W</b>	Engineering Drawing .....	16
<b>PHY1010W</b>	Physics 110 .....	32
	Total credits .....	148

**Second Year Core Courses**

Number	Course	Credits
<b>CEM2007F</b>	Chemistry 207 .....	24
<b>CEM2008S</b>	Chemistry 208 .....	24
<b>CHE2031F</b>	Material and Energy Balances .....	20
<b>CHE2032F</b>	Design of Chemical Processes .....	8
<b>CHE2033W</b>	Chemical Engineering Laboratory I .....	4
<b>CHE2035S</b>	Thermodynamics I .....	12
<b>CHE2040S</b>	Design of Fluid Flow and Heat Transfer Systems.....	20
<b>MAM2080W</b>	Mathematics 280 .....	32
	Total credits .....	144

**Third Year Core Courses**

Number	Course	Credits
<b>CHE3040S</b>	Solid Fluid Operations .....	12
<b>CHE3043S</b>	Separation Processes .....	16
<b>CHE3044F</b>	Reactor Design I .....	12
<b>CHE3045S</b>	Reactor Design II .....	16
<b>CHE3046F</b>	Thermodynamics II .....	12
<b>CHE3049W</b>	Chemical Engineering Laboratory II .....	16
<b>CHE3062S</b>	Professional Communication .....	12
<b>CHE3063F</b>	Mass Transfer .....	16
<b>MAM3080F</b>	Numerical Methods .....	12
	Total credits.....	124
<b>CHE3000X</b>	Practical Training	

**Fourth Year Core Courses**

These courses may only be taken by students who are in their final year of study. Students may be given a concession to carry a maximum of 16 additional credits per semester, over and above the

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standard 16 credits of electives. These can be further elective courses or outstanding third year core courses.

Number	Course	Credits
<b>CHE4029Z</b>	Professional Communication Studies .....	8
<b>CHE4036Z</b>	Chemical Engineering Design .....	28
<b>CHE4042F</b>	Process Dynamics and Control .....	16
<b>CHE4045Z</b>	Chemical Engineering Project .....	32
<b>CHE4048F</b>	Business, Society and Environment .....	20
<b>CHE4049F</b>	Process Synthesis and Equipment Design .....	20
	Total credits .....	124

### Elective Courses

Students need to complete at least 48 credits of elective courses. At least 16 of these credits need to be from the Liberal Arts group; and 16 credits need to be completed in the EBE specialisation group. The final 16 credits can be taken from any course offered at UCT for which the student meets the prerequisites, subject to the approval of the Programme Convenor.

### Liberal Arts 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.

### EBE Specialisation Group

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

Number	Course	Credits
<b>CHE3035S</b>	Bioprocess Technology I .....	8
<b>CHE3039S</b>	Chemistry & Chemical Engineering of Catalytic Processes.....	8
<b>CHE3064S*</b>	Mineral and Metallurgical Processing I .....	8
<b>CHE4024F</b>	Introduction to Environmental Process Engineering.....	8
<b>CHE4050F*</b>	Mineral and Metallurgical Processing II .....	8

\* **CHE3064S** and **CHE4050F** are compulsory for mining-house bursars.

Alternatively, students may wish to take any EBE course at or above the 3rd year level for which they meet the prerequisites. Such courses must be approved by the Programme Convenor.

## Chemical Engineering Conversion Programme for Science (BSc) Graduates

The entrance requirements are as follows:

1. For the 2-year programme: A BSc degree in minimum time with above 60% in Mathematics II, Chemistry II and majors in Mathematics or Applied Mathematics or Physics or Computer Science or Chemistry or Biochemistry, and an average of above 60% in the final year.
2. For the 3-year programme: A BSc degree in minimum time with Mathematics II and Chemistry II and majors as above.

The following curriculum is applicable to BSc graduates who have been accepted into the conversion programme.

### First Year of Conversion Programme (2-year programme)

Number	Course	Credits
<b>CHE1000Z</b>	Introduction to Chemical Engineering .....	16
<b>CHE2031F</b>	Material and Energy Balances .....	20
<b>CHE2032F</b>	Design of Chemical Processes .....	8
<b>CHE2033W</b>	Chemical Engineering Laboratory I .....	4

CHE2035S	Thermodynamics I .....	12
CHE2040S	Design of Fluid Flow and Heat Transfer Systems .....	20
CHE3043S	Separation Processes .....	16
CHE3044F	Reactor Design I .....	12
CHE3045S	Reactor Design II .....	16
CHE3049W	Chemical Engineering Laboratory II .....	16
CHE3062S	Professional Communication Studies .....	12
MAM3080F	Numerical Methods .....	12
MEC1003F	Engineering Drawing .....	8
	Total credits .....	172
CHE3000X	Practical Training	

### Second Year of Conversion Programme (2-year programme)

Number	Course	Credits
CHE3040S	Solid-Fluid Operations .....	12
CHE3046F	Thermodynamics II .....	12
CHE3063F	Mass Transfer .....	16
CHE4029Z	Professional Communication Studies .....	8
CHE4036Z	Chemical Engineering Design .....	28
CHE4042F	Process Dynamics & Control .....	16
CHE4045Z	Chemical Engineering Project .....	32
CHE4048F	Business, Society and Environment .....	20
CHE4049F	Process Synthesis and Equipment Design .....	20
	Total credits .....	164

### First Year of Conversion Programme (3-year programme)

Number	Course	Credits
CHE1000Z	Introduction to Chemical Engineering .....	16
MEC1003F	Engineering Drawing .....	8
CHE2031F	Material and Energy Balances .....	20
CHE2032F	Design of Chemical Processes .....	8
CHE2033W	Chemical Engineering Laboratory I .....	4
CHE2035S	Thermodynamics I .....	12
CHE2040S	Design of Fluid Flow and Heat Transfer Systems .....	20
	Group I Elective courses .....	16
	Total credits .....	104

### Second Year of Conversion Programme (3- year programme)

Number	Course	Credits
CHE3040S	Solid-Fluid Operations .....	12
CHE3043S	Separation Processes .....	16
CHE3044F	Reactor Design I .....	12
CHE3045S	Reactor Design II .....	16
CHE3046F	Thermodynamics II .....	12
CHE3049W	Chemical Engineering Laboratory II .....	16
CHE3062S	Professional Communication Studies .....	12
CHE3063F	Mass Transfer .....	16
MAM3080F	Numerical Methods .....	12
	Total credits .....	124
CHE3000X	Practical Training	

### Third Year of Conversion Programme (3-year programme)

Number	Course	Credits
CHE4036Z	Chemical Engineering Design .....	28

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<b>CHE4042F</b>	Process Dynamics & Control .....	16
<b>CHE4045Z</b>	Chemical Engineering Project .....	32
<b>CHE4048F</b>	Business, Society and Environment .....	20
<b>CHE4049F</b>	Process Synthesis and Equipment Design .....	20
<b>CHE4029Z</b>	Professional Communication Studies.....	8
	Total credits .....	124

### Access Programme for Technikon/University of Technology Transferees

The entrance requirements are as follows:

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 necessary to have qualified for matriculation exemption before commencement of the National Diploma programme.)

Students accepted on to this programme will be credited with the following courses:

CHE1004W, CHE2032F, CHE2033W, CHE3000X, CHE3049W, and all elective courses. 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 MAM1003W, CEM1000W and PHY1010W end of year examinations through self-study. Should these courses all be passed, the student will be able to enter into the second year of the programme.

### Postgraduate Programme

The Department offers Masters and PhD degrees by thesis only in any of its research areas, and Masters degrees by structured coursework in the areas of specialisation listed below. All new postgraduate students are obliged to complete CHE5055Z.

### Bioprocess Engineering

#### Professor and Convenor:

STL Harrison, BSc (Hons) *Cape Town* PhD *Cantab* MSAIChe FSAAE MSASM

#### Core Courses (to total 56 credits)

Number	Course	Credits
<b>CHE5049Z</b>	Chemical Engineering Topics for Scientists <sup>#2</sup> .....	16
<b>CHE5051Z</b>	Microbial Physiology and Dynamics <sup>#1</sup> .....	8
<b>CHE5052Z</b>	Molecular Biology and Catalysis <sup>#1</sup> .....	8
<b>CHE5054Z</b>	Biotechnology Laboratory .....	4
<b>CHE5055Z</b>	Research Communication and Methodology .....	16

#### Optional courses: to meet a minimum requirement of 60 credits in total

and either

<b>CHE5070Z</b>	Advanced Bioprocess Engineering .....	16
	(cannot be taken with CHE5053Z and CHE5038Z and vice versa)	

or

<b>CHE5053Z</b>	Bioprocess Design Technology .....	12
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with

<b>CHE5038Z</b>	Biokinetics and Bioenergetics.....	8
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or

<b>CHE527Z</b>	Advanced Reaction Kinetics in Heterogeneous Systems .....	8
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#### Note:

<sup>#1</sup> core courses for engineering graduates

<sup>#2</sup> core courses for life science graduates

Physical Science graduates will complete all or a selection of <sup>#1</sup> and <sup>#2</sup>, dependent on their previous studies



## Catalytic Process Engineering

### Professor and Convenor

JCQ Fletcher, BSc (Eng), PhD *Cape Town*, MSAIChe, MACS

#### Core Courses (to total 44 credits)

Number	Course	Credits
CHE5022Z	Introduction to Catalysis .....	16
CHE5055Z	Research Communication and Methodology .....	16
	and at least one of:	
CHE5040Z	Chemicals from Oil .....	12
CHE5045Z	Chemicals from Synthesis Gas .....	12

**Optional courses: to meet a minimum requirement of 60 credits in total.**

## Hydrometallurgical Engineering

### Honorary Associate Professor and Convenor

PG Gaylard, PrEng, BSc (Eng), *Witwatersrand*.FSAIMM, MSAIChe

#### Core Courses (to total 60 credits)

Number	Course	Credits
CHE5055Z	Research Communication and Methodology .....	16
CHE5057Z	Fundamentals of Hydrometallurgy .....	12
CHE5058Z	Hydrometallurgical Unit Operations .....	16
CHE5059Z	Hydrometallurgical Practice .....	16

**Optional Courses (to total 20 credits); see below**

## Optional Courses for all Postgraduate Programmes

In addition to the courses listed below, the core courses of the three programmes above may be used as optional courses in the other programmes.

Number	Course	Credits
CHE5027Z	Advanced Reaction Kinetics in Heterogeneous Systems .....	8
CHE5030Z	Advanced Engineering Statistics I.....	8
CHE5032Z	Applied Mathematics and Modelling I .....	8
CHE5033Z	Applied Mathematics and Modelling II .....	8
CHE5034Z	Applied Mathematics and Modelling III.....	4
CHE5038Z	Biokinetics and Bioenergetics.....	8
CHE5040Z	Chemicals from Oil .....	12
CHE5041Z	Instrumental Analysis 1 - General Measurement .....	4
CHE5042Z	Instrumental Analysis 2 - Chromatography .....	4
CHE5043Z	Instrumental Analysis 3 - Spectroscopy.....	4
CHE5045Z	Chemicals from Synthesis Gas .....	12
CHE5047Z	Molecular Modelling .....	8
CHE5048Z	Crystallisation and Precipitation .....	12
CHE5056Z	Biobleaching of Sulfide Minerals .....	8
CHE5060Z	Solvent Extraction: Practice, Engineering and Modelling .....	8
CHE5061Z	Advanced Topics in Reduction .....	8
CHE5062Z	Electrowinning and Refining Practice .....	8
CHE5063Z	Advanced Topics in Adsorption and Ion Exchange .....	8
CHE5064Z	Sustainability in Chemical Engineering .....	16

<b>CHE5065Z</b>	Introduction to DEM & SPH .....	16
<b>CHE5066Z</b>	Computing for Engineers .....	8
<b>CHE5067Z</b>	Advanced Process Synthesis and Flowsheeting .....	8
<b>CHE5068Z</b>	Process Control and Management .....	8
<b>CHE5069Z</b>	Advanced Thermodynamics and Separation Processes .....	8
<b>CHE5070Z</b>	Advanced Bioprocess Engineering .....	16
<b>CHE5071Z</b>	Applied Numerical Analysis in Biochemical Systems .....	8
<b>CHE5072Z</b>	Fundamentals of Process Modelling .....	4
<b>CHE5073Z</b>	Essential Technical tools .....	16
<b>CHE5074Z</b>	Advanced Comminution, Level 1 .....	16
<b>CHE5075Z</b>	Advanced Comminution, Level 2 .....	16
<b>CHE5076Z</b>	Conceptual Framework of Minerals Beneficiation .....	8
<b>CIV5010F</b>	Aquatic Chemistry .....	20
<b>CIV5101F</b>	Wastewater Treatment Part 1 .....	32
<b>MEC5035Z</b>	Project Management .....	20

## Research Entities

### Bioprocess Engineering Research Unit

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

### Centre for Catalysis

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

### Crystallisation and Precipitation Unit

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

### Centre for Mineral Processing

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

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# CIVIL ENGINEERING

The Department offers the following Degree Programmes:

## BSc Engineering Degree Programme in Civil Engineering

### Postgraduate areas of specialisation:

Structural Engineering, Structural Materials and Geotechnical Engineering  
 Water Quality Engineering  
 Transport Studies  
 Integrated Urban Water Management  
 Urban Engineering and Urban Management

### Research Entities:

Structural Engineering, Structural Materials and Geotechnical Engineering  
 Water Quality Engineering  
 Transport Studies  
 Integrated Urban Water Management  
 Urban Engineering and Urban Management

The Department is housed in the Snape Building, situated on the top terrace of the Groote Schuur campus. The building consists of a three-storey block, containing offices, lecture theatres and drawing offices, separated from a single storey laboratory block by a grassed quadrangle. The laboratories and workshops are equipped for teaching and research, and cover a total floor area of about 2000m<sup>2</sup>.

## Staff

### Professor and Head of Department:

Professor GA Ekama, BSc(Eng) PhD *Cape Town* SFWISA FRSSAf FSAAE MASSAf MWEF MIWA

### Professors:

MG Alexander, PrEng BSc(Eng) MSc(Eng) PhD *Witwatersrand* FSAICE FSAAE, MASSAf MICT  
 MC Wentzel, BSc PhD *Cape Town* MWISA MIWA  
 A Zingoni, PrEng BSc(Eng) *Zimbabwe* MSc(Eng) *London* DIC PhD *London* CEng FIStructE FZweIE MASSAF

### Associate Professors:

NP Armitage, PrEng BSc(Eng) *Natal* MSc(Eng) *Cape Town* PhD *Stell* FSAICE FWISA FSAIMunE  
 Mem IAHR, Mem IAHS, Mem IWA  
 R Del Mistro PrEng TRP(SA) BSc(Eng) Diploma TE(IHE) MURP *Cape Town* PhD *Pretoria*

### Emeritus Associate Professors:

MO de Kock, PrEng BSc(Eng) *Cape Town*  
 RO Heckroodt, MSc DSc *Pret* Dip Ceram *Leeds* FSAIMM FI Ceram (UK)  
 FA Kilner, PrEng MA *Oxon* MSc(Eng) *London* DIC  
 RE Loewenthal, BSc(Eng) *Witwatersrand* MSc(Eng) PhD *Cape Town* MWISA  
 ADW Sparks, PrEng BSc(Eng) *Natal* MSc(Eng) *Witwatersrand* MICE FSAICE MOPResSocSA  
 MRoySocSA CEng

### Senior Lecturers:

R Behrens, BA MCRP PhD *Cape Town* TRP (SA) MSAPI

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A Masarira, Dipl-Ing Dr-Ing *Weimar* PGDip(Proj.Mgmt) *Cape Town* MSAICE MSAISC  
P Moyo BSc(Eng) *Zimbabwe* MSc(Eng) *Newcastle upon Tyne* PhD *Nanyang*  
UK Rivett, DipEng *München*, PhD *Cape Town*  
F Scheele, PrEng Dipl-Ing Dr. Ing *Munich* IGS GIGSA SAACEL  
M Vanderschuren, BSc(Eng) *Tilburg*, MScEng *Delft* PhD *Enschede* MSAICE MSASITS

### **Part-time Lecturers:**

RGK Blyth, PrEng BSc(Eng) *Cape Town* CEng DipBM FSAICE  
CB Prisman, BA LLB *Cape Town*

### **Honorary Research Associate:**

LA Kane, BEng *Wales (Cardiff)* MSc(Eng) *Cape Town*

### **Principal Technical Officer:**

Mr EN von Guerard

### **Chief Technical Officer:**

Mr CJ Nicholas

### **Water Quality Laboratory Manager:**

Mr MT Lakay

### **Structural Materials, Mechanics and Geotechnical Engineering Laboratory Manager:**

Mr N Hassen

### **Laboratory Technician:**

Mr D Manuel

### **Administrative Assistant:**

Ms AB Dalwai

### **Research Administrative Assistants:**

Mrs AEI Opperman

Ms E Yelverton

### **Senior Secretary:**

Ms I Ncube

### **Secretaries:**

Mrs C Wright (mornings)

Ms M Waglay (afternoons)

### **Departmental Assistants:**

Mr C May

Mr H Mafungwa

Mr T Moyana

Mr E Witbooi

## **Laboratory Facilities**

The **Structures Laboratories** have facilities for studying the mechanical behaviour of structural components, models and materials. They contain a number of testing machines for static and dynamic loading and feature special floors with closely-spaced anchor bolt holes, as well as ample open spaces for full-scale testing of structural elements and structural assemblies.

**The Hydraulics Laboratory** is equipped with a 1.5 x 1.5 x 14m tank, a 600 mm wide wave flume, a 300mm wide tilting channel flume, and a 600mm wide tilting channel flume. It also contains various teaching aids.

**The Geotechnical Engineering Laboratories** consist of areas for teaching and research in soil and rock mechanics. A special test pit is available for research on full size structural members embedded in soils. A fully computerised stress-path triaxial facility is also available.

**The Concrete Materials Laboratory** contains equipment and controlled temperature and humidity rooms for studying properties of concrete, cement and aggregates.

**The Water Quality Engineering Laboratories** are equipped with constant temperature rooms and apparatus for chemical, biochemical and bacteriological investigations into water supplies and waste water. Laboratory scale activated sludge, flotation, coagulation, settling and filtration units are operated for developing design criteria for full-scale plants.

## Undergraduate Programme

A candidate shall complete approved courses of a value not less than 576 credits and shall comply with the prescribed curriculum requirements (which may in any given year 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 urban engineering, including transportation. In the final year, the two major courses of Design Project and Thesis allow students to integrate their knowledge and develop advanced problem-solving skills.

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

### Associate Professor and Programme Convenor

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

### First Year Core Courses

Number	Course	Credits
<b>CEM1008F</b>	Chemistry for Engineers .....	16
<b>CIV1004W</b>	Engineering I .....	32
<b>MAM1003W</b>	Mathematics 103 .....	32
<b>MAM1042S</b>	Engineering Statics .....	16
<b>MEC1002W</b>	Engineering Drawing .....	16
<b>PHY1010W</b>	Physics 110 .....	32
	Total credits .....	144

### Second Year Core Courses

Number	Course	Credits
<b>CIV2011F</b>	Mechanics of Materials .....	16
<b>CIV2031S</b>	Structural Engineering 1 .....	16
<b>CIV2034S</b>	Spatial Data Acquisition and Management .....	16
<b>CIV2035X</b>	Civil Engineering Camp .....	4
<b>CIV2036F</b>	Fundamentals of Water Treatment .....	16
<b>CIV2037F</b>	Experimental Methods and Statistics .....	16
<b>CIV2038S</b>	Hydraulic Engineering 1 - Fluid Mechanics and Pipe Flow .....	16

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<b>MAM2080W</b>	Mathematics 280.....	32
<b>MEC2042F</b>	Materials Science in Engineering.....	12
	Total credits.....	144
<b>CIV2020X</b>	Practical Experience	

### Third Year Core Courses

Number	Course.....	Credits
<b>CIV3031F</b>	Structural Engineering 2 .....	16
<b>CIV3034S</b>	Geotechnical Engineering 1 .....	16
<b>CIV3035S</b>	Structural Engineering 3 .....	16
<b>CIV3038F</b>	Hydraulic Engineering 2 - Open Channel Flow .....	16
<b>CIV3040F</b>	Urban Engineering 1 - Cities, Transport and Roads.....	24
<b>CIV3041S</b>	Urban Engineering 2 - Water Services.....	16
<b>ECO1007S</b>	Economics for Engineers .....	16
<b>GEO1008F</b>	Geology for Engineers .....	12
	Total credits.....	132

### Fourth Year Core Courses

Number	Course	Credits
<b>CIV4031F</b>	Structural Engineering 4 .....	16
<b>CIV4033Z</b>	Professional Practice .....	24
<b>CIV4034F</b>	Geotechnical Engineering 2 .....	16
<b>CIV4035C</b>	Design Project.....	24
<b>CIV4036D</b>	Thesis .....	36
<b>CIV4040F</b>	Urban Engineering 3 - City and Infrastructure Management .....	16
<b>EGS4006F</b>	Introduction to Environmental Assessment and Management .....	12
	Total credits.....	144

### Elective Courses

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. Any shortfall must be made up with elective course credits (usually 16 credits).

These elective courses are Complementary Studies in the Humanities discipline. Additional (optional) courses may be taken in any disciplines but these will not be counted as core and elective credits of the curriculum.

A list of approved electives will be available at registration. It is the responsibility of the student when proposing electives to ensure that there are no lecture, practical or examination timetable clashes for courses so offered.

### Curriculum for Technikon/University of Technology Transferees

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 Diplomates to have obtained a matriculation exemption before commencement of National Diploma studies, an average of at least 70% for all prescribed final year subjects and a minimum of 75% for Mathematics II in the National Diploma examinations. Students who satisfy these criteria may be granted 144 credits (for the First Year), and be exempted from CIV1004W, MAM1003W, MAM1042S, MEC1002W, CIV2011F, CIV2020X, CIV2034S and MEC2042F. Such students will be required to take the following courses in their first year of registration:

Number	Course	Credits
<b>CEM1008F</b>	Chemistry for Engineers .....	16

<b>CIV2031S</b>	Structural Engineering I .....	16
<b>CIV2035X</b>	Civil Engineering Camp .....	4
<b>CIV2036F</b>	Fundamentals of Water Treatment.....	16
<b>CIV2037F</b>	Experimental Methods and Statistics .....	16
<b>CIV2038S</b>	Hydraulic Engineering I - Fluid Mechanics and Pipe Flow .....	16
<b>MAM2080W</b>	Mathematics 280 .....	32
<b>PHY1031F</b>	Physics of Natural Systems 1 .....	18
<b>PHY1032S</b>	Physics of Natural Systems 2 .....	18
	Total credits .....	152

After completing the above courses, subject to rule FB8.2, students will be required to complete the prescribed Third and Fourth Years of study.

## Postgraduate Programme

The department offers postgraduate coursework in the following areas of specialisation. Note: Course offerings in particular years vary, and should be ascertained by reference to the department's annual postgraduate brochure. Courses are offered provided there is sufficient demand.

### Structural Engineering and Structural Materials

Advanced courses are offered in the fields of structural analysis, structural mechanics, reinforced and prestressed concrete structures, plate and shell structures, concrete materials and geotechnical engineering.

### Water Quality Engineering

Advanced courses are offered in theory, design, modeling and operation of biological and chemical wastewater and sludge treatment systems.

### Integrated Urban Water Management

This group includes researchers from, *inter alia*, Geomatics, Environmental and Geographical Science and Social Anthropology. Courses may be taken from any of these disciplines subject to the student meeting the specific entrance requirements and on approval from the supervisor. Courses on urban drainage, urban infrastructure management and design (see below) are offered by the Civil Engineering Department.

### Urban Infrastructure Design and Management

Advanced courses are offered in developing cities: Issues and strategies; Community Development, Urban Renewal, Sustainable Urban Systems, Municipal Infrastructure Management and information technology in urban infrastructure provision ([www.urbaninfrastructure.uct.ac.za](http://www.urbaninfrastructure.uct.ac.za)).

### Transport Studies

Offered jointly with the School of Architecture, Planning and Geomatics.

#### Programme Convenor:

R Behrens, BA MCRP PhD *Cape Town* TRP (SA) MSAPI

The primary aim of the Postgraduate Diploma, MEng and MPhil in Transport Studies is to produce diplomates and graduates with the necessary knowledge and skills to engage effectively with the challenge of creating affordable, efficient, sustainable, safe, equitable and environmentally sound urban transport systems. The emphasis of the Programme is on developing competence in the field of urban transport planning as it adapts to meet the requirements of new and demanding policy directives both locally and internationally. The content of the Programme curriculum is cross-disciplinary in orientation and exposes students to a broad range of the analytical, evaluative,

planning and management issues they are likely to encounter in the field. A candidate for the Postgraduate Diploma in Transport Studies is required to complete core courses totalling not less than 80 credits plus an elective course or courses totalling a minimum of 40 credits, and to comply with the prescribed curriculum. A candidate for the MEng in Transport Studies is required to complete core courses totalling 180 credits (including a 60 credit Research project) and to comply with the prescribed curriculum. A candidate for the MPhil in Transport Studies is required to complete core courses totalling 140 credits (including a 60 credit Research project) plus elective courses totalling a minimum of 40 credits, and to comply with the prescribed curriculum.

**Core Courses**

Number	Course	Credits
<b>CIV5017Z</b>	Research Project (for MEng candidates only).....	60
<b>END5035Z</b>	Management of Transport Supply and Demand .....	20
<b>END5036Z</b>	Local Area Transport Planning, Management and Design .....	20
<b>END5037Z</b>	Research Project (for MPhil candidates only) .....	60
<b>END5038Z</b>	Integrated Land Use-Transport Planning .....	20
<b>END5045Z</b>	Public Transport Planning and Economics (for MEng candidates only).....	20
<b>END5047Z</b>	Transport Demand Analysis and Project Assessment .....	20
<b>END5048Z</b>	Transport Modeling (for MEng candidates only).....	20

**Elective Courses** (for Mphil candidates only)

Number	Course	Credits
<b>END5039Z</b>	Non-motorised Transportation.....	20
<b>END5045Z</b>	Public Transport Planning and Economics .....	20
<b>END5046Z</b>	Rural Transport.....	20
<b>END5048Z</b>	Transport Modeling .....	20

Subject to approval by the Programme Convenor, candidates for the Postgraduate Diploma and the MPhil are required to select an appropriate course or courses totalling a minimum of 40 credits as their elective. Candidates may nominate other courses offered at this or any other university for consideration in this regard.

**Other Postgraduate Courses**

Other courses offered from time to time include topics in:  
 Contract and Construction Law  
 Hydraulics

**Course descriptions are set out in the section Courses Offered. The course code abbreviation for Civil Engineering is CIV. The code abbreviation for interdisciplinary courses offered through the Faculty is END.**



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# CONSTRUCTION ECONOMICS AND MANAGEMENT

The Department offers the following degree programmes:

## **BSc Degree Programmes in**

Construction Studies

Property Studies

## **Postgraduate Degree Programmes in**

Construction Management

Housing Development and Management

Project Management

Property Studies

Quantity Surveying

The Department is housed in Centlivres Building, situated at the southern end of University Avenue opposite the Robert Leslie Building. The building consists of a five-storey block, containing offices, lecture theatres, the Built Environment Library and the CAD Laboratory. The Building is shared with the School of Architecture, Planning and Geomatics.

## **Staff**

### **Associate Professor and Head of Department:**

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

### **Professor:**

PA Bowen, BSc(QS)BCom *Natal* MSc(Construction Management) *Heriot-Watt* PhD *UPE* PrQS PMAQS FRICS FCIQB PrCM PrCPM MAACE Pr.Valuer

### **Emeritus Professors:**

BG Boaden, BSc(QS) *Witwatersrand* MBA *British Columbia* PhD *Witwatersrand*

AJ Stevens, MSc(Building) *Cape Town* PhD *UPE*

### **Senior Lecturers:**

K Evans, BSc(QS) MSc(Property Studies) *Cape Town* PrQS PMAQS

MW Massyn, BSc(Building) *UPE* FCIQB

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

D Root, BSc(Hons)(Building Surveying) *Salford* MSc(Con.Man) PhD(Cons.Man) *Bath* MRICS MCIQB

W Shakantu, BSc(Building) *Copperbelt* MSc(Construction Management) *Reading* PG Cert (Construction Management) *Lund* PhD *Glasgow Caledonian*(LTHS) MCIQB MSIZ AEIZ

### **Lecturer:**

K Le Jeune, BSc(QS) *Cape Town* PrQS PMAQS

MM Mooya, BSc(Land Economy) *Copperbelt* MPhil(Land Economy) *Cambridge*

### **Administrative Officer:**

Mrs E Koch

### **Administrative Assistant:**

Mrs M Fagodien

### **Senior Secretaries:**

Mrs N Pienaar, BSocSci *Cape Town*

Ms B du Toit

**Departmental Assistant:**

Mr B Baron

## Undergraduate Programmes

Please note that the offering of all undergraduate programmes is subject to a minimum student enrolment. A subminimum of 40% applies to the examination and coursework components of all undergraduate courses with a CON course code.

### Construction Studies Programme

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).

**Senior Lecturer and Programme Convenor:**

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

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**

Number	Course	Credits
<b>BUS1036F</b>	Evidence-based Management .....	18
<b>CIV1006S</b>	Building Science I .....	16
<b>CON1004W</b>	Construction Technology 1 .....	32
<b>CON1010F</b>	Construction Information Systems .....	8
<b>ECO1010F</b>	Microeconomics .....	18
<b>ECO1011S</b>	Macroeconomics .....	18
<b>MEC1002W</b>	Engineering Drawing .....	16
<b>STA1001F</b>	Statistics 101 .....	18
	Total credits .....	144
<b>CON1007X</b>	Practical Training	

**Second Year Core Courses**

Number	Course	Credits
<b>ACC1006S</b>	Financial Accounting 1 .....	18
<b>APG2026F</b>	Elementary Surveying.....	16
<b>CML1001F</b>	Business Law 1 .....	18
<b>CML2001F</b>	Labour Law 1 .....	18
<b>CON1019S</b>	Professional Communication Studies.....	16
<b>CON2006W</b>	Construction Technology 2 .....	32
<b>CON2020S</b>	Construction Management 1 .....	16

CON2022W	Measurement and Design Appraisal 1 .....	16
	Total credits .....	150
CON2013X	Practical Training	

### Third Year Core Courses

Number	Course	Credits
CON3012W	Construction Technology 3 .....	32
CON3030S	Construction Costing .....	16
CON3031W	Measurement and Design Appraisal 2 .....	32
CON3032W	Applied Contract Law 1 .....	12
CON3033F	Property Studies 1 .....	16
CON3038W	Construction Management 2 .....	32
CON3043W	Cost Engineering under Uncertainty.....	16
	Total credits .....	156
CON3023X	Practical Training	

### Property Studies Programme

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).

#### Senior Lecturer and Programme Convenor:

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

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

Number	Course	Credits
BUS1036F	Evidence-based Management .....	18
CON1011F	Property Studies 1A .....	16
CON1012S	Property Studies 1B .....	16
CON1015F	Property Information Systems .....	8
CON1017S	Property Investment Mathematics 1 .....	8
CON1018W	Building Technology 1T.....	16
ECO1010F	Microeconomics .....	18
ECO1011S	Macroeconomics .....	18
STA1000S	Statistics 100 .....	18
STA1001F	Statistics 101 .....	18
	Total credits .....	154

## 110 PROGRAMMES OF STUDY

### Second Year Core Courses

Number	Course	Credits
ACC1006F/S	Financial Accounting 1 .....	18
BUS2020F	Business Finance .....	18
CML1001F	Business Law 1 .....	18
CON2024S	Property Studies 2A .....	16
CON2027F	Real Property Law 1 .....	16
CON2029S	Measurement .....	8
CON2030F	Property Investments Mathematics 2 .....	8
CON2031S	Property Studies 2B .....	16
	Total credits .....	118

### Elective Core Courses

Courses totalling a minimum of 36 credits must be chosen from the following:

Number	Course	Credits
BUS1006S	People Management.....	18
BUS2010F/S	Marketing I .....	18
CML2005F	Labour Law .....	18
ECO2003F	Economics 203 .....	18
ECO2004S	Economics 204 .....	18
STA2020F/S	Business Statistics .....	18
	Approved Elective(s) .....	18

### Third Year Core Courses

Number	Course	Credits
CML2010S	Business Law II .....	18
CON1019F	Professional Communication Studies.....	16
CON3034F	Property Studies 3A .....	16
CON3035S	Property Studies 3B .....	16
CON3036W	Property and Contract Law .....	16
CON3041F	Property Studies 3C .....	16
CON3040W	Cost Engineering IT.....	16
	Total credits .....	114

### Elective Core Courses

Courses totalling a minimum of 36 credits must be chosen from the following:

Number	Course	Credits
ACC1112S	Business Accounting .....	18
ACC2022F/S	Management Accounting 1 .....	18
BUS2010F/S	Marketing I .....	18
CML2001F	Company Law .....	18
CML2005F	Labour Law .....	18
ECO2003F	Economics 203 .....	18
ECO2004S	Economics 204 .....	18
STA2020F/S	Business Statistics .....	18
STA3022F	Research and Survey Statistics .....	18
	Approved Elective(s) .....	18

## Postgraduate Programmes

Please note that the offering of all postgraduate programmes is subject to a minimum student enrolment.

A subminimum of 40% applies to the examination and coursework components of all Honours level courses with a CON course code.

A subminimum of 50% applies to the examination and coursework components of all Postgraduate Diploma and Masters level courses with a CON course code.

## Honours in Construction Management Programme

### Senior Lecturer and Programme Convenor:

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

The curriculum of the BSc (Hons) in Construction Management programme equips graduates to: identify, analyse and solve problems in the field of construction assembly and management of the process; perform a number of managerial roles within a constructor organisation, after an appropriate period of practical experience; work effectively in teams; and undertake research and produce reports. The aims of the degree 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 required to bring the total to a minimum of 160 credits and shall comply with all the prescribed curriculum requirements.

### Core Courses

Number	Course	Credits
ACC2022S	Management Accounting 1 .....	18
CON4030F	Property Studies 2.....	16
CON4033W	Applied Contract Law 2.....	16
CON4036W	Research Report.....	16
CON4038F	Advanced Construction Management.....	16
CON4039S	Integrated Management Project.....	16
CON4049S	Construction Innovation .....	16
STA1000F	Statistics 100.....	18
	Total credits.....	132
CON4035X	Practical Training	

### Elective Core Courses

Courses totalling a minimum of 28 credits must be chosen from the following:

Number	Course	Credits
CON4032F	Measurement and Design Appraisal 3 .....	12
CON4034W	Professional Practice.....	20
CON4037S	Civil Engineering Measurement .....	16
CON4047W*	Treatise.....	32
CON4045F	Housing Development and Management 1T.....	16
	Approved elective.....	16

\* Should a candidate elect to do CON4047W the candidate will not be required to register for CON4036W.

## Honours in Quantity Surveying Programme

### Senior Lecturer and Programme Convenor:

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

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The curriculum of the BSc (Hons) in Quantity Surveying programme equips graduates to: undertake financial planning and control of new and existing facilities; undertake property development and property portfolio management; value property; apply appropriate quantity surveying techniques to building and civil engineering projects; perform appropriate professional quantity surveying management functions; work effectively in teams; and undertake research and produce reports. The aims of the degree are to provide employable professional graduates to the Quantity Surveying Profession; to fully satisfy the criteria for accreditation in terms of the requirements of the South African Council for the Quantity Surveying Profession (SACQSP); and the Royal Institution of Chartered Surveyors (RICS).

A candidate shall complete approved courses of a value required to bring the total to a minimum of 164 credits and shall comply with all the prescribed curriculum requirements.

### Core Courses

Number	Course	Credits
ACC2022S	Management Accounting 1 .....	18
CON4030F	Property Studies 2 .....	16
CON4032F	Measurement and Design Appraisal 3 .....	12
CON4033W	Applied Contract Law 2 .....	16
CON4034W	Professional Practice .....	20
CON4036W	Research Report .....	16
CON4037S	Civil Engineering Measurement .....	16
STA1000F	Statistics 100 .....	18
	Total credits .....	132
CON4035X	Practical Training	

### Elective Courses

Courses totalling a minimum of 32 credits must be chosen from the following:

Number	Course	Credits
CON4038F	Advanced Construction Management .....	16
CON4039S	Integrated Management Project .....	16
CON4045F	Housing Development and Management IT .....	16
CON4047W*	Treatise .....	32
CON4049S	Construction Innovation .....	16
	Approved Elective .....	16

\* Should a candidate elect to do CON4047W the candidate will not be required to register for CON4036W.

## Honours in Property Studies Programme

### Senior Lecturer and Programme Convenor:

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

The curriculum of the BSc (Hons) in Property Studies programme equips graduates to: apply advanced methods of valuation and value special properties; manage property and buildings; plan, control and report costs associated with property management; know and apply legislation and case law relevant to the valuation of fixed property; define a research problem, undertake empirical research, analyse data and report research findings; and apply skills in an elective area of speciality in statistics, management, economics or law.

The aim of the degree is to fully satisfy the criteria for accreditation in terms of the requirements of

the South African Council for the Property Valuers Profession (SACPVP) A candidate shall complete approved courses of a value required to bring the total to a minimum of 144 credits and shall comply with all the prescribed curriculum requirements.

**Core Courses**

Number	Course	Credits
CON4041F	Advanced Property Studies A .....	16
CON4042F	Advanced Property Studies B .....	16
CON4043S	Applied Property Law .....	16
CON4045F	Housing Development and Management 1T .....	16
CON4047W	Treatise .....	32
CON4048S	Advanced Property Studies C .....	16
	Total credits .....	112

**Elective Courses**

Courses totalling a minimum of 32 credits must be chosen from the following:

Number	Course	Credits
ACC1012S	Business Accounting .....	18
ACC2022F/S	Management Accounting 1 .....	18
BUS2010F	Marketing I .....	18
CML2001F	Company Law .....	18
CML2005F	Labour Law .....	18
CON3030S	Construction Costing .....	16
CON3038W	Construction Management 2 .....	32
ECO2003F	Economics 203 .....	18
ECO2004S	Economics 204 .....	18
STA2020F/S	Business Statistics .....	18
STA3022F	Research and Survey Statistics .....	18
	Approved elective .....	18

**Postgraduate Diploma / Masters in Property Studies Programmes**

The primary aim of the Postgraduate Diploma and MSc in Property Studies programmes is to produce graduates with the necessary skills to enter the field of property at a professional managerial level. Students are exposed to the full spectrum of property related disciplines and issues, including: urban land economics; property law; property finance; property development; property valuation; property portfolio management; and facilities management. In addressing each of these areas, a strong emphasis is placed on the development of decision-making skills. The purpose of the research report, only undertaken by candidates for the MSc in Property Studies programme, is to develop advanced research skills.

**Senior Lecturer and Programme Convenor:**

KA Michell, BSc(QS) MPhil *Cape Town* MAQS MAACE ACIOB MSAFMA

A candidate for the Postgraduate Diploma in Property Studies shall complete approved courses of a value required to bring the total to a minimum of 120 credits and shall comply with the prescribed curriculum requirements. A candidate for the MSc in Property Studies shall complete approved courses of a value required to bring the total to a minimum of 200 credits and shall comply with all the prescribed curriculum requirements.

**Core Courses**

Number	Course	Credits
CON5006Z	Property Development .....	20
CON5007Z	Property Law .....	20

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CON5008Z	Urban Land Economics .....	20
CON5009Z	Property Finance .....	20
CON5010Z	Research Report (PS) (MSc Candidates only) .....	60
CON5013Z	Property Valuation.....	20
CON5021Z	Property Portfolio Management.....	20
CON5036Z	Introduction to Research.....	4
CON5037Z	Research Methodology .....	6
STA5081Z	Introduction to Applied Statistics.....	4
STA5082Z	Further Applied Statistics .....	6
	Sub-total credits .....	200

### **Postgraduate Diploma / Masters in Housing Development and Management Programmes**

NOTE: There will be no new intake of students for this programme from 2004 onwards.

The primary aim of the Postgraduate Diploma and MPhil in Housing Development and Management programmes is to produce graduates with the necessary skills to enter the field of affordable housing delivery. Emphasis is placed on the management of the housing process. A developmental view of housing delivery is taken, where the provision of housing is seen as more than the mere provision of shelter, encompassing other important aspects such as community participation, community empowerment, and job creation. The purpose of the research report, only undertaken by candidates for the MPhil in Housing Development and Management programme, is to develop advanced research skills.

A candidate for the Postgraduate Diploma in Housing Development and Management programme shall complete approved courses of a value required to bring the total to a minimum of 120 credits and shall comply with the prescribed curriculum requirements. A candidate for the MPhil in Housing Development and Management programme shall complete approved courses of a value required to bring the total to a minimum of 200 credits and shall comply with all the prescribed curriculum requirements.

#### **Core Courses**

Number	Course	Credits
CON5004Z	Community Participation: Social, Political and Economic Aspects .....	20
CON5008Z	Urban Land Economics .....	20
CON5026Z	Housing Theory and Policy .....	20
CON5027Z	Project Management and Finance for Housing .....	20
CON5032Z	Research Report (HDM) (MPhil candidates only) .....	60
	Sub-total credits .....	140

#### **Elective Courses**

Students must select any two approved Masters level 20-credit courses, or combination of courses totalling 40 credits, offered by this department or the Department of Civil Engineering.

### **Postgraduate Diploma / Masters in Project Management Programmes**

The primary aim of the Postgraduate Diploma and MSc in Project Management programme is to produce graduates with the necessary skills to enter the field of project management, the form of management considered most appropriate for the handling of multi-disciplinary projects in a rapidly changing business environment.

#### **Senior Lecturer and Programme Convenor:**

MW Massyn, BSc(Building) *UPE* FCIQB



A candidate for the Postgraduate Diploma in Project Management programme shall complete approved courses of a value required to bring the total to a minimum of 120 credits and shall comply with the prescribed curriculum requirements. A candidate for the MSc in Project Management programme shall complete approved courses of a value required to bring the total to a minimum of 200 credits and shall comply with all the prescribed curriculum requirements.

#### Core Courses

Number	Course	Credits
<b>CON5014Z</b>	Project Management and Systems Theory .....	20
<b>CON5016Z</b>	Project Planning and Implementation .....	20
<b>CON5018Z</b>	Human Resource Management and Interpersonal Communication .....	20
<b>CON5022Z</b>	Total Quality Management in a Project Environment .....	20
<b>CON5023Z</b>	Research Report (PM) (MSc candidates only) .....	60
<b>CON5036Z</b>	Introduction to Research .....	4
<b>CON5037Z</b>	Research Methodology .....	6
<b>STA5081Z</b>	Introduction to Applied Statistics .....	4
<b>STA5082Z</b>	Further Applied Statistics .....	6
	Sub-total credits .....	160

#### Elective Courses

Students must select any two approved Masters level 20-credit courses, or combination of courses totalling 40 credits, offered by the University.

#### Elective Courses

Number	Course	Credits
<b>CON5029Z</b>	Project Risk Management.....	20
<b>CON5030Z</b>	Project Finance and Procurement .....	20
	Approved elective.....	20

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## ELECTRICAL ENGINEERING

The Department offers the following Degree programmes:

### **BSc Engineering Degree Programme in**

Electrical Engineering

Electrical and Computer Engineering

Mechatronics

### **Postgraduate specialisations in**

Control Engineering

Digital Systems

Image Processing and Vision Systems

Instrumentation

Power Electronics

Power Engineering

Process Systems and Control (offered jointly with the Department of Chemical Engineering)

Remote Sensing and Radar

Telecommunications

The Department of Electrical Engineering occupies the 4th floor of the Menzies Building on the Groote Schuur Campus, Rondebosch.

## Staff

### **Professor and Head of Department:**

CT Gaunt, BSc(Eng) *Natal* MBL SA PhD *Cape Town* FIETFSAIEE

### **Professors:**

M Braae, PrEng MSc(Eng) *Cape Town* PhD *UMIST* MSAIEE MIEEE

HA Chan, BSc *Hong Kong* PhD *Maryland* SMIEEE

BJ Downing, MSc *Bradford* PhD *Sheffield*

MR Inggs, PrEng BSc (Hons) *Rhodes* PhD *London* MIEEE

JC Tapson, BSc BSc(Eng) PhD *Cape Town* MIEEE

### **Emeritus Professors:**

G de Jager, MSc *Rhodes* PhD *Manchester* MBL SA MIEEE

SG McLaren, BSc(Eng) PhD *Cape Town* MSAIEE CEng

A Petroianu, Dipl Ing *USSR* Dr Ing *Bucharest* SMIEEE VDE CIGRÉ

KM Reineck, CEng Dip Eng *Cologne* DipEIEng *Dunelm* PhD *Newcastle* VDE FIEE CEng

### **Emeritus Associate Professor:**

JR Greene, MSc(Eng) *Cape Town* MIEEE

### **Part-time Professor:**

P Pillay, BEng *UDW* MSc(Eng) *Natal* PhD *Virginia Tech* MIET FIEEE Ceng

### **Associate Professors:**

M Dlodlo, BS.EE BS *Geneva* MSc *Kansas* PhD *Delft* FZweIE MIEEE

KA Folly, MSc(Eng) *Beijing* PhD *Hiroshima* MIEEJ MIEEE MSAIEE

### **Adjunct Professor:**

JH Potgieter, PrEng MSc(Eng) *Cape Town*

**Visiting Professors:**

CJ Baker, BSc(Hons) PhD *Hull*  
 HD Griffiths, BA *Oxon* PhD DSc *London*

**Senior Lecturers:**

EO Bejide, MSc *Ife* PhD *UKZN* MIEEE  
 AWD Jongens, MSc(Eng) *Cape Town* MSAAI MASA NAG SAIIE  
 F Nicolls, MSc(Eng) PhD *Cape Town*  
 MJE Ventura, PrEng BSc BSc(Eng) *Cape Town* BSc(Hons) *Pret* MIEEE MSAIIE  
 AJ Wilkinson, BSc(Eng) *Cape Town* PhD *London*

**Part-time Senior Lecturer:**

M Malengret, BSc(Eng) *Natal* MSc(Eng) *Cape Town* M(SA)IEE

**Lecturers:**

SI Ginsberg, MSc(Eng) *Cape Town* M(SA)IEE  
 I Khan, MSc(Eng) *Cape Town* MIEEE  
 MA Khan, MSc(Eng) *Cape Town*

**Principal Research Officer:**

K Forbes, MSc(Eng) *Cape Town*

**Senior Research Officer:**

RT Lord, BSc(Eng) PhD *Cape Town*

**Research Officers:**

TH Bennett, MSc(Eng) *Cape Town*  
 R Herman, BSc(Eng) *Cape Town* MSc(Eng) PhD(Eng) *Stell*  
 AB Sebitosi, BSc(Eng)(Hons) *Nairobi* PhD *Cape Town* RENG MIEEE MIEK

**Honorary Research Associates:**

J Collins, MSc *Oxon*  
 BT Farrimond, BA *Oxon* MSc(Computer Science) *Manchester*  
 A Langman, PhD *Cape Town*  
 N Morrison, MSc(Eng) *Akron* PhD *Case WRU*  
 K Woodbridge, BSc(Hons) *Sussex* DPhil

**Principal Technical Officers:**

Mr S Schrire  
 Mr AC Wozniak

**Chief Technical Officer:**

Mr MK Nkewu

**Senior Technical Officer:**

Mr P Daniels

**Administrative Assistant:**

Mrs SC Booyesen

**Finance Assistants:**

Ms ME Joubert  
 Ms LS Rossouw

**Senior Secretaries:**

Ms N Moodley (Secretary to HoD)  
 Ms K van Wyk

**Departmental Assistants:**

Mr A Martin  
 Ms C Waqu

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 Acoustics, Control and Process Control, Data Communications, Digital Systems and Computers, Electrical Machines and Transformers, Electronics and Telecommunications, Image Processing, Instrumentation, Microwave, Radar, 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*.

**Graduate Studies and Research**

The Department prepares candidates for Masters and PhD degrees. Whilst the PhD is a research degree, the route for Masters candidates can be either by research only or by coursework and research.

The department offers a number of special postgraduate courses each year some of which are scheduled to facilitate attendance by practising engineers from industry. The majority of courses are, however, full-time courses and cover a variety of topics.

**Departmental Website**

Additional information can be obtained from the website [www.ee.uct.ac.za](http://www.ee.uct.ac.za)

**Electrical Engineering Programme (EE)**

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

**Professor and Programme Convenor**

M Braae, PrEng MSc(Eng) *Cape Town* PhD *UMIST* MSAIEE MIEEE

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

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

**First Year Core Courses (EE)**

Number	Course	Credits
CAS1001S	Culture, Identity and Globalization in Africa.....	8
EEE1004W	Engineering I .....	32
MAM1003W	Mathematics 103 .....	32
MAM1045S	Modelling for Electrical Engineers .....	16
MEC1003F	Engineering Drawing .....	8
PHY1010W	Physics 110 .....	32

**EEE100X** Practical Training

**First Year Elective Core Courses**

Number	Course	Credits
<b>CSC1017F*</b>	Computer Science for Engineers 117 .....	16
<i>or</i>		
<b>EEE1003W*</b>	Computing for Electrical Engineers .....	16
	Total credits .....	144

\* **EEE1003W** is an introductory course for students with little or no computer background while **CSC1017F** is a more advanced course that allows for conditional transfer to the Electrical and Computer Engineering programme.

**Second Year Core Courses (EE)**

Number	Course	Credits
<b>EEE2035F</b>	Signals and Systems I .....	12
<b>EEE2036F</b>	Probability & Statistical Design in Engineering .....	12
<b>EEE2037W</b>	Fundamentals of Electronic Engineering .....	32
<b>EEE2038W</b>	Fundamentals of Electrical Engineering .....	24
<b>MAM2080W</b>	Mathematics 280 .....	32
<b>MEC2043F</b>	Electrical and Mechanical Materials .....	12
<b>PHY2010S</b>	Electromagnetism for Engineers .....	16
	Total credits .....	140

**Third Year Core Courses (EE)**

A maximum of 24 second year credits can be carried concurrently with Third Year EE courses.

Number	Course	Credits
<b>EEE2036F</b>	Probability & Statistical Design in Engineering .....	12
<b>EEE3017W</b>	Digital Electronics .....	16
<b>EEE3055F</b>	Electromagnetic Engineering .....	20
<b>EEE3057S</b>	Power Engineering .....	20
<b>EEE3068F</b>	Electronic Circuits .....	12
<b>EEE3069W</b>	Control Engineering .....	20
<b>EEE3073S</b>	Professional Communication Studies .....	12
<b>EEE3080F</b>	Communications Network and System Fundamentals .....	20
<b>MEC2026S</b>	Project Management .....	8
	Total credits .....	140
<b>EEE3000X</b>	Practical Training	

**Third Year Optional Courses (EE)**

Number	Course	Credits
<b>EEE3064W</b>	Digital Electronics and Microprocessors .....	16
<b>EEE3071W</b>	Electronic Components, Circuits & Modules .....	16

**Fourth Year Core Courses (EE)**

Number	Course	Credits
<b>EEE4006F</b>	Professional Communication Studies .....	8
<b>EEE4022S/F</b>	Thesis Project .....	40
<b>EEE4036C</b>	Electrical Engineering Design .....	8
<b>EEE4051F</b>	New Venture Planning .....	8
<b>MEC4044Z</b>	Maintenance, Management and Reliability in Systems .....	8

**Fourth Year Elective Core Courses (EE)**

Choose three courses (60 credits) from the following:

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Number	Course	Credits
EEE4001F	Digital Signal Processing.....	20
EEE4002F	Telecommunications and Data Networks.....	20
EEE4026F	Digital Communication Engineering .....	20
EEE4084F	Digital Systems .....	20
EEE4086F	RF and Microwave Systems .....	20
EEE4089F	Power Distribution & Transmission Networks .....	20
EEE4090F	Power Systems Analysis Operation and Control .....	20
EEE4093F	Process Control and Instrumentation .....	20
EEE4099F	Power Electronics and Machines .....	20
	Total Credits.....	132

### 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.

Number	Course	Credits
EEE4003S	Broadband Networks .....	10
EEE4080C	Electrical Machines & Drives .....	8
EEE4096S	Neural Fuzzy & Evolving Systems .....	8
EEE4098F	Acoustics: Noise Control Engineering .....	12
HUB4045F	Introduction to Medical Imaging and Image Processing .....	12

### Programme for Technikon/University of Technology Transferees (EE)

The Senate criteria for granting course credits and exemptions to Technikon/University of Technology transferees entering the BSc(Eng) Electrical Engineering degree programme require Technikon students to have obtained a matriculation exemption 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 Mathematics IIA and Mathematics III in the New National Diploma examinations. Students who satisfy these criteria may be granted 144 credits (for the First Year) and exempted from MAM1003W (without admission to MAM2000W), EEE1004W, EEE2032F, EEE2033S and Second Year elective-core course requirements, and will take the following courses in their first year of registration:

#### First and Second Year Core Courses - Transferee programme

Number	Course	Credits
CSC1017F	Computing for Engineers 117 .....	16
EEE2035F	Signals and Systems I .....	12
EEE2036SF	Probability and Statistical Design in Engineering .....	12
MAM1045S	Modelling for Electrical Engineers .....	16
MAM2080W	Mathematics 280 .....	32
MEC1003F	Engineering Drawing .....	8
MEC2043F	Electrical and Mechanical Materials .....	12
PHY1031F	Physics of Natural Systems I .....	18
PHY2010S	Electromagnetism for Engineers .....	16
	Total Credits .....	142

#### Third and Fourth Year of the Transferee Programme

After completing the above courses, subject to rules FB8.2 students will be required to complete the prescribed Third and Fourth Year courses in the Electrical Engineering Programme.

### Conversion Programme for Science (BSc) Graduates (EE)

Suitably qualified Science (BSc) graduates entering the BSc(Eng) Electrical Engineering degree programme are granted 288 credits and are required to complete the following courses amounting to

a value not less than 288 credits in 2 years. Science graduates who do not satisfy the required entry criteria for the 2-year programme may follow a 3 year programme prescribed by the Department.

### First Year of the Conversion programme

Number	Course	Credits
EEE2035F	Signals and Systems I.....	12
EEE3017W	Digital Electronics .....	16
EEE3057S	Power engineering .....	20
EEE3068F	Electronic Circuits .....	12
EEE3055F	Electromagnetic Engineering .....	20
EEE3069W	Control Engineering .....	20
EEE3073S	Professional Communication Studies .....	12
EEE3080F	Communications Network and System Fundamentals .....	20
MEC1003F	Engineering Drawing .....	8
	Total credits.....	136
EEE3000X	Practical Training	

### Optional Course

Number	Course	Credits
EEE3071W	Electronic Components, Circuits and Modules .....	16

### Second Year of the Conversion Programme

After completing the above courses, subject to rules FB8.2 students will be required to complete the prescribed Fourth Year courses in the Electrical Engineering Programme.

## Electrical and Computer Engineering Programme (EC)

### Professor and Programme Convenor:

MR Ingg, PrEng BSc (Hons) *Rhodes* PhD *London* MIEEE

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 to build valuable engineering roles in modern industry. Apart from receiving a thorough grounding in both electrical engineering and computing, the Electrical and Computer Engineering student at UCT will gain a foundation of understanding in physical science, advanced engineering mathematics, microcomputer technology and systematic engineering design.

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

The Electrical and Computer Engineering Programme is administered as a distinct Programme within the Department of Electrical Engineering, and student advice specific to the needs of Electrical and Computer Engineering undergraduates is available to students on the Programme.

## Electrical and Computer Engineering Curriculum (EC)

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

## 122 PROGRAMMES OF STUDY

### First Year Core Courses (EC)

Number	Course	Credits
CAS1001S	Culture, Identity and Globalization in Africa.....	8
CSC1015F	Computer Science for Engineers 115 .....	18
CSC1016S	Computer Science for Engineers 116 .....	18
EEE1004W	Engineering I .....	32
MAM1003W	Mathematics 103 .....	32
MEC1003F	Engineering Drawing .....	8
PHY1010W	Physics 110 .....	32
	Total credits .....	148
EEE1000X	Practical Training	

### Second Year Core Courses (EC)

Number	Course	Credits
CSC2001F	Computer Science 201 .....	24
CSC2002S	Computer Science 202 .....	24
EEE2035F	Signals and Systems 1.....	12
EEE2037W	Fundamentals of Electronic Engineering .....	32
EEE2038W	Fundamentals of Electrical Engineering .....	24
MAM2080W	Mathematics 280 .....	32
	Total credits .....	148

### Third Year Core Courses (EC)

Number	Course	Credits
CSC3012Z	Operating Systems 1 .....	8
CSC4015Z	Operating Systems 2 .....	10
EEE2036F	Probability & Statistical Design in Engineering.....	12
EEE3063F	Transmission Lines .....	10
EEE3064W	Digital Electronics & Microprocessors .....	16
EEE3073S	Professional Communication Studies.....	12
EEE3074W	Embedded Systems.....	20
EEE3080F	Communications Network and System Fundamentals .....	20
MEC2026S	Project Management .....	8
EEE3000X	Practical Training	

### Third Year Elective Core Courses (EC)

Select at least one of the following. (Note: These are pre-requisites for Fourth Year Elective Core Courses. Other courses are required to make up the normal load, 144 credits.)

Number	Course	Credits
EEE3057S	Power Engineering .....	20
EEE3069W	Control Engineering .....	20
	Total credits .....	136

### Fourth Year Core Courses (EC)

Number	Course	Credits
EEE4006F	Professional Communication Studies.....	8
EEE4022S/F	Thesis Project .....	40
EEE4036C	Electrical Engineering Design .....	8
EEE4051F	New Venture Planning .....	8
EEE4084F	Digital Systems .....	20
MEC4044Z	Maintenance Management and Reliability in Systems .....	8



**Fourth Year Elective Core Courses (EC)**

Choose two courses from the following:

Number	Course	Credits
EEE4001F	Digital Signal Processing.....	20
EEE4002F	Telecommunications and Data Networks .....	20
EEE4026F	Digital Communication Engineering .....	20
EEE4086F	RF & Microwave Systems .....	20
EEE4089F	Power Distribution and Transmission Networks.....	20
EEE4090F	Power Systems Analysis Operation and Control .....	20
EEE4093F	Process Control and Instrumentation .....	20
EEE4099F	Power Electronics and Machines .....	20
	Total credits.....	132

**Fourth Year Optional Courses (EC)**

Number	Course	Credits
EEE4003S	Broadband Networks .....	10
HUB4045F	Introduction to Medical Imaging and Image Processing .....	12

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

**Mechatronics Programme (ME)****Professor and Programme Convenor:**

JC Tapson, BSc BSc(Eng) PhD *Cape Town* MIEE

Mechatronics is an interdisciplinary branch of engineering which combines a fundamental study 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, systematic engineering design and some principles of engineering management. In addition, the Mechatronics Programme offers final-year optional courses in related fields, such as bio-medical engineering, 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.

**Mechatronics Curriculum (ME)**

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

## 124 PROGRAMMES OF STUDY

### First Year Core Courses (ME)

Number	Course	Credits
CAS1001S	Culture, Identity and Globalization in Africa.....	8
MAM1003W	Mathematics 103 .....	32
MAM1042S	Engineering Statics .....	16
MEC1003F	Engineering Drawing .....	8
EEE1004W	Engineering I .....	32
PHY1010W	Physics 110 .....	32
EEE1000X	Practical Training	

### First Year Elective Core Courses (ME)

Number	Course	Credits
CSC1017F*	Computer Science for Engineers 117 .....	16
<i>or</i>		
EEE1003W*	Computing for Electrical Engineers .....	16
	Total credits .....	144

\* EEE1003W is an introductory course for students with little or no computer background while CSC1017F is a more advanced course that allows for conditional transfer to the Electrical and Computer Engineering programme.

### Second Year Core Courses (ME)

Number	Course	Credits
EEE2037W	Fundamentals of Electronic Engineering .....	32
EEE2038W	Fundamentals of Electrical Engineering .....	24
EEE2035F	Signals and Systems I .....	12
MAM2080W	Mathematics 280 .....	32
MEC2022S	Thermofluids 1 .....	16
MEC2023F	Dynamics 1 .....	16
MEC2043F	Electrical & Mechanical Materials .....	12
	Total credits .....	144

### Third Year Core Courses (ME)

Number	Course	Credits
EEE2036F	Probability and Statistical Design in Engineering .....	12
EEE3017W	Digital Electronics .....	16
EEE3031S	Energy Utilisation .....	8
EEE3040F	Electronic Circuits .....	20
EEE3061W	Mechatronics Design I .....	12
EEE3069W	Control Engineering .....	20
EEE3073S	Professional Communication Studies.....	12
MEC2025F	Mechanics of Solids .....	12
MEC2026S	Project Management .....	8
MEC3031S	Dynamics II .....	16
MEC3035S	Computer Integrated Manufacture & Robotics .....	8
	Total credits .....	144
EEE3000X	Practical Training	

### Third Year Optional Course (ME)

Number	Course	Credits
EEE3080F	Communications Network and System Fundamentals .....	20

### Fourth Year Core Courses (ME)

Number	Course	Credits
EEE4006F	Professional Communication Studies.....	8

EEE4022S/F	Thesis Project .....	40
EEE4036C	Electrical Engineering Design .....	8
EEE4051F	New Venture Planning .....	8
EEE4093F	Process Control & Instrumentation .....	20
EEE4099F	Power Electronics and Machines .....	20
MEC4044Z	Maintenance Management & Reliability in Systems .....	8
	Total credits .....	112

#### Fourth Year Optional Courses (ME)

Number	Course	Credits
EEE4098F	Acoustics: Noise Control Engineering .....	12
HUB4045F	Introduction to Medical Imaging and Image Processing .....	12
MEC3023F	Mechanics of Solids .....	12
MEC3068C	Functional Materials .....	8

Select other optional courses in Electrical Engineering or Mechanical Engineering to bring the credit total up to 576 credits.

## Postgraduate Programme

### Telecommunications

#### Professor and Convenor:

HA Chan, BSc *Hong Kong* PhD *Maryland* SMIEEE

The Department offers structured coursework in Telecommunications leading to the award of a Postgraduate Diploma or Masters Degree. An MEng(Telecom) candidate shall complete approved courses of a value not less than 120 credits in taught courses plus 60 credits in a research project. A PgDip(Telecom) candidate shall complete approved courses of a value not less than 120 credits. At least 90 of the 120 credits must be from the elective core courses.

#### Elective Core Courses

Number	Course	Credits
EEE5024Z	Satellite Technology .....	8
EEE5025Z	Wireless Data Network and Systems .....	15
EEE5026Z	Convergent Telecom and Data Networks .....	15
EEE5027Z	Network and Internet Security .....	15
EEE5028Z	Optical Communication Network .....	15
EEE5029Z	Broadband Communication Networks .....	15
EEE5030Z	Formal Methods and Analysis of Networks .....	15
EEE5032Z	Digital Communications .....	20
EEE5033Z	Advanced Topics in Communication and Network .....	12
EEE5051Z	Applications in Digital Signal Processing .....	10
EEE5044Z	Professional Communication Studies: Postgraduate .....	16

#### Elective Courses

Number	Course	Credits
EEE5005Z	Research Methods and Ethics .....	12
EEE5031Z	Data Modelling, Prediction and Optimisation .....	12
END5049Z	Research Communication and Methodology .....	16

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

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# MECHANICAL ENGINEERING

The Department offers the following Degree Programmes:

## **BSc (Eng) Degree Programmes in**

Electro-Mechanical Engineering

Mechanical Engineering

## **Postgraduate Programme**

Research projects and courses are offered through which suitably qualified graduates may qualify for the degrees of BSc Honours in Materials Science, MIndAdmin, MSc(Eng), MSc(ApplSci), MPhil(Eng), MEngMan and PhD. These areas of specialisation include:

Computational Mechanics

Engineering Management

Materials Engineering

Mechanical Engineering

Sustainable Energy Engineering

## **Research Entities:**

Blast Impact and Survivability Research Unit (BISRU)

Centre for Materials Engineering

Centre for Research in Computational and Applied Mechanics (CERECAM)

Energy Research Centre (ERC)

Engineering Management

Sasol Advanced Fuels Laboratory

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:**

RB Tait, PrEng BSc(Hons) *Rhodes* MA *Oxon* BSc(Eng) PhD *Cape Town* M(SA)IMEchE

### **Professor and Deputy Head of Department:**

KF Bennett, PrEng BSc(Eng) *Cape Town* MSc CNAA PhD *Cape Town* F(SA)IMEchE

### **Professors:**

CI Lang, BSc PhD *Cape Town*

GN Nurick, PrEng MSc(Eng) *Natal* PhD *Cape Town* F(SA) IMechE MASME

C Redelinghuys, PrEng BEng(Hons) *Stell* MS *Stanford* PhD *Stell*

### **Adjunct Professor:**

ADB Yates, BSc(Eng) MSc(Eng) PhD *Cape Town* *Cape Town* M(SA)IMEchE

### **Associate Professors:**

RD Knutsen, BSc PhD *Cape Town*

AT Sayers, PrEng EurIng BSc(Mech Eng) *City Univ Lond* MSc *Birmingham* PhD *Cape Town*

MIMEchE CEng M(SA)IMEchE

### **Senior Lecturers:**

TJ Cloete, MIng *Stell*

GS Langdon, BEng PhD *Liverpool* AMIMechE  
 S Marais, MSc(Eng) *Cape Town*  
 HT Pearce, BSc(Eng) *Cape Town* MS PhD *Illinois*  
 BI Reed, PrEng MSc(Eng) *Cape Town* M(SA)IMechE SAARMSTE ASEE  
 G Vicatos, PrEng BSc(MechElec)(Marine) *Newcastle* MSc(Aero) DIC *London* PhD *Cape Town*

**Lecturers:**

D Findeis, MSc(Eng) *Cape Town* M(SA)IMech  
 CB Shaw, MPhil *Cape Town*  
 R Wood, Dip. Ed. *London* HDE *Unisa*

**Part-Time Lecturer:**

Adv J Evans

**Senior Research Officer:**

S Oorder, MIng DIng *RAU*

**Teaching Assistants:**

Mr J Coulter BSc(Eng) *Cape Town*  
 Mr J D'Arcy-Evans, PrEng BSc(Eng) *London* MIMechE, SAIRAC  
 Mr BH Muller, Maschinenbau Ingenieur F H *Heidenheim*  
 Mr H Nieuwmeyer, PrEng BSc(Eng) *Cape Town*  
 Mr M Shelley

**Principal Technical Officers:**

Mr J Mayer  
 Mr G Newins  
 Mr L Watkins

**Chief Technical Officers:**

Mr H Emrich  
 Mr H Tomlinson

**Laboratory Attendants:**

Mr P Jacobs  
 Mr S Johannes  
 Mr W Slaverse  
 Mr S Swigelaar

**Administrative Assistants:**

Mrs CA Bloomer  
 Ms T Dlakiya, BAdmin *UWC*

**Senior Secretary:**

Mrs S Batho

**Undergraduate Programmes**

The undergraduate BSc(Eng) degree programmes in Mechanical Engineering and Electro-Mechanical Engineering have a common First and Second Year Curriculum.

Note: Students make a choice of which programme to pursue prior to the beginning of their Third Year of study.

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### Common First Year Core Courses

Number	Course	Credits
CEM1008F	Chemistry for Engineers .....	16
MAM1003W	Mathematics 103 .....	32
MAM1042S	Engineering Statics .....	16
MEC1002W	Engineering Drawing .....	16
MEC1004W	Engineering I .....	32
PHY1010W	Physics 110 .....	32
	Total credits .....	144
MEC1000X	Practical Training	

### Common Second Year Core Courses

Number	Course	Credits
EEE2030F	Electrical Engineering I .....	12
EEE2031S	Electrical Engineering II .....	12
MAM2080W	Mathematics 280 .....	32
MEC2020W	Design I .....	32
MEC2022S	Thermofluids I .....	16
MEC2023F	Dynamics I .....	16
MEC2025F	Mechanics of Solids .....	12
MEC2042F	Materials Science in Engineering .....	12
	Total credits .....	144
MEC2000X	Practical Training	

## Electro-Mechanical Engineering Programme

The Programme in Electro-Mechanical Engineering mainly comprises courses selected from the Electrical Engineering and Mechanical Engineering curricula. The Programme aims to provide an educational approach where emphasis is placed on integrated studies and on the production of graduates who are generalists, rather than specialists, in the broad area of professional engineering practice associated with the processing and manufacturing industries. It also aims to meet the increasing demand for engineers with cross-discipline skills, particularly in the fields of robotics, flexible manufacturing and electromechanical power systems. Whilst encompassing a wide range of fundamental engineering science courses, predominantly from the disciplines of Electrical and Mechanical Engineering, the Programme's curriculum also includes important components from the field of Industrial and Project Management, that gives students in the later years some measure of choice in the selection of courses to meet their needs after graduation. The Electro-Mechanical Degree was originally developed at the request of a number of companies who felt that there was a need for a graduate of this nature. Many of these companies still offer several bursaries to students registered for the Programme.

### Programme Convenor:

BI Reed, PrEng MSc(Eng) *Cape Town* M(SA)IMechE SAARMSTE ASEE

Following the common First/Second Years of Curriculum 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.

### Third Year Core Courses

Number	Course	Credits
EEE3044S	Energy Conversion and Utilization .....	8
EEE3061W	Mechatronics Design I .....	12
EEE3062F	Digital Electronics .....	12
EEE3070S	Measurement and Microprocessors .....	8
MAM2082F	Computer Programming in Matlab .....	8

<b>MEC2026S</b>	Project Management .....	8
<b>MEC3023F</b>	Mechanics of Solids .....	12
<b>MEC3031S</b>	Dynamics II .....	16
<b>MEC3033F</b>	Thermofluids II .....	20
<b>MEC3035F</b>	Computer Integrated Manufacture and Robotics .....	8
<b>MEC3037S</b>	Professional Communication Studies and Development .....	12
<b>MEC3050W</b>	Design II .....	24
	Total credits .....	148
<b>MEC3000X</b>	Practical Training .....	

#### **Fourth Year Core Engineering Courses**

Number	Course	Credits
<b>EEE4013F</b>	Control Systems .....	8
<b>MEC4053Z</b>	Measurement and Control in Engineering Systems .....	16
<b>MEC4055Z</b>	Design III .....	16
<b>MEC4061F/Z</b>	Individual Laboratory/Research Project .....	48

#### **Fourth Year Core Complementary Studies Course**

Number	Course	Credits
<b>MEC4063C</b>	Industrial Ecology.....	8

#### **Fourth Year Elective Complementary Studies Courses**

Number	Course	Credits
<b>MEC4022F</b>	Industrial Law .....	8
<b>MEC4042Z</b>	Industrial Management.....	8
<b>MEC4051F</b>	New Venture Planning .....	8
<b>MEC4054Z</b>	Quality Reliability and Maintenance Management.....	12
<b>MEC4063C</b>	Industrial Ecology.....	8

Students must select a minimum of 24 credits of Complementary Studies courses from the list above, or with the approval of the Programme Convenor, any course offered by faculties other than the Faculty of Engineering & the Built Environment and the Faculty of Science, as long as such courses meet ECSA's definition of a complementary studies course.

#### **Fourth Year Elective Core Courses**

Any third or fourth level courses offered by the Departments of Mechanical or Electrical Engineering are suitable for inclusion as elective courses if the prerequisites for the courses are satisfied and they can be fitted into the timetable without clashes. These are listed in the 'Courses Offered' section of this handbook under EEE and MEC. Students must select sufficient elective courses to bring their total to at least 576 credits.

## **Mechanical Engineering Programme**

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

#### **Associate Professor and Programme Convenor:**

AT Sayers, PrEng Eurling BSc(Mech Eng) *City Univ Lond* MSc *Birmingham* PhD *Cape Town*  
MIMechE CEng M(SA)IMechE

Following the common First/Second Years of Curriculum a candidate shall complete approved

## 130 PROGRAMMES OF STUDY

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

### Third Year Core Courses

Number	Course	Credits
EEE3044S	Energy Conversion and Utilisation .....	8
MAM2082F	Computer Programming in Matlab .....	8
MEC2026S	Project Management .....	8
MEC3023F	Mechanics of Solids .....	12
MEC3031S	Dynamics II .....	16
MEC3033F	Thermofluids II .....	20
MEC3037S	Professional Communication Studies and Development .....	12
MEC3044S	Thermofluids III .....	12
MEC3045F	Experimental Methods.....	12
MEC3050W	Design II .....	24
	Total credits .....	132
MEC3000X	Practical Training	

### Elective Core Courses:

At least one, but not more than two courses must be chosen from the following:

Number	Course	Credits
MAM3080F	Numerical Methods .....	12
MEC3014S	Production Systems .....	8
MEC3060F	Materials Under Stress .....	8

Note: If only one 8 credit elective core course is selected at this stage, students will be 4 credits short of the norm of 144 credits per annum, and will obtain only 140 credits in this third year. They will then be required to undertake 148 credits in fourth year to bring their total to at least 576 for the degree.

### Fourth Year Core Courses

Number	Course	Credits
MEC4055Z	Design III. ....	16
MEC4061F/Z	Individual Lab/Research Project .....	48
MEC4063C	Industrial Ecology.....	8
	Total credits .....	72

### Elective Core Courses:

Students must select sufficient Elective Core Engineering and Elective Complementary Studies Courses to bring their total to at least 576 credits. Of the courses selected, a minimum of 48 credits of Elective Core Engineering Courses must be chosen from the Fourth Year Elective Core Course List. In addition, students must select a minimum of 24 credits of Elective Complementary Studies Courses. These may be selected from the Fourth Year Elective Complementary Studies Course List below, or can also be chosen from suitable courses offered outside the EBE and Science Faculties.

### Fourth Year Elective Core Courses:

Number	Course	Credits
EEE4013F	Control Systems .....	8
EEE4098F	Noise Control Engineering .....	12
MEC4035F	Fracture Mechanics .....	8
MEC4036C	Power Plant .....	8
MEC4045F	Numerical Methods in Heat and Fluid Flow .....	12
MEC4047F	Mechanical Vibrations .....	12
MEC4048F	Advanced Heat Transfer .....	12



<b>MEC4049F</b>	Turbomachines .....	8
<b>MEC4062Z</b>	Air Conditioning and Refrigeration .....	12
<b>MEC4065F</b>	Finite Elements in Mechanical Design .....	16
<b>MEC4087Z</b>	Failure Analysis .....	8
<b>MEC4088F</b>	Manufacturing with Materials .....	12
<b>MEC4092F</b>	Internal Combustion Engines .....	12

#### Elective Complementary Studies Courses:

Number	Course	Credits
<b>MEC4022F</b>	Industrial Law .....	8
<b>MEC4042Z</b>	Industrial Management .....	8
<b>MEC4051F</b>	New Venture Planning .....	8
<b>MEC4054Z</b>	Quality, Reliability and Maintenance Management .....	12

## Postgraduate Programme

### Computational Mechanics

The Department offers the following courses in Computational Mechanics. This area of study is truly interdisciplinary and is available to all postgraduate students in the Faculty.

#### Professor and Convenor:

GN Nurick, PrEng MSc(Eng) *Natal* PhD *Cape Town* F(SA)IMEchE MASME

Number	Course	Credits
<b>MEC5063Z</b>	An Introduction to Finite Elements .....	12
<b>MEC5064Z</b>	Finite Element Analysis .....	16
<b>MEC5065Z</b>	Engineering Software Design & Development .....	12
<b>MEC5066Z</b>	Continuum Mechanics .....	12
<b>MEC5067Z</b>	Non-linear Material Behaviour .....	12
<b>MEC5068Z</b>	Topics in Computational and Applied Mechanics .....	12
<b>MEC5069Z</b>	Computational Fluid Dynamics: A First Course .....	12

### Engineering Management

The Department offers structured coursework in Manufacturing Management Development and Systemic Management Development leading to the award of a Postgraduate Diploma or Masters Degree.

#### Systemic Management Development

**Convenor:** CB Shaw, MPhil *Cape Town*

Candidates whose programmes include coursework are required to complete courses from the list of elective-core courses listed below, to be selected in consultation with the Programme Convenor.

Number	Course	Credits
<b>MEC5035Z</b>	Project Management .....	20
<b>MEC5036Z</b>	Managing for Performance Improvement .....	20
<b>MEC5037Z</b>	Operations Management Project.....	20
<b>MEC5038Z</b>	Engineering Management Technical Report (for PGDipl candidates) .....	40
<b>MEC5046Z</b>	Systems Engineering Practice .....	40
<b>MEC5054Z</b>	Introduction to Business Administration .....	40
<b>MEC5095Z</b>	Engineering Management Research Project (for Masters candidates) .....	60
<b>MEC5080Z</b>	Managing New Venture Projects .....	20

## Materials Science

The Department offers a BSc(Hons) in Materials Science to **graduates with a three-year Bachelor of Science degree**. The aim is to provide one year of intensive training in Materials Science and Technology. The broad-based instructional approach prepares graduates for careers in a wide range of industrial settings, from small manufacturing companies to large corporations producing bulk commodity products, and R&D laboratories. In addition the BSc(Hons) in Materials Science programme prepares students for registration for research degrees in Materials Engineering at the Masters and ultimately Doctoral levels.

The programme runs over one year, with students taking a structured programme of **144 credits** of coursework, including a project, as follows.

### Programme Convenor:

K Marcus, BSc(Hons) PhD *Cape Town MBA Stell*

### Core Courses

Number	Course	Credits
<b>MEC4091S</b>	Materials Science Laboratory Project .....	48
<b>MEC5076Z</b>	Polymeric Materials.....	12
<b>MEC5077Z</b>	Composite Materials.....	12
<b>MEC5078Z</b>	Ceramic Materials.....	8
<b>MEC5079Z</b>	Metallic Materials.....	16

### Elective Core Courses

Select 48 credits from the following courses:

Number	Course	Credits
<b>MEC3037S</b>	Professional Communication Studies and Development.....	12
<b>MEC3060F</b>	Materials under Stress.....	8
<b>MEC3068C</b>	Functional Materials.....	8
<b>MEC4085F</b>	Fracture Mechanics.....	8
<b>MEC4087Z</b>	Failure Analysis.....	8
<b>MEC4088F</b>	Manufacturing with Materials.....	12
<b>MEC5073Z</b>	Phase Transformations.....	8

## Sustainable Energy Engineering

The Energy Research Centre offers a structured Masters Programme in Sustainable Energy Engineering. Students are required to complete 80 credits of course work, the courses being chosen from the list below. To qualify for the degree in MSc(Eng), candidates are required to complete a supervised dissertation, equivalent to a further 120 credits, the topic of which requires the approval of the Director of the ERC.

### Professor and Convenor:

KF Bennett, PrEng BSc(Eng) *Cape Town* MSc CNA A PhD *Cape Town* F(SA)IMechE

### Compulsory Course

Number	Course	Credits
<b>MEC5091Z</b>	Introduction to Energy Policy & Sustainable Energy Engineering .....	20

**Elective Courses** (60 credits must be selected from the following list)

Number	Course	Credits
<b>MEC5049S</b>	Advanced Refrigeration .....	12
<b>MEC5056Z</b>	Energy Efficient and Demand Side Management .....	20
<b>MEC5059Z</b>	Energy Modelling .....	20

<b>MEC5062Z</b>	Power Production Systems .....	20
<b>MEC5075Z</b>	New & Renewable Energy Technologies .....	20
<b>MEC5085Z</b>	Engines and the Environment.....	12
<b>MEC5089Z</b>	Energy Project .....	20

## Energy & Development Studies

The Energy Research Centre offers a structured Masters Programme Energy Studies. Students are required to complete 80 credits of course work, the courses being chosen from the list below. To qualify for the degree in MSc(Eng), candidates are required to complete a supervised dissertation, equivalent to a further 120 credits, the topic of which requires the approval of the Director of the ERC.

### Professor and Convenor:

KF Bennett, PrEng BSc(Eng) *Cape Town* MSc CNAA PhD *Cape Town* F(SA)IMechE

### Compulsory Course

Number	Course	Credits
<b>MEC5091Z</b>	Introduction to Energy Policy & Sustainable Energy Engineering .....	20

### Elective Courses (60 credits must be selected from the following list)

Number	Course	Credits
<b>MEC5059Z</b>	Energy Modelling .....	20
<b>MEC5075Z</b>	New & Renewable Energy Technologies .....	20
<b>MEC5087Z</b>	Energy Markets & Governance .....	20
<b>MEC5088Z</b>	Energy Poverty & Development .....	20
<b>MEC5089Z</b>	Energy Project .....	20
<b>MEC5090Z</b>	Energy & Climate Change .....	20

## Research Entities

### Blast Impact & Survivability Research Unit (BISRU)

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

### Centre for Materials Engineering

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

### Centre for Research in Computational & Applied Mechanics (CERECAM)

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

## Engineering Management

This unit engages in multidisciplinary research which includes the fields of Management education, Operations and Project management, Strategic management, Organisational practice, Systemic organisational design and development, Quality and productivity management, Management of knowledge and technology, Decision support and policy formulation.

Research is focussed with a view to broadening and deepening the thinking and understanding of issues such as the emerging global and digital economy which coupled to the democratisation of society and our institutions affect the nature of work. The aim is to develop innovative and appropriate approaches, which will be more relevant to the context in which we find individuals in society. Research is conducted in the following areas: Systemic organisational design and development; Operations and project management; Quality and productivity management;

Management of knowledge and technology; Strategic management; and Decision support and policy formulation.

**Associated Academic Staff:**

CB Shaw, MPhil *Cape Town*

**Energy Research Centre (ERC)**

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

**Sasol Advanced Fuels Laboratory (SASOL)**

See Centres and Units Established in the Faculty of Engineering & the Built Environment.

# ACADEMIC DEVELOPMENT IN THE FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

## ASPECT Co-ordinator:

HT Pearce, BSc(Eng) *Cape Town* MS PhD *Illinois*

## Lecturers:

P le Roux, BSc(Eng) PGDipEd(HES) *Cape Town*

N Mustapha, BSc(Hons) HDE(PG)Sec MSc PhD *Cape Town*

KR Kanjee, MSc(Eng) *Cape Town*

## Part Time Lecturer:

E Vicatos, BA(Hons) *Natal*

## Administrative Staff:

Mrs L Nkomo

## The ASPECT Programme

The Academic Support Programme for Engineering in Cape Town (ASPECT) is designed for students who matriculate from schools, particularly those from the ex-DET school system, that have not prepared them adequately for tertiary study. The Programme tries to provide a supportive environment that is sensitive to students' academic, social and emotional needs. The curriculum is planned so that the degree should take five years to complete.

In the First Year, students register for three full credit-bearing courses all counting towards the degree. These are Mathematics I, Physics I and Engineering I. These are the same courses as are taken by students registered for the 4 year degree. The Mathematics course is taught by staff in ASPECT; the Physics lectures are conducted by ASPECT staff, while the laboratory sessions are offered by the Physics department. Students also take an Introduction to Communication course, run by ASPECT staff.

Students who continue with engineering at UCT will complete, in their second year, the remaining first year courses, one major second year course, namely the Mathematics course for engineers, and up to two courses from the second year engineering curriculum. ASPECT will provide additional tutorial and non-academic support during this year.

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.

## ASPECT Curriculum

### First Year Courses

Number	Course	Credits
END1007W	Mathematics .....	32
END1008Z	Introduction to Communication .....	8
PHY1011W	Physics 111 .....	32

## 136 PROGRAMMES OF STUDY

### Elective Courses

Number	Course	Credits
<b>CHE1004W</b>	Engineering I (Chemical).....	32
<i>or</i>		
<b>CIV1004W</b>	Engineering I (Civil) .....	32
<i>or</i>		
<b>EEE1004W</b>	Engineering I (Electrical) .....	32
<i>or</i>		
<b>MEC1004W</b>	Engineering I (Mechanical) .....	32

The Engineering I course to be selected will depend on the engineering discipline that the student chooses.

### Second Year Courses

Number	Course	Credits
<b>MAM2080W</b>	Mathematics 280 .....	32
<b>MEC1002W</b>	Engineering Drawing .....	16

### Elective Core Courses

Number	Course	Credits
<b>CEM1000W</b>	Chemistry .....	36
<i>or</i>		
<b>CSC1017F</b>	Computer Science for Engineers .....	16
<i>and</i>		
<b>MAM1045S</b>	Modelling & Programming with MATLAB for Electrical Engineers .....	16
<i>or</i>		
<b>CSC1015F</b>	Computer Science 1A .....	18
<i>and</i>		
<b>CSC1016S</b>	Computer Science 1B .....	18
<i>or</i>		
<b>CEM1008F</b>	Chemistry 108 .....	16
<i>and</i>		
<b>MAM1042S</b>	Engineering Statics .....	16

The elective core and the remaining second year courses will depend on the engineering discipline to which the student is admitted. The student should see the relevant pages in the departmental entry in this handbook for further information.

## CENTRES AND OTHER ENTITIES ESTABLISHED IN THE FACULTY

### Centres and Units Accredited by the University Research Committee

#### Centre for Catalysis and DST-NRF Centre of Excellence

Industrial catalysis research was initiated in the Department of Chemical Engineering in 1980 and was formally established as a Research Unit within the University in the mid-1980's. Funding comes from a variety of sources including the University, the National Research Foundation (NRF), Technology & Human Resources for Industry Program (THRIP), and several industrial sponsors. Industrial contract research from both domestic and international companies contributes substantially to the Unit'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 Unit has a strong commitment to addressing issues of direct importance to the South African Chemical Process Industry.

The main fields of investigation within the unit cover Fischer-Tropsch synthesis, zeolites and molecular sieves, catalysis by gold, hydrocracking and phenolics conversion. The unit offers a MSc(Eng) degree involving coursework, and research degrees at PhD level.

#### Professor and Director:

JCQ Fletcher, BSc(Eng)Chem, PhD *Cape Town*

#### Associated Academic Staff:

Professor CT O'Connor, PrEng BSc *Unisa* STD *Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAICHe FSAAE FRSSAf

Honorary Professor ME Dry, MSc *Rhodes*, PhD *Bristol*

Professor E van Steen, MSc(Eng) *Eindhoven*, PhD *Karlsruhe*

Honorary Associate Professor M Claeys, Dipl.Ing (Chem Eng), DIng *Karlsruhe*

L Callanan, BSc(Eng)Chem, PhD *Cape Town*

Associate Professor KP Möller, BSc(Eng)Chem, PhD *Cape Town*

W Böhringer, Dipl.Chem *Karlsruhe*

#### Centre for Research in Computational & Applied Mechanics (CERECAM)

The Centre for Research in Computational and Applied Mechanics (CERECAM) is a multi-departmental and multi-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, and mechanical engineering, and applied mathematics. Research in the area of solid and structural mechanics focusses 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, BSc(Eng) *Cape Town* PhD *Cantab* FRSSAf

**Associated Academic Staff:**

Professor AE Lewis, PrEng, BSc(Chem Eng) MSc (Eng) PhD *Cape Town*, MSAICH  
Professor GN Nurick, PrEng MSc(Eng) *Natal* PhD *Cape Town* F(SA)IMEchE MASME  
Professor RB Tait, BSc(Hons) *Rhodes MA Oxon* BSc(Eng) PhD *Cape Town*  
Professor A Zingoni, BSc(Eng) *Zimbabwe* MSc(Eng) *London* DIC PhD *London* CEng MIStructE  
FZwele  
Associate Professor DA Deglon BSc (Eng) *Witwatersrand* PhD *Cape Town* MSAIMM  
Associate Professor AT Sayers, PrEng EurIng BSc(Mech Eng) *City Univ Lond* MSc *Birmingham*  
PhD *Cape Town* MIMechE CEng M(SA)IMEchE  
TJ Cloete, MIng *Stell*  
A Masarira, Dr-Ing Weimar MSAICE MSAISC  
P Moyo BSc(Eng) *Zimbabwe* MSc(Eng) *Newcastle upon Tyne* PhD *Nanyang*  
TG Myers, BSc(Hons) *Leicester* PhD *Leeds*  
F Scheele, Dr Ing *Munich*

**Research Staff:**

I Govender, BSc *UDW HDE UNISA* BSc(Hons) PhD *Cape Town*

**Administrative Assistant:**

Ms OJ Goodhind

## **Centre for Materials Engineering**

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 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. 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.

**Director:**

Associate Professor RD Knutsen, BSc PhD *Cape Town*

**Associated Academic Staff:**

Professor RB Tait, PrEng BSc(Hons) *Rhodes MA Oxon* BSc(Eng) PhD *Cape Town* M(SA)IMEchE  
Professor CI Lang, BSc PhD *Cape Town*

**Senior Research Officer:**

K Marcus, BSc(Hons) PhD *Cape Town* MBA *Stell*

**Scientific Officer:**

P Park-Ross

**Secretary:**

Mrs N Africa

**Laboratory Assistant:**

Mrs FD Young



## Centre for Minerals Research

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 both Mechanical and Electrical Engineering. 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:

CT O'Connor, PrEng BSc *Unisa STD Natal* BSc(Hons) PhD *Cape Town* DEng *Stell* FSAIMM FSAICHe FSAAE FRSSAF

### Associated Academic Staff:

Emeritus Professor G de Jager, MSc *Rhodes* PhD *Manchester* MBL SA MIEEE

Adjunct Professor PG Gaylard, PrEng BSc (Eng) *Witwatersrand*

Adjunct Professor PJ Harris, BSc (Hons) PhD *Witwatersrand*

Honorary Professor J-P Franzidis, BSc (Chem Eng) MSc (Eng) *Cape Town*, PhD *Open*, MSAICHe MSAIMM

Honorary Associate Professor DJ Bradshaw, BSc(Eng) PhD *Cape Town*

I Govender, BSc *UDW HDE UNISA* BSc(Hons) PhD *Cape Town*

MC Harris, MSc(Eng) *Cape Town*

AN Mainza, BSc *Zambia* PhD *Cape Town* MSAIMM

PJ Meyer, MEng PhD *Stell*

F Nicholls, MSc(Eng) PhD *Cape Town*

LAS Parolis, BPharm, PhD *Rhodes*

J Sweet BSc(Eng) MSc *Cape Town*

A van der Westhuizen, BEng *Stell* MSc(Eng) *Cape Town* MSAIMM .

### Research Staff:

M Becker, MSc *Cape Town*

R Chandramohan, MSc(Eng) *Cape Town*

J Waters, BTech *Cape Technikon*

JG Wiese

### Administrative Staff:

Ms H Sundström

Ms N Davies

Ms J Le Cash

See under Courses Offered for course details. The course code abbreviation for Chemical Engineering is **CHE**.

## Centre for Research in Engineering Education

### Director:

JM Case, BSc (Hons) *Stell* HDE *Cape Town* MEd *Leeds* PhD *Monash*

### Administrative Staff:

Ms Z Geyer, BA *Cape Town*

**Associated Academic Staff:**

Professor D McK Fraser, BSc (ChemEng) PhD *Cape Town* MSAICHÉ

Mr J Jawitz, BSc (Hons) HDE (PG) Sec. MPhil *Cape Town*

Dr HT Pearce, BSc(Eng) *Cape Town* MS PhD *Illinois*

Mr BI Reed MSc(Eng) *Cape Town* M(SA)IMechE SAARMSTE ASEE

The Centre for Research in Engineering Education (CREE) was launched in September 1996 with the following aims:

- . to promote research that informs the development of the learning environment and educational process in engineering and related disciplines, in order to improve student learning and graduation rates, with specific reference to issues of race, gender and disadvantage;
- . to build the capacity of academic staff to undertake educational research in engineering and related disciplines as well as to implement the results of such research;
- . to disseminate the results of engineering education research and related disciplines through publications, seminars and conferences; and
- . to promote co-operation in engineering education and related disciplines regionally, nationally and internationally.

Current research projects are:

- . curriculum design using a systems approach;
- . learners' interaction with technology;
- . students' experiences of learning;
- . staff development;
- . student learning through computer simulation;
- . student success in engineering;
- . transformative learning;
- . recent graduates perceptions of the curriculum.

**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).

The ERC is a multi-disciplinary Centre that conducts high quality, targeted and relevant research as well as offering postgraduate opportunities at the Masters and PhD levels. Two Masters programmes are convened by the Centre, an MSc in Sustainable Energy Engineering and an MSc 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 focusses more on engineering graduates. These two streams comprise a coursework component and a dissertation component.

Students also have the option of registering for a masters 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:**

KF Bennett, PrEng BSc(Eng) *Cape Town* MSc CNA A PhD *Cape Town* F(SA)IMechE

**Energy & Climate Change Group Leader**

H Winkler, MSc *Berkeley* MA *Cape Town*

**Energy Economics Group Leader**

JC Nkomo, BSc(Hons) MSc PhD *Surrey*

**Energy Efficiency Group Leader:**

D van Es, PrEng BSc(Eng) *Cape Town* CEng

**Energy Modelling Group Leader:**

MI Howells, MSc(Eng) *Cape Town*

**Research Staff:**

WD Cowan, MA *Oxon* MPhil *Cape Town*

AG Hughes, BIng *Stell* MSc(Eng) *Cape Town*

MB Magwaca, Nat Dipl *Pentech*

P Monamodi, Nat Dipl *Pentech*

J Muller, Dipl Anal Chem *Cape Technikon*

S Mwakasonda, BSc(Eng) MBA *Dar es Salaam*

D Sparks, MSc PhD *Cape Town*

A Trikam, BSc(Eng) *Cape Town*

**Honorary Research Associate:**

PJD Lloyd, PrEng BSc(Eng) PhD *Cape Town*

**Project Manager:**

P Mukheibir, MSc(Eng) *Cape Town*

**Administrative and Support Staff:**

Ms S Adams

Ms A Steiner

**Receptionist:**

Ms B Matuba

**Publications & Media Staff:**

R Drummond, BSocSci MRCP *Cape Town* AAA DipCEA

T James, BA *Witwatersrand* PhD *Cape Town*

**Bioprocess Engineering Research Unit**

The Bioprocess Engineering Research Unit was formally constituted in 2001 cementing a long history of research in this field. It aims to underpin the growth and exploitation of biotechnology in South Africa through a national centre of expertise in bioprocess engineering. As such, the Unit maintains a productive balance between research centred on the application of biological principles through process development and on the fundamental understanding of biological processes and bioprocess engineering science at the mechanistic level and of the interaction of these processes with their environment.

**Professor and Director:**

STL Harrison, BSc (Hons) *Cape Town* PhD *Cantab* MSAICHe SASM FSAAE

**Associated Academic Staff:**

Emeritus Professor GS Hansford, BSc (Chem Eng) MSc *Cape Town* MSE PhD *Pennsylvania* CEng MIChemE FSAICHe FSAIMM

Professor SG Burton, BSc (Hons) *Zimbabwe*, PhD *Rhodes*, SASBMB, IUBMB, ASM, SGB, AAAS

J Petersen, BSc(Chemical Eng) *Witwatersrand* PhD *Cape Town*

R Rawatlal, BSc(Hons) PhD *KwaZulu-Natal*

R van Hille, BSc(Hons), PhD *Rhodes*

## **Blast Impact & Survivability Research Unit (BISRU)**

There is an ever-increasing potential for injuries and fatalities from blast events, 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 blast and impact loading and structural response. BISRU 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
- Underwater Blast Response
- Energy Absorbers
- Human Response
- Sporting Equipment

### **Professor and Director:**

GN Nurick, PrEng MSc(Eng) Natal PhD Cape Town HonF(SA) IMechE MASME

### **Associated Academic Staff:**

TJ Cloete, MIng *Stell*

GS Langdon, BEng *Liverpool* PhD *Liverpool* AMIMechE

### **Researchers:**

VH Balden, MSc(Eng) *Cape Town*

SA Oerder, MIng DIng *RAU*

**Website:** [www.bisru.uct.ac.za](http://www.bisru.uct.ac.za)

## **Crystallisation and Precipitation Research Unit**

Industrial crystallisation research was initiated in the Department of Chemical Engineering in 2000 and the Crystallisation and Precipitation Unit was formally accredited in 2006. Although industrial applications of crystallisation and precipitation have a long history and precipitation has been studied scientifically since the 1930's, understanding of this operation is still very limited. In this context, the main aim of the Unit is to advance existing fundamental knowledge in the fields of crystallisation and precipitation, especially related to the South African and International mineral processing and extractive metallurgy industries.

Particular interests of the research group are modelling and simulation approaches to industrial research, such as the particle rate process approach for modelling of industrial crystallisation processes; aqueous chemistry modelling and computational fluid dynamics modelling. All of these modelling techniques are aimed at deepening the understanding of these chemically complex, multiphase processes.

The ultimate objective of furthering this scientific understanding is in order to optimise and control industrial crystallisation and precipitation processes, including treatment of effluent streams. A particular interest of the research unit is in the modelling and treatment of hypersaline brines.

The Research Unit is also involved in the development and presentation of various continuing professional education courses. These courses satisfy the interest and demand for skills in this area from both an industrial as well as an academic standpoint.

**Professor and Director:**

AE Lewis PrEng MSc (Eng), PhD *Cape Town* MSAIChE

**Associated Academic Staff:**

Jeeten Nathoo MSc(Eng) *Cape Town*

**Sasol Advanced Fuels Laboratory (SASOL)**

Sasol's Fuels Research group at Sasolburg is world renowned for leading the local and international understanding of both High and Low Temperature Fischer-Tropsch (HTFT, LTFT) fuels in the different applications which include, amongst others, the automotive and aviation environments. The Sasol Advanced Fuels Laboratory at the University of Cape Town was set up with the following objectives:

- To actualise the future-oriented research initiatives that have been identified and classified as being of a high priority for the Sasol Fuels Research group.
- To derive a deeper understanding of the science and engineering of internal combustion engines and fuels so as to stimulate their application and to disseminate such knowledge to the mutual benefit of Sasol and the University.
- To develop human-resource capacity to meet the future needs of the Sasol Fuels Research group as well as providing for the fuel technology needs of South Africa as a whole.
- To elevate the group's international stature through technical publications and selected collaborations.

**Director and Projects Coordinator:**

Adjunct Professor ADB Yates, BSc(Eng) MSc(Eng) PhD *Cape Town* *Cape Town* M(SA)IMEchE

**Project Leaders:**

A Swarts, MSc(Eng) PhD *Cape Town*

P Schaberg, MSc(Eng) *Cape Town*

C Viljoen, MSc *Cape Town*

**Engineering Technician and Contractor:**

G Floweday, MSc(Eng) *Cape Town*

**Other Entities****Continuing Professional Development****Administrators:**

Ms C Mitchell BSocSci PGDipMan *Cape Town*

Ms H Tait BHE *Stell*

Ms M Winter

The CPD programme offers short courses, symposia and conferences. These provide a means for the ongoing 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 normal 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. The CPD web address is [www.cpd.uct.ac.za](http://www.cpd.uct.ac.za).

## **Geographical Information Systems Unit**

### **Administrators:**

Mr N Lindenberg, BSc(Hons) *Cape Town*

Mr T Slingsby, MSc(Eng) *Cape Town*

The UCT GIS Laboratory acts as a consulting & 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**

### **Convenor:**

J English BA MPhil *Cape Town*

### **Administrative Staff:**

Ms J Rumbelow

Professional Communication Studies (PCS) was established in 2004 in the Faculty of Engineering & the Built Environment. It evolved from the former Professional Communication Unit. The 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;
- 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](http://www.pcs.uct.ac.za)

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## **CENTRES, DEPARTMENTS, SCHOOLS AND UNITS ESTABLISHED IN OTHER FACULTIES**

The following pages list the centres, units, departments and schools in other faculties which offer courses or opportunities for research for students registered in the Faculty of Engineering & the Built Environment. (For further information on these centres, units, departments and schools refer to the Handbook of the Faculty concerned.)

### **Departments Established in the Faculty of Commerce**

#### **Accounting**

**Associate Professor and Head of Department:**

M Wormald, BCom (Hons) *Cape Town CA SA*

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code ACC.

#### **School of Economics**

**Associate Professor and Director of the School:**

M Ayogu, BA *Calif State* PhD *Ohio State*

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code ECO.

#### **School of Management Studies**

**John Garlick Professor of Business Science and Head of Department:**

JD Simpson, BSc MBA PhD *Cape Town*

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code BUS.

### **Centre Established in the Faculty of Humanities**

#### **Centre for African Studies**

**Professor and Director:**

B Cooper, MA *Birmingham* PhD *Sussex*

The Centre for African Studies is housed in the Harry Oppenheimer Institute Building, located on the Engineering Mall.

The course offered by the Centre for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code CAS.

## Department Established in the Faculty of Law

### Commercial Law

**Professor and Head of Department:**

M Larkin, BCom LLB HDip Company Law *Wits*

## Department Established in the Faculty of Health Sciences

### Human Biology

**Professor and Head of Department:**

SH Kidson, BSc(Hons) MSc PhD *Witwatersrand HDE (JCE)*

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. Courses offered are listed in the section (Undergraduate Courses - HUB).

## Departments and Unit Established in the Faculty of Science

### Astronomy

**Professor of Astronomy and Head of Department:**

RC Kraan-Korteweg, Diploma *Basle* PhD Phil II *Basle*

Courses which may be taken by registered students in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code AST.

### Chemistry

**Professor and Head of Department:**

AL Rodgers, MSc PhD *Cape Town*

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code CEM.

### Computer Science

**Professor and Head of Department:**

KJ MacGregor BSc *Strathclyde*, MSc *Glasgow*

Courses which may be taken by registered students in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code CSC.



## **Electron Microscope Unit**

**Associate Professor and Director:**

BT Sewell, MSc *Witwatersrand* PhD *Lond*

The Electron Microscope Unit is housed in the RW James Building at 9 University Avenue and provides scanning and transmission electron microscopy facilities for staff and research students in all faculties. The Unit has a LEO S440 scanning electron microscope equipped with an extensive range of accessories including an x-ray analyser, cathodoluminescence spectrometer and cryopreparative facility. The unit also has a LEO 912 EFTEM with in column energy filter and 2kX2k CCD camera to support tomographic applications in structural biology. Other microscopes in the Unit include the JEOL 200CX and JEOL 1200 EX II CRYO transmission electron microscopes and the Cambridge S200 scanning electron microscope. Associated preparative, darkroom, light microscopy and library facilities are also provided. Enquiries regarding the use of these facilities are welcome.

As digital imaging is used extensively in modern microscopy the Unit has established an Imaging Centre equipped with facilities for digitizing images on transparent media, image processing and analysis software and printing.

Courses in aspects of electron microscopy are offered to any University member who wishes to make use of the Unit's facilities for the purpose of research. Details of these courses, which are held throughout the year, may be obtained from the Unit. The Unit is also able to provide information and advice on a wide range of microscopy related topics. More detailed information is available at <http://emu0.uct.ac.za>

## **Environmental and Geographical Science**

**Professor and Head of Department:**

ME Meadows, BSc(Hons) *Sussex*, PhD *Cantab*, FSSAG

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course codes EGS and ERT. Refer also to the Science Faculty Handbook.

## **Geological Sciences**

**Chamber of Mines Professor of Geochemistry and Head of Department:**

C Harris, MA DPhil *Oxon*

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code ERT or GEO. Refer also to the Science Faculty Handbook.

## **Mathematics and Applied Mathematics**

**Associate Professor and Head of Department:**

CRA Gilmour, MSc PhD *Cape Town*

The courses offered by the department for students registered in the Faculty of Engineering & the Built Environment are described in the Courses Offered section of this Handbook under the course code MAM. Refer also to the Science Faculty Handbook for details of other courses offered by the Department.

## Physics

**Associate Professor and Head of Department:**

CM Comrie, MSc *Natal* PhD *Cantab*

The courses offered by the above department for students registered in the Faculty of Engineering & the Built Environment are described in the section on Courses Offered under the course code PHY. Refer also to the Science Faculty Handbook.

## Statistical Sciences

**Professor and Head of Department:**

TT Dunne, BA(Hons) UED BEd *Natal* PhD *Cape Town*

The courses offered by the above department for students registered in the Faculty of Engineering & the Built Environment are described in the section on Courses Offered, under the course code STA. For further information refer to Handbook of the Faculty of Science or Faculty of Commerce.

## COURSES OFFERED

Note: The offering of courses is subject to minimum student enrolment and the discretion of the Head of Department concerned.

## KEY TO COURSE ABBREVIATIONS, CODES AND TERMINOLOGY GUIDE TO THE CREDIT SYSTEM

### Course Codes

<b>ACC</b>	Accounting
<b>APG</b>	Architecture, Planning and Geomatics
<b>AST</b>	Astronomy
<b>BUS</b>	Management Studies
<b>CAS</b>	Centre for African Studies
<b>CEM</b>	Chemistry
<b>CHE</b>	Chemical Engineering
<b>CIV</b>	Civil Engineering
<b>CML</b>	Commercial Law
<b>CON</b>	Construction Economics and Management
<b>CSC</b>	Computer Science
<b>ECO</b>	Economics
<b>EEE</b>	Electrical Engineering
<b>EGS</b>	Environmental & Geographical Science
<b>END</b>	Faculty of Engineering & the Built Environment
<b>ERT</b>	School of Earth Sciences
<b>GEO</b>	Geological Sciences
<b>HUB</b>	Biomedical Engineering
<b>MAM</b>	Mathematics & Applied Mathematics
<b>MEC</b>	Mechanical Engineering
<b>PHY</b>	Physics
<b>SEA</b>	Oceanography
<b>STA</b>	Statistical Sciences

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 structure will change from 2006 with the introduction of the PeopleSoft Student system. The course code will change to an eight character code in the format AAAAnnnnB, where

<b>AAA</b>	represents the department offering the course;
<i>l</i>	is a number representing the year level of the course;
<b>nnnn</b>	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>B</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

## 150 COURSES OFFERED

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  
SUP Supplementary

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 cover both undergraduate and postgraduate courses. All are listed 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 (eg 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, eg a bachelor's degree.

**Postgraduate course:** This is a course which is required for a higher qualification, eg a Postgraduate Diploma, Honours or a Masters degree.

## Credit System

The Faculty has adopted the SA Qualifications Authority (SAQA) credit system with effect from 2004. The Faculty's course credit ratings which were in effect prior to 2004 have been converted to SAQA credits. This conversion involves multiplying the pre-2004 credit values by four. The SAQA 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.

## Lecture timetable

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

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### ACC1006F/S FINANCIAL ACCOUNTING 1

18 credits, 4 lectures per week, 1 double tutorial per week.

**Entrance requirements:** None.

**Course outline:** The nature of business and various business decisions, the flow of documentation in business, the nature and context of Accounting, the Accounting framework, recording business transactions, reporting financial information, preparing and interpreting financial statements.

**Assessment:** Tests and one project 35%, final 3 hour examination 65%.

**DP requirements:** Attendance at and submission of a minimum of 80% of tutorials AND weighted average of at least 40% for class tests and satisfactory completion of project. Students who do not obtain a minimum of 50% in class tests will not automatically be granted a deferred exam on application.

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### ACC1012S BUSINESS ACCOUNTING

This course is a terminating course and does not lead to a 200 level course.

18 credits, 4 lectures per week, 1 double tutorial per week.

**Prerequisites:** A minimum 40% final mark for ACC1006F/S Financial Accounting IA.

**Course outline:** Objective: To provide students with an overview of published financial statements, analysis and interpretation of financial information, and an introduction to management accounting, taxation and systems control. Course outline: Analysis and interpretation of financial information; company financial statements; costing; budgeting; taxation; and systems control.

**Assessment:** Test(s)/assignment(s)/other 40%, final 3 hour examination 60%.

**DP requirements:** A weighted average of 40% for class tests AND satisfactory performance on assignments AND attendance at and submission of a minimum of 75% of tutorial assignments.

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### ACC2022F MANAGEMENT ACCOUNTING 1

This course is restricted to students registered for BCom programmes. Repeating students from other programmes may register for the course. BCom students are cautioned that the second semester option ACC2022S is not automatically available to them.

18 credits, 4 lectures per week, 1 double period tutorial per week.

**Course co-ordinator(s):** Mr C Smith.

**Prerequisites:** Pass in Financial Accounting IA (ACC1006F/S).

**Course outline:** Analysis of costs and Systems for establishing costs; Relationship between Costs, Revenues and Profits; Absorption and Variable Costing; Cost-Volume-Profit Relationships; Cost Benefit Analyses and Pricing; Activity Based Costing; and Standard Costing.

**Assessment:** Tests and/or projects 40%, Final examination 60%.

**DP requirements:** A minimum of 40% for tests and 40% for assignments, and attendance at 75% of tutorials.

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### APG1003W TECHNOLOGY 1

24 credits, 40 lectures, site visits, tutorials.

**Co-requisites:** APG1019W, APG1013W, APG1014S, APG1020W.

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

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

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

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### APG1004F HISTORY AND THEORY OF ARCHITECTURE 1

8 credits, 20 lectures, 10 tutorials.

**Course outline:** The primary aim is to give a broad historical overview of architecture and urban history up to the end of the 19th Century. The emphasis on exploring historical models to gain a working understanding of the phenomena which support and influence the design of buildings and places. The course also introduces concepts and methods that are used in historical analysis and criticism.

**Assessment:** By written examination and examination of all essays, presentations and assignments.

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

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### APG1005S HISTORY AND THEORY OF ARCHITECTURE 2

8 credits, 20 lectures, 10 tutorials.

**Course outline:** This course revisits the inquiry of APG1004F in the context of the South African city, engaging students in an enquiry into local and international buildings. The critical skills and methods introduced in HATA1 are expanded upon.

**Assessment:** By written examination and examination of all essays, presentations and assignments.

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

---

### APG1009S THEORY OF STRUCTURES 2

4 credits, 12 lectures.

**Course outline:** Understand the development and process of empirical structural design loading on structures, strip and pad foundations and the basics of soils mechanics, the difference and performance of the principle building materials, the forces of elements and the theory of simply supported beams. Arches and thrust lines are introduced.

**Assessment:** By written class test and tutorials.

**DP requirements:** 80% attendance and participation and 100% completion of projects, assignments and tests.

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### APG1014S REPRESENTATION 2

4 credits.

**Co-requisites:** APG1019W, APG1003W, APG1020W, APG1021W.

**Course outline:** The course introduces the use of computers in technical drawing and presentation, aiming to develop a working knowledge of basic operating procedures and graphic techniques.

**Assessment:** By CAD examination and examination of all projects and assignments.

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

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**APG1015F PROGRAMMING FOR GEOMATICS**

18 credits, 12 lectures, 12 practical/tutorial assignments.

**Course outline:** Course Aims: To provide students with competence in developing GIS/Geomatics applications using high-level programming languages and scripting for and customisation of Geographic Information System (GIS) and Geomatics applications. Furthermore, students are equipped with skills to develop algorithms for Geomatics and GIS problem solving as well as being competent in the use of GIS/Geomatics applications.

**Course Content:** Introduction - Computing in Geomatics and GIS, Programming paradigms, Essential concepts in programming, Input/Output and essential data formats, Structured programming, Extended data types, O-O programming, Trigonometric functions and examples in Geomatics, 2D Graphics, 3D Graphics, VB vs VB.Net, VB.Net vs C/C++ and Java.

**Assessment:** Tests 35%, Practical Assignments 65%.

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor.

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**APG1016S GEOMATICS 1**

18 credits, 60 lectures, 12 practical/tutorial assignments.

**Prerequisites:** Using Computers.

**Course outline:** Course Aims: To provide a foundation in geomatics as a measurement science by introducing key concepts, instrumentation, techniques and conventions in the discipline.

**Course Content:** Introduction to geomatics, measurement science, spatial reference systems, and basic calculations, survey measurement and techniques, representation of spatial data, areas and volumes, programming and software in geomatics, introduction to Geographical Information Systems, Remote Sensing and Photogrammetry.

**Assessment:** Tests 20%, Practical Assignments 25%, Examination 3 hours 55% (sub minimum 40%).

**DP requirements:** Class tests must be written and all practicals/assignments completed to the satisfaction of the course convenor.

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**APG1017F ACADEMIC DEVELOPMENT CLASS**

First Semester, DP course.

**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.

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**APG1018S ACADEMIC DEVELOPMENT CLASS**

Second Semester, DP course.

**Co-requisites:** APG1003W, APG1020W.

**Course outline:** A tutorial based class in which individual learning difficulties evident in mid-year review are clarified and in which remedial work programmes are developed.

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**APG1019W ENVIRONMENT AND SERVICES 1**

8 credits, 20 lectures.

**Co-requisites:** APG1003W, APG1013W, APG1014S, APG1020W.

**Course outline:** The course introduces global, regional and local environmental sustainability aiming to establish an understanding of the links between renewable resource utilisation and built environment design issues. The study of building services is introduced, in the context of circular systems.

**Assessment:** By examination of projects and assignments.

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

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### APG1020W DESIGN AND THEORY STUDIO 1

76 credits, 1 theory and 1 design lecture and studio - 12 hours per week.

**Co-requisites:** APG1019W, APG1003W, APG1013W, APG1014S.

**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.

**Assessment:** Theory of Design assignments and tests, *en-loge* design test and examination of portfolio of all projects.

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

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### APG1021W REPRESENTATION 1

12 credits, 20 freehand drawing lectures and tutorials.

**Co-requisites:** APG1019W, APG1003W, APG1013W, APG1014S, APG1020W.

**Course outline:** The course aims to develop visual literacy, and is divided between freehand, geometric and figure drawing. While the aim is to introduce techniques and disciplines, once understood these are intended to enhance creativity rather than conformity.

**Assessment:** By examination of portfolio of all projects and assignments.

**DP requirements:** 80% attendance and participation and 100% completion of tutorials and assignments.

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### APG2000F HISTORY AND THEORY OF ARCHITECTURE 3

8 credits, 20 lectures, 10 tutorials.

**Course outline:** The course reviews precursors of modernism, and deals primarily with the history and theory of post World War 1, 20th Century architecture and urbanism. The intention of the course is to give students an insight into the culture, tradition, programmes and movements of early modern architecture.

**Assessment:** By written examination and examination of all essays, presentations and assignments.

**DP requirements:** 100% completion of: Tutorial assignments: seminar presentation and examination; 80% attendance and participation in lectures and tutorials.

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### APG2003S HISTORY AND THEORY OF ARCHITECTURE 4

8 credits, 20 lectures, 10 tutorials.

**Course outline:** This course is a continuation of the enquiry into modern architecture, started in APG200F. It takes the investigation into modern and contemporary architectural design and practice. In addition to presenting an overview of modern architecture, the course aims to develop students' capacity for understanding design issues and to develop crucial skills and methods.

**Assessment:** By written examination and examination of all essays, presentations and assignments.

**DP requirements:** 100% completion of projects and assignments; seminar presentation on exam and an essay; 80% attendance and participation.

---

### APG2009F THEORY OF STRUCTURES 3

4 credits, 10 lectures.

**Prerequisites:** APG1009S.

**Course outline:** Understand and be able to produce various structural concepts of all horizontal spanning elements pertaining to buildings of residential scale. The concepts must show how the structure carries the loads (in all three directions), how it connects to the vertical structure and the most appropriate material choice. Here vector and other relevant force diagrams are used to argue



the form and material. Structural elements include roofs, suspended floors (including prestressed and precast systems) and cantilevers and beams and their various evolutions. Fixed and pinned connections are introduced. Arches are developed into vaults and domes. There is some cross over with vertical structure.

**Assessment:** By written class tests and tutorials.

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

#### **APG2011S THEORY OF STRUCTURES 4**

4 credits, 10 lectures.

**Prerequisites:** APG1009S, APG2009F.

**Course outline:** Understand and be able to produce various structural concepts of all vertical spanning elements pertaining to buildings of residential scale. The concepts must show how the structure (and appropriate material choices) and its connections 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, reservoirs, walls, columns, small towers as vertical cantilevers and frames. There is some crossover with horizontal structure.

**Assessment:** By written class tests and tutorials.

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

#### **APG2014S GEOMATICS II**

24 credits, 60 lectures, 8 practical/tutorial assignments.

**Prerequisites:** APG1015F or CSC1017F or CSC1015F, MAM1003W or MAM1000W, APG1016S.

**Course outline:** Course Aims: 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; software applications in Geomatics; two-dimensional co-ordinate systems; motions of the Earth; time; satellite orbits; three-dimensional co-ordinate systems.

**Assessment:** Tests 15%, Practical Assignments 25%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of projects and tests to the satisfaction of the course convenor.

#### **APG2015F GEOGRAPHIC INFORMATION SYSTEMS I**

24 credits, 60 lectures; 8 practical sessions, 2 projects.

**Prerequisites:** CSC1015F or CSC1017F or APG1015F, MAM1000W or MAM1003W or MAM1004F with STA1000S, APG1010S/APG1016S.

**Co-requisites:** APG2016W, APG2018X.

**Course outline:** Course Aims: To provide knowledge and skills in the fundamental concepts of geographic information systems and remote sensing. Course Content: GIS concepts, spatial relationships, topology, spatial and non-spatial data structures and algorithms, vector databases, raster data structures, data capture for raster GIS, spatial analysis using the raster data model, relational database management systems, data modelling, data display and presentation, theory of map projections.

**Assessment:** Tests 20%, Practical Assignments 25%, Examination 3 hours 55% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor (test average of 35% or more).

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### APG2016W SURVEYING I

24 credits, 50 lectures; 8 practical assignments; 5 tutorial assignments.

**Prerequisites:** MAM1000W or MAM1003W, APG1010S or MAM1004F with STA100S, APG1010S/APG1016S.

**Co-requisites:** APG2017X.

**Course outline:** Course Aims: This course is designed for students of Geomatics to provide understanding of graphical and spatial concepts and skills of plane surveying measuring and calculation. To teach problem solving skills in relation to practical surveying problems. To equip the student with group work skills and technical report writing skills. Course Content: 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, triangulation, error figures, eccentric reduction and reverse polars, levelling calculations, distance measurement, and tacheometry and topographic mapping and surface fitting. In addition, the course builds competency in the solution of integrated survey calculation problems.

**Assessment:** Tests 25%, Practical Assignments 25%, Examination 3 hours 50% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor and a test average of 35% or more.

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### APG2017X BASIC SURVEY CAMP

4 credits, 1 Week practical project.

**Prerequisites:** Prerequisites: APG1010S/APG1016S.

**Co-requisites:** APG2016W with a minimum of 40% in the June examination.

**Course outline:** Course Aims: To consolidate knowledge and skills learnt in the course APG2016W. To further teach problem solving skills in relation to practical surveying problems, and to equip the student with group work skills and engender tolerance of diversity. To equip the student with simple technical report writing skills. Course Content: This 1-week camp in the field, is intended for students studying for the Geomatics degree.. The 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.

**Assessment:** Project 100%.

**DP requirements:** Completion of project to the satisfaction of the course convenor.

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### APG2018X GEOGRAPHIC INFORMATION SYSTEMS CAMP

4 credits, 1 Week practical project.

**Prerequisites:** APG1010S/APG1016S.

**Co-requisites:** APG2015F.

**Course outline:** 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. Course Content: 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.

**Assessment:** Project 100%.

**DP requirements:** Completion of project to the satisfaction of the course convenor.

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**APG2019X PRACTICAL TRAINING I**

Practical training.

**Co-requisites:** APG2016W.

**Course outline:** Course Aims/Objectives: To consolidate knowledge and skills learnt in the course APG2016W. To equip the student with skills relating to the workplace, which may include: group work, professional communication skills, office procedures, timekeeping, logistical planning, organisational skills and administrative procedures. Course Content: Practical work of not less than five weeks duration related to surveying, as well as practical tasks and computations set by the course convenor, during the vacation. The work must be approved by the course convenor. 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.

**Assessment:** Report 100%.

**DP requirements:** Completion of course to the satisfaction of the course convenor.

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**APG2021W TECHNOLOGY 2**

24 credits, 40 lectures, site visits, tutorials.

**Prerequisites:** APG103W.

**Co-requisites:** APG2022W, APG2025W, APG2028W.

**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.

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

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

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**APG2022W DESIGN AND THEORY STUDIO 2**

72 credits, 1 theory and 1 design lecture and studio - 12 hours per week.

**Prerequisites:** APG1020W.

**Co-requisites:** APG2021W, APG2025W, APG2028W.

**Course outline:** The course reiterates in more sophisticated form the issues explored in the first year studio in order to gain familiarity with them. They are addressed within an exploration of the architecture of place, conceived as having four keystones: 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 contexts. The format of the course consists of short experimental exercises, longer projects and *en loqe* tests.

**Assessment:** Theory of Design assignments and reports, *en-loqe* design test and examination of portfolio of all projects.

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

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**APG2023F MANAGEMENT PRACTICE LAW 1**

4 credits, 10 lectures.

**Course outline:** An introductory course which provides a broad understanding of social and organisational principles which influence the production of the built environment. Economic and legal principles are introduced in global and national contexts.

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**Assessment:** By examination of essays and assignments.

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

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### APG2024S MANAGEMENT PRACTICE LAW 2

4 credits, 10 lectures.

**Course outline:** The course extends the general organisational principles introduced in APG2023F into the local context of the built environment, focusing on two themes: production of the built environment (including financial, sectoral, professional and ethnic issues) and regulation of the built environment (providing an overview of multiple legislative frameworks).

**Assessment:** By examination of essays and assignments.

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

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### APG2025W REPRESENTATION 3

8 credits, 20 lectures and tutorial sessions.

**Prerequisites:** APG1014S

**Co-requisites:** APG2021W, APG2022W, APG2028W.

**Course outline:** The course consolidates the basic skills developed in APG1014S, and extends these to 3D CAD principles and methods in order to facilitate design, presentation and documentation requirements. A range of packages are introduced for both CAD and presentation, emphasising the appropriateness of choices and combinations of methods.

**Assessment:** By CAD examination and examination of all projects and assignments.

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

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### APG2026F ELEMENTARY SURVEYING

16 credits, 48 lectures, 9 practical/tutorial assignments.

**Prerequisites:** STA1001F or MAM1003W, or MAM1004F and STA100S, or equivalents.

**Course outline:** Course Aims: This course is designed to provide 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. To teach problem solving skills in relation to practical surveying problems. To equip the student with group work and technical report writing skills. Course Content: The content of 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, 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.

**Assessment:** Tests 25%, Practical Assignments 25%, Examination 3 hours 50% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor and a test average of 35% or more.

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### APG2027X WORK EXPERIENCE

**Co-requisites:** APG2021W, APG2022W, AOG2025W.

**Course outline:** A three week period of work experience during the second year mid-year break to consolidate learning and to gain exposure to career directions, requiring 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. Please note that it is

not the responsibility of the University or the School of Architecture, Planning and Geomatics to find employment for work experience students.

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### APG2028W ENVIRONMENT AND SERVICES 2

8 credits, 20 lectures.

**Co-requisites:** APG2021W, APG2022W, APG2025W.

**Course outline:** Consolidation of the understanding of broad environmental impacts on the design of buildings and the spaces around buildings, developed in relation to human comfort standards, climatic performance, and servicing systems applicable to low rise buildings.

**Assessment:** By examination of all projects & assignments.

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

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### APG3000F HISTORY AND THEORY OF ARCHITECTURE 5

8 credits, 20 lectures, 5 tutorials.

**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.

**Assessment:** By examination of essays and assignments.

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

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### APG3001S HISTORY AND THEORY OF ARCHITECTURE 6

8 credits, 10 lectures, 5 tutorials.

**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.

**Assessment:** By examination of essays and assignments.

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

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### APG3004W CONVERSION STUDIO

68 credits, 3 studio sessions per week.

**Course outline:** This is a continuation of the Conversion Studio in Semester 1, and deals with increasingly complex site planning and design problems.

**Assessment:** Examination of all projects and assignments related to studio work.

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

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### APG3008F THEORY OF STRUCTURES 5

4 credits, 10 lectures.

**Prerequisites:** APG1009S, APG2009F and APG2011S.

**Course outline:** Understand and be able to produce various structural concepts of all horizontal spanning elements pertaining to buildings beyond the residential scale. The concepts must show how the structure carries the loads (in all three directions), how it connects to the vertical structure 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, portal frames, planar space frames, shells, girders etc. Form active structures are explored in this section.

**Assessment:** By written class test and tutorials.

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

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### APG3010S THEORY OF STRUCTURES 6

4 credits, 10 lectures.

**Prerequisites:** APG1009S, APG2009F, APG2011S and APG3008F.

**Course outline:** Understand and be able to produce various structural concepts of all vertical spanning elements pertaining to buildings beyond residential scale. The concepts must show how the structure carries the loads (in all three directions), how it connects to the ground and other horizontal structures and appropriate material choice. Here vector and other relevant force diagrams are used to argue the form and material. Structural elements include advanced retaining systems, dams, towers, tall buildings, multistory and other evolutions. At this stage the buildings are fully integrated with the horizontal elements. Additionally, the entire course is brought together with the total study of large low-rise buildings like airports, factories etc.

**Assessment:** By written class test and tutorials.

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

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### APG3011F GEOGRAPHIC INFORMATION SYSTEMS II

24 credits, 60 lectures; 12 practicals/tutorials.

**Prerequisites:** CSC1015F or CSC1017F, APG2015F, APG2018X.

**Co-requisites:** APG218X (unless already passed).

**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.

**Assessment:** Tests 20%, Practical Assignments 25%, Examination 3 hours 55% (sub minimum 40%).

**DP requirements:** Satisfactory completion of practical assignments and a test average of 35% or more.

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### APG3012S GEOMATICS III

24 credits, 60 lectures; 12 practicals/tutorials.

**Prerequisites:** APG1015F or CSC117F or CSC115F and APG116S

**Course outline:** Course Aims: To provide the fundamental knowledge and skills in photogrammetry. To teach problem solving skills in relation to practical spatial data acquisition. To equip the student with group work skills.

**Course Content:** Basic mathematics of photogrammetry, stereo photogrammetry, orientation techniques, relative orientation, absolute orientation, collinearity, coplanarity, bundle adjustment, DLT, camera calibration, image measurement and co-ordinate refinement, introduction to digital photogrammetry. Aerotriangulation and close range network design. DTM production, rectification, ortho-rectification, mosaicing and automation in digital photogrammetry. Laser scanning.

**Assessment:** Tests 15%, Practical Assignments 25%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor and a test average of 35% or more.

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**APG3013F NUMERICAL METHODS IN GEOMATICS**

16 credits, 48 lectures; 8 practicals/tutorials.

**Prerequisites:** MAM2080W, APG2014S, APG2016W.

**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.

**Assessment:** Tests 15%, Practical Assignments 25%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor and a minimum average of 35% for all tests.

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**APG3014X CONTROL SURVEY CAMP**

4 credits, 1 Week practical project.

**Prerequisites:** APG2016W.

**Co-requisites:** APG3017D and APG3016C.

**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.

**Assessment:** Project 100%.

**DP requirements:** Completion of project to the satisfaction of the course convenor.

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**APG3015X PRACTICAL TRAINING II**

Practical training.

**Co-requisites:** APG3016F.

**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 convenor, during the vacation. The work must be approved by the course convenor. 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.

**Assessment:** Report 100%.

**DP requirements:** Completion of course to the satisfaction of the course convenor.

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**APG3016C SURVEYING II**

12 credits, 30 lectures; 1 essay; 2 practicals; 1 seminar.

**Prerequisites:** APG1010F/APG1016F and APG2015 or equivalent; for BSc Geomatics students APG2016W is also a prerequisite.

**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; two lectures will be delivered on essay writing and related skills. Some additional surveying instrumentation/methods not mentioned in pre-

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requisite courses are introduced, and students are expected to research and present a 20-minute seminar on a surveying technique, interesting surveying equipment, or a surveying project. Surveying with the global positioning system is covered in detail and consists of 80% of the course.

**Assessment:** Tests 20%, Practical Assignments/Seminars 20%, Examination 1½ hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor; 35% test mark (or average if more than one test).

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### APG3017D SURVEYING III

12 credits, 30 lectures; 6 practical/tutorial assignments.

**Prerequisites:** APG2016W.

**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. Sources of error and their elimination or mitigation are covered, as are more specialized instruments. Hydrographic surveying is introduced.

**Assessment:** Tests 20%, Practical Assignments/Seminars 20%, Examination 1½ hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor; 35% test mark (or average if more than one test).

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### APG3018W LAND LAW AND LAND TENURE SYSTEMS

16 credits, 48 lectures; seminars; practical and essay assignments.

**Prerequisites:** APG2015F, APG2016W, APG2019X.

**Course outline:** Course Aims: To provide knowledge and understanding of land tenure, land law and land registration and custodianship of land tenure security required by geoinformatics stream students. Course Content: Land tenure systems, ownership, fundamentals of Roman Dutch law, acquisition and cession of rights in land, land registration, cadastral systems. Statutes and case law relating to cadastral survey, registration, and property ownership and management in South Africa.

**Assessment:** Tests and essays 20%, Practical Assignments 20%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor; 45% year mark.

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### APG3020X SPATIAL DATA ANALYSIS PROJECT

4 credits, 1 week practical project.

**Prerequisites:** APG2015F or equivalent.

**Co-requisites:** APG3011F or equivalent.

**Course outline:** Course Aims: To provide practical experience in processing, management, analysis and representation of spatial data. Course Content: This will vary from project to project.

**Assessment:** Project 100%.

**DP requirements:** Completion of project to the satisfaction of the course convenor.

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### APG3021W LAND AND CADASTRAL SURVEY LAW

24 credits, 60 lectures; 12 practical assignments.

**Prerequisites:** APG2016W, APG2015F, APG2019X.



**Course outline:** Course Aims: To provide knowledge and understanding of land tenure, land law and land registration and cadastral survey law and the role of the land surveyor as a custodian of land tenure security. This course is intended for students of the Surveying and Planning streams of the Geomatics Programme. Course Content: 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. Post-apartheid land policies and legislation. International law and law of the sea. Cadastral survey problem solving.

**Assessment:** Tests and essays 20%, Practical Assignments 20%; Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor; 45% year mark.

### APG3023W TECHNOLOGY 3

24 credits, 40 lectures, site visits and tutorials.

**Prerequisites:** APG2021W.

**Co-requisites:** APG3024W, APG3029W.

**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.

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

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

### APG3024W DESIGN AND THEORY STUDIO 3

84 credits, 1 theory and 1 design lecture and studio - 12 hours per week.

**Prerequisites:** APG2022W.

**Co-requisites:** APG3023W, APG3029W.

**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, and competition briefs are used to hone the clarity of design ideas. 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.

**Assessment:** Theory of Design assignments and reports, *en loge* design test and examination of portfolio of all projects.

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

### APG3026F MANAGEMENT PRACTICE LAW 3

4 credits, 10 lectures.

**Course outline:** An introduction to entrepreneurship and small business development in the context of design consultancies. Documentation methods and exercises are used as the platform for introducing aspects of business and financial planning, roles, responsibilities, information and risk

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management in relation to project cycles.

**Assessment:** By examination of projects, drawings and assignments.

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

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### APG3027Z CADASTRAL SURVEY AND REGISTRATION PROJECTS

14 credits, 2 projects and 1 week camp.

**Prerequisites:** APG2015F, APG2016W.

**Co-requisites:** APG3018W or APG3021W, APG2019X.

**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. Simulated land registration system using GIS and database software. This course includes 2 major projects and a one-week camp project, which takes place during a vacation, away from the UCT campus.

**Assessment:** Practical Assignments 100%.

**DP requirements:** Completion of all practical assignments to the satisfaction of the course convenor.

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### APG3028X INDEPENDENT RESEARCH

**Co-requisites:** APG3024W.

**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.

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### APG3029W ENVIRONMENT AND SERVICES 3

8 credits, 20 lectures.

**Co-requisites:** APG3023W, APG3024W.

**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 the students own design work.

**Assessment:** By examination of all projects and assignments.

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

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### APG4000Z EXTERNAL EXPERIENCE

Qualifying course for BArch taken only in the first year.

**Course outline:** (a) External experience (office work, field work, study travel or building work). Time sheets and work experience documents are to be handed in by 31 January of the year following external experience. (b) Research assignment (work/travel report and photographic essay), to be handed in by 30 November of the year of registration. Please note that it is not the responsibility of the University or the School of Architecture, Planning and Geomatics to find work for external experience students.

**Assessment:** DP requirement.

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### APG4001S GEODESY

24 credits, 60 lectures, 12 practicals.

**Prerequisites:** MAM2080W or equivalent, APG2014S, APG3013F, APG3016C, APG3017D/F.

**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.

**Assessment:** Tests 15%, Practical Assignments 25%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor.

### **APG4002Z LAND USE PLANNING AND TOWNSHIP DESIGN**

16 credits, 48 lectures, 8 practicals.

**Prerequisites:** APG3016C, APG3048W/APG3021W

**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.

**Assessment:** Tests 15%, Practical Assignments 20%, Class Work 5%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor.

### **APG4003Z GEOMATICS PROJECT**

40 credits, 10 - 12 contact sessions, mid-year seminar.

**Prerequisites:** The candidate must be able to graduate in the year in which the course is taken.

**Course outline:** Course Aims: Students will start a geomatics project at the beginning of the year, and will submit completed reports and posters at the end of the year. This project will provide them with an opportunity to demonstrate their ability to design, execute and report on a Geomatics-related problem. Students will give an oral presentation of their project mid-year, as well as for the final assessment towards the end of the year. Course Content: Presentation of the project plan, execution of the project, presentation of the result in written, poster and oral form.

**Assessment:** Project Report 70%, Poster 10%; Final Oral Presentation 20%.

### **APG4004A REMOTE SENSING**

12 credits, 30 lectures, 6 practical assignments.

**Prerequisites:** APG1015F or CSC1015F or CSC1017F, APG1010S/APG1016S, APG2015F or equivalent.

**Course outline:** Course Aims: To broaden the knowledge of remotely sensed imagery and its use in spatial information system. To equip the student with problem solving skills for practical applications. Course Content: The concept of computer processing of remote sensing images: digital image processing, physical principles of remote sensing, spatial statistics, prediction and simulation, classification and spatial sampling schemes. Remote Sensing and Decision Support Systems.

**Assessment:** Tests 20%, Practical Assignments 20%, Seminars 5%, Examination 1½ hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor and a test mark of 35% or more.

### **APG4005B ENGINEERING SURVEYING AND ADJUSTMENT**

12 credits, 30 lectures, 6 practical assignments.

**Prerequisites:** APG2014S, APG2016W, APG3013F/S, APG3017F/D.

**Course outline:** Course Aims: To provide knowledge on the design and optimisation of two- and

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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.

**Assessment:** Tests 15%, Practical Assignments 25%, Examination 1½ hours 60% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor and a minimum average of 35% for all tests.

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### APG4006S GEOMATICS PRACTICE AND LAND MANAGEMENT

12 credits, 24 lectures, 6 practical assignments.

**Prerequisites:** BSc Geomatics: APG3018W or APG3021W, APG3019Z.

**Co-requisites:** BSc Hon GIS: Elective Core courses.

**Course outline:** Course Aims: To prepare students for professional practice in the private and public sector and provide understanding of the interaction between business practices, land policies and the geomatics profession.

**Course Content:** The commercial environment: building a clientele and contracting, land resource policies. The practice environment: business entities and professional practice, human resource management. The financial environment: business finance, cash flow, resource management, budgets and financial statements, management accounting, pensions and benefits. The professional environment: professionalism, ethics, codes and conduct, professional structures in South Africa.

**Assessment:** Practical Assignments 40%, Examination 3 hours 60% (sub minimum 40%).

**DP requirements:** Completion of all assignments to the satisfaction of the course convenor. 40% minimum for class test.

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### APG4007F INTRODUCTORY GIS

24 credits, 60 lectures; 12 practical sessions, 2 Projects.

**Co-requisites:** APG4003Z, APG4004A, APG4008F, APG4009F.

**Course outline:** Course Aims: This course aims to provide the knowledge and skills in the fundamental concepts of Geographical Information Systems for scientists, especially in the fields of natural, earth and computer sciences. Instruction will take the form of formal lectures, seminars, practicals, assignments and self-study using internet resources and GIS software.

**Course contents:** GIS concepts, spatial relationships, topology, spatial and non-spatial data structures and algorithms, vector databases, raster data structures, data capture for raster GIS, spatial analysis using the raster data model, relational database management systems, data modelling, data display and presentation, theory of map projections.

**Assessment:** Tests 20%, Practical Assignments 25%, Examination 3 hours 55% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor (test average of 35% or more).

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### APG4008F ADVANCED GIS

24 credits, 60 lectures; 12 practical/tutorials.

**Co-requisites:** APG4007F, APG4009F, APG4003Z.

**Course outline:** Course Aims: This course builds on the theory and skills developed in the Introductory GIS course. The aim of this course is to provide students with advanced level GIS skills and knowledge including GIS management issues, GIS application design, Internet GIS and 3D modelling.

**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.

**Assessment:** Tests 20%, Practical Assignments 25%, Examination 3 hours 55% (sub minimum 40%).

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor (test average of 35% or more).

### **APG4009F COMPUTING FOR GIS**

18 credits, 12 lectures; 12 practical/tutorial assignments.

**Co-requisites:** APG4007F, APG4003Z.

**Course outline:** Course Aims: This course aims to provide students with the fundamental scripting and programming skills they will need to enhance GIS software and develop stand-alone GIS applications using general software environments. It also aims to provide students with the skills needed to interface between GIS applications and other software applications. Course Content: Structure and Syntax of Visual Programming Language, development of GIS functionality in general programming environments, customisation of GIS using scripting languages, extension of attribute management through external DB links and SQL.

**Assessment:** Tests 35%, Practical Assignments 65%.

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor (test average of 35% or more).

### **APG4020F PLANNING THEORY AND PRACTICE**

Qualifying course for MCRP and MCPUD taken in the first year. Elective for students in BArch 3 and 5.

8 credits.

**Course outline:** Evolution of planning; the planning process; ethics in planning; plan making and design

**Assessment:** Based on a paper.

### **APG4021F URBAN SYSTEMS**

First semester qualifying course for the MCRP and MCPUD programmes taken in the first year. Elective for students in BArch 3 and 5. Audited by Landscape Architecture students.

12 credits.

**Course outline:** Processes of settlement formation and growth; settlement patterns in regional space; forces affecting the internal distribution of urban activities; the urban land market; elements of public structure; private sector responses.

**Assessment:** Based on a paper.

### **APG4022F PLANNING PROJECT A**

First Semester, qualifying course for the MCRP and MCPUD, taken in the first year.

32 credits.

**Course outline:** Focuses on urban planning at the local scale and involves the development of descriptive, explanatory, evaluative and interventive skills. An introduction to visual and verbal communication techniques forms part of the course. Fieldwork is an integral requirement of the course.

**Assessment:** Based upon Project work.

### **APG4023S URBAN DEVELOPMENT PROCESSES**

Qualifying course for MCRP and MCPUD, taken in the first year. Elective for students in BArch 3 and 5.

12 credits.

**Course outline:** The dynamics of contemporary urban development processes. Land development models, land/property economics, the social/political/economic context of urban development.

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**Assessment:** Based on a paper.

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### APG4024S PLANNING AND GOVERNMENTAL SYSTEMS

Qualifying course for MCRP and MCPUD, taken in the first year. Elective for students in BArch 3 and 5.

12 credits.

**Course outline:** The political and institutional context of planning; systems of representation and administration; local government financing and budgeting; integrated development planning; negotiation and public participation; "package of plans" approaches; public-private partnerships; plan monitoring and evaluation.

**Assessment:** Based on a paper.

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### APG4025S REGULATORY AND LEGAL FRAMEWORK

Qualifying course for MCRP, MCPUD and MLA taken in the first year. Elective for students in BArch 3 and 5.

12 credits.

**Course outline:** Planning law; Introduction to South African law; administrative law; environmental law; current legislative framework for planning; development control; options for a new planning framework.

**Assessment:** By examination.

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### APG4026S PLANNING PROJECT B

Qualifying course for MCRP and MCPUD, taken in the first year.

32 credits.

**Prerequisites:** APG4022F

**Course outline:** The project focuses on planning within the large metropolitan context and on plan implementation.

**Assessment:** Based on Project work.

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### APG4028F ASPECTS OF CITY DESIGN

Qualifying course for MCRP, MCPUD and MLA taken in the first year. Elective for students in BArch 3 and 5.

12 credits.

**Course outline:** The course focuses on historically conceptualised concepts of urban structure and performance at the local area scale. It includes: Introduction to city planning: conceptual framework; role of the planner; issues of planning; approach of the programme. Aspects of city design: the need for design and a design approach to planning ; the process of design; exploration of fundamental ideas. Historical case studies: framework of evaluation; overseas case studies; local case studies.

**Assessment:** Based on a paper.

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### APG4029F NATURAL SYSTEMS

Qualifying course for MCRP, MCPUD and MLA taken in the first year. Elective For students in BArch 3 and 5.

12 credits.

**Course outline:** The course focuses on the relationship between nature and settlement. It deals with central issues, methods of environmental analysis and evaluation, and substantive knowledge relating to: land systems, water systems, air systems, life systems, and the related design and planning implications.

**Assessment:** Based on a paper.

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**APG4030F HISTORY AND THEORY OF LANDSCAPE ARCHITECTURE A**

Qualifying course for MLA.

Elective for students in BArch 3 and 5.

12 credits.

**Course outline:** Covers the great traditions and developments in landscape architecture of both the East and the West, and explores the influence of these on contemporary landscape works.

**Assessment:** Assignments.

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**APG4031F LANDSCAPE TECHNIQUES 1**

12 credits, lectures/tutorials.

**Course outline:** Landscape graphics; map reading; airphoto interpretation and introduction to GIS.

**Assessment:** Assignments.

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**APG4032S LANDSCAPE DESIGN**

Qualifying course for MLA.

Elective for students in BArch 3 and 5.

12 credits.

**Course outline:** Values, principles and informants for site planning and the design of urban spaces, streetscapes and open spaces including paving, street furniture, lighting, signage and water elements.

**Assessment:** Assignments, workbook.

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**APG4033S LANDSCAPE TECHNIQUES 2**

8 credits.

**Prerequisites:** APG4031F or permission of course convenor.

**Course outline:** The tools and routines in computer applications related to landscape planning work, including CAD and image manipulation programmes.

**Assessment:** Assignments.

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**APG4034S TERRAIN ANALYSIS**

Qualifying course for MLA taken in the first year. Elective for students in BArch 3 and 5.

12 credits.

**Prerequisites:** APG4029F or permission of course convenor.

**Course outline:** Terrain analysis methodology covering geological, hydrological, coastal, climatic, biotic and visual assessments, and the implications of these for planning and design. Includes mandatory ecology camp/s.

**Assessment:** Projects.

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**APG4035F PLANNING TECHNIQUES 1**

Qualifying course for MCRP and MCPUD, taken in the first year.

Elective for students in BArch3 and 5.

12 credits.

**Course outline:** Map work and cartographic/aerial photography interpretation; techniques of graphic presentation and communication, introduction to Geographical Information Systems, report writing.

**Assessment:** Assignments.

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**APG4036F LOCAL AREA LANDSCAPE ARCHITECTURE PROJECT**

Qualifying course for MLA taken in the first year.

32 credits.

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**Course outline:** analysis of landscape and urban structure and performance at the local scale (diagnostic and evaluative skills); concept design/s for a 'greenfield' site within a local area (development of design and plan-making skills); elaboration of implementational implications.

**Assessment:** Project work.

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### APG4037S METRO LANDSCAPE PROJECT

Qualifying course for MLA taken in the first year.

36 credits.

**Prerequisites:** APG4036F.

**Co-requisites:** APG4034S or permission of course convenor.

**Course outline:** Urban context and natural processes; site planning and concept design for a 'brownfield' site, including implementation strategies.

**Assessment:** Project work.

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### APG4038S PLANNING TECHNIQUES 2

Qualifying course for MCRP and MCPUD, taken in the first year. Electives for students in BArch 3 and 5.

4 credits.

**Course outline:** Identifying key information needs for planning; assembling relevant data; generating and analysing demographic and socio-economic data.

**Assessment:** Assignment.

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### APG5000W MASTERS DISSERTATION : GEOMATICS

180 credits.

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### APG5001Z MASTERS DISSERTATION: GEOMATICS

120 credits.

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### APG5002F STUDIOWORK (ARCH3)

48 credits.

**Course outline:** In this course the focus is on architecture and urban design/landscape, as well as issues of detail design and sustainability. The design programmes engage directly with current, urgent city issues. It is intended to give the participant the experience of working with consultants to the city or with city officials themselves, on a problem with which they are engaged or within a real policy framework. The programme, secondly, aims to produce work which makes a contribution to solving city issues. Students are required to attend the Aspects of City Design course as a prerequisite to Urban Design programmes.

**Assessment:** Examination (Of all term work, projects and assignments).

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### APG5003S STUDIOWORK (ARCH4)

48 credits.

**Course outline:** This is a simulated office group work studio with an emphasis on professional practice, management and documentation for building contracts of various types. The primary focus is on community projects. An effort is made to present the student with as many simulated aspects of a professional architect's work as possible, including dealing with clients, colleagues in a partnership situation, consultants, local authorities etc. Groups are both architects and quantity surveying students who work under the guidance of tutors selected from the profession. 50% of the course will comprise an assessment of individual studiowork. The balance of the course will comprise group work. Students are required to pass both components of the studio.

**Assessment:** Oral examination (Of term project work).



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**APG5005F HISTORY AND THEORY OF ARCHITECTURE**

12 credits.

**Course outline:** This research is a course wherein students are required to elect a topic in History or Theory of Architecture, work under the guidance of a tutor and produce a term paper of approximately 5000 words.

**Assessment:** Examination of proposal and final research paper.

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**APG5006F ADVANCED CONSTRUCTION (RESEARCH)**

12 credits.

**Course outline:** The course is a research study focusing on an aspect of architectural technology or the building industry, of the student's choice. Normally the subject matter is related to work being done in the Simulated Office programme. A paper or approximately 4000 words is required.

**Assessment:** Examination of proposal and final research paper.

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**APG5008F ASPECTS OF HISTORY AND THEORY 508**

12 credits, 10 lectures.

**Course outline:** Within the broad area of History and Theory of Architecture, taught in the BArch programme, a number of different electives are offered each year, of which the content and the coordinators vary, depending on visiting lecturers, research interests of staff and topical issues. Detailed contents will be published each year.

**Assessment:** Examination (By review of term project).

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**APG5009F ASPECTS OF HISTORY AND THEORY 509**

12 credits, 10 lectures.

**Course outline:** Within the broad area of History and Theory of Architecture, taught in the BArch programme, a number of different electives are offered each year, of which the content and the coordinators vary, depending on visiting lecturers, research interests of staff and topical issues. Detailed contents will be published each year.

**Assessment:** Examination (by review of term project).

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**APG5010F ASPECTS OF HISTORY AND THEORY 510**

12 credits, 10 lectures.

**Course outline:** Within the broad area of History and Theory of Architecture, taught in the BArch programme, a number of different electives are offered each year, of which the content and the coordinators vary, depending on visiting lecturers, research interests of staff and topical issues. Detailed contents will be published each year.

**Assessment:** Examination (by review of term project).

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**APG5011S ASPECTS OF HISTORY AND THEORY 511**

12 credits, 10 lectures.

**Course outline:** Within the broad area of History and Theory of Architecture, taught in the BArch programme, a number of different electives are offered each year, of which the content and the coordinators vary, depending on visiting lecturers, research interests of staff and topical issues. Detailed contents will be published each year.

**Assessment:** Examination (By review of term project).

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**APG5012S ASPECTS OF HISTORY AND THEORY 512**

12 credits, 10 lectures.

**Course outline:** Within the broad area of History and Theory of Architecture, taught in the BArch programme, a number of different electives are offered each year, of which the content and the

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coordinators vary, depending on visiting lecturers, research interests of staff and topical issues. Detailed contents will be published each year.

**Assessment:** Examination (by review of term project).

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### APG5013S ASPECTS OF HISTORY AND THEORY 513

12 credits, 10 lectures.

**Course outline:** Within the broad area of History and Theory of Architecture, taught in the BArch programme, a number of different electives are offered each year, of which the content and the coordinators vary, depending on visiting lecturers, research interests of staff and topical issues. Detailed contents will be published each year.

**Assessment:** Examination (by review of term project).

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### APG5014F INTRODUCTION TO URBAN DESIGN THEORY

12 credits.

**Course outline:** Core theories in urban design: "urban design pioneers" and their ideas; selected theorists and practitioners; review of the state of the art.

**Assessment:** by one paper.

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### APG5016S ADVANCED CONSTRUCTION (STRUCTURES)

12 credits, 10 lectures.

**Course outline:** Content will vary, depending on staff interest/research. The course aims to develop the conceptual design skill looking at both the rational and empirical approaches.

**Assessment:** Examination/Paper.

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### APG5020F REGIONAL PLANNING PROJECT

Qualifying course for MCRP, taken in the second year.

32 credits.

**Prerequisites:** APG4026S

**Course outline:** The course focuses on regional planning issues at a number of scales and involves the development of descriptive, explanatory, evaluative and interventive skills.

**Assessment:** Based on project work.

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### APG5023F REGIONAL PLANNING THEORY

Qualifying course for MCRP, taken in the second year.

20 credits.

**Course outline:** The 20th Century Experience of Regional Planning: shifts in approaches to Development, and changing regional planning Doctrines across 4 eras. The Natural Landscape Framework of Regional Planning: conceptual exploration of landscape processes and patterns; methods of regional landscape analysis and synthesis; landscape management frameworks.

The Regional Economic Development Framework: models of regional economic development; issues and debates; SA national and regional economic development policies.

The Settlement and Services Framework of Regional Planning: processes of settlement formation; resultant settlement patterns (size and spatial); major issues and debates relating to service provision.

**Assessment:** By term papers.

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### APG5024F PLANNING TECHNIQUES 3

Qualifying course for MCRP and MCPUD, taken in the second year.

8 credits.

**Course outline:** Environmental assessment and management (including rezoning and public participation, evaluation and environmental impacts, mitigation and optimization of impacts,

monitoring, environmental management plans, auditing); research methods and dissertation writing.  
**Assessment:** Assignments.

### **APG5025F HISTORY AND THEORY OF LANDSCAPE ARCHITECTURE B**

Qualifying course for MLA, elective for students in BArch 3 and 5.

12 credits.

**Course outline:** Contemporary landscape architecture, spanning the 20th Century, to the present day, exploring a range of issues and themes, relating to landscape theory and practice.

**Assessment:** Assignments.

### **APG5026F LANDSCAPE CONSTRUCTION**

Qualifying course for MLA.

12 credits.

**Course outline:** Principles of grading, drainage, stormwater management, vehicular and pedestrian circulation, parking and cycleways. Hard landscape details.

**Assessment:** Assignments and workbook.

### **APG5029F LANDSCAPE ARCHITECTURE PROJECT**

Qualifying course for MLA taken in the second year.

36 credits.

**Prerequisites:** APG4032S, APG4037S or permission of course convenor.

**Co-requisites:** APG5026F, APG5053F or permission of course convenor.

**Course outline:** The structure and functioning of landscapes at the large scale, and the precinct scale, suitability evaluations; settlement and resource management, urban landscape design and detailing.

**Assessment:** Project work.

### **APG5030W GEOGRAPHICAL INFORMATION SYSTEMS PROJECT**

40 credits, lectures, contact sessions.

**Prerequisites:** APG5031F, APG5043F.

**Course outline:** On the recommendations of the supervisor and the agreement of the Head of Department, a student may be permitted to enter into a programme of individual study guided by the supervisor. The program will involve the student in about 360 hours of work and a written report must be submitted.

**Assessment:** Project report(s).

### **APG5031F DATA ACQUISITION AND CONCEPTS OF GIS**

28 credits, 12 four hour lectures, 40 hours on GIS software.

**Course outline:** Definition of GIS; GIS application areas, raster and Vector structures, maps and map analysis; review of co-ordinate systems and reference surfaces; map projections; introduction to Global Positioning System (GPS); spatial data sources-digitising and data formatting, spatial analysis, remote sensing and image processing, stereo and rectified images.

**Assessment:** June examination 3 hours.

### **APG5032S TECHNICAL ISSUES IN GIS**

28 credits, 40 hours on GIS software, 12 four hour lectures and related technologies.

**Course outline:** Map projections, co-ordinate systems and transformations; vector and raster data structures and algorithms; digital elevations models, TIN and general digital terrain applications in environmental and temporal studies; database concepts of GIS; error modelling and data uncertainty; design and presentation of spatial data.

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Research design and methodology.

**Assessment:** November examination 4½ hours.

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### APG5033Z MANAGEMENT ISSUES IN GIS

28 credits, 12 lectures 3½ hours.

**Course outline:** GIS application areas; land information systems and cadastral data bases; decision support systems; artificial intelligence; system planning, design and implementation; national and international data exchange standards.

**Assessment:** June examination 3 hours.

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### APG5034Z SURVEYING FOR RESEARCH PURPOSES

12 credits, 2 week block course including lectures, practical assignments, and technical reports.

**Prerequisites:** None.

**Course outline:** The aim is to provide a basic understanding of graphical and spatial concepts and skills of plane surveying, to teach problem solving skills in relation to practical surveying problems; to equip the student with group work skills; to equip the student with simple technical report writing skills. Content includes use and testing of levelling instruments, levelling calculation using the rise and fall method. Steel tapes: corrections for temperature, tension, catenary. EDM: principal of electronic distance measurement, corrections for refraction. Reduction of distances: slope, sea level, scale enlargement. Angular measure; the mapping/projection plane; the SA co-ordinate system; joins and polars, orientation, traverses. Setting up theodolites, observing procedures. Planning and execution of a tacheometric survey using electronic instrumentation. Fundamentals of mapping and cartography. Horizontal setting out: offsets, reference-grid, right angles, staking out. Vertical alignment: longitudinal sections, cross sections and volume calculations, sight rails, profiles, batter boards. GPS field data collection. Types and Sources of errors. Course outcomes: After completing this module the student should be able to: demonstrate understanding of graphical and spatial concepts, carry out basic site work from collecting spatial data to presentation of the results; set out works and perform area and volume calculations; use the Global Positioning System for basic data collection purposes; work in a team; produce technical reports and comment on accuracies achieved.

**Assessment:** Practical Assignments 70%, Examination 3 hours 30%.

**DP requirements:** Completion of practical assignments to the satisfaction of the course convenor.

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### APG5036F PROFESSIONAL PRACTICE

12 credits, 20 lectures.

**Prerequisites:** None.

**Course outline:** Professionalism is defined, differing modes of practice in the public and private sectors, client/architect relationships - terms of references, remuneration, roles, responsibilities, opportunities and liabilities. Interdisciplinary thinking between other players/co-consultants - project managers. Understanding basic common and contract law and critical legislation influencing the role and conduct of architects, building procurement systems and conflict resolution.

**Assessment:** Examination.

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### APG5037F PRACTICE MANAGEMENT FOR ARCHITECTS

12 credits, 20 lectures.

**Prerequisites:** None.

**Course outline:**

- practical experience in the application of management skills;
- context driven facilitation;
- financial principles/financial administration;
- modes of practice management;
- financial planing and monitoring;

- marketing procurement;
- resources - strategic planning and performance review.

**Assessment:** Examination.

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### **APG5040Z LAND, TENURE AND LAW**

20 credits, one week block lectures

**Course outline:** Land and tenure within the context of overarching city problems. Different approaches internationally to land and tenure issues. Current legal framework in SA in relation to tenure. Land markets - formal: investment cycles, sources of land, decision-making drivers; informal: invasions, informal sales, illegal tenure, occupation. Housing markets: shelter strategies, delivery systems, secondary markets, subsidy access modes. Land, tenure and social dynamics: migration, household structures, household economies / livelihoods, gender and youth, economic participation, HIV/AIDS. Political dynamics and power relations: leadership structures and modes, participation, patronage, clientelism. Fiscal/financial aspects.

**Assessment:** Three hour exam 40%; assignment 60%.

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### **APG5043F DATABASE MODELLING AND GEO-STATISTICS**

28 credits, 40 hours on GIS software, 12 four hour lectures and related technologies.

**Course outline:** Relational, Object-relational and Object oriented database concepts; knowledge based systems; general digital terrain models; applications in environmental and temporal studies; advanced Interpolation techniques; error modelling and data uncertainty.

**Assessment:** 3 hour examination (55%) and assignments and tests (45%).

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### **APG5044F WEB GIS**

18 credits, 48 lectures and 20 hours on GIS software and application development.

**Course outline:** Computer networks: Principles of computer networks, hardware/software, client/server computing and distributed systems Internet concepts: Overview of Internet concepts & features: Internet protocol, Domain Name System, Internet services, WWW, Web servers, Web clients. Web application development: Web page design principles, HTML, XML, data formats, helper applications, Java, databases and the Web. Internet GIS: Application of Internet services to GIS, Internet GIS software.

**Assessment:** 3 hour examination (55%) and assignments and tests (45%).

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### **APG5045S GIS FOR URBAN AND REGIONAL PLANNING**

18 credits, 40 hours of directed reading and research.

**Course outline:** The course is spread over three main areas:

- GIS in Property and Land Valuations: Property modeling using GIS. Spatial Urban Management Systems. Spatial Multi-criteria systems in evaluation.
- Urban Infrastructure Management: Dynamic segmentation modeling of linear features, The GIS-T model, Linear databases. 3-D Linear modeling systems. Route modeling and management of networks.
- Land Use and Cadastral systems: Land Information Systems. Decision support systems for Land Use Planning. GIS and the Cadastre.

**Assessment:** Seminar(s) (40%), term paper (60%).

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### **APG5046S ENVIRONMENTAL MANAGEMENT**

18 credits, 40 hours of directed reading and research.

**Course outline:** Spatial Decision Support systems for Natural Resources Management, GIS and Remote Sensing in Environmental Impact Assessment and Multi-criteria Evaluation analysis,

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Geological modeling, mathematical modeling for Geography, 3-D visualization, 3-D data structures for environmental data modeling. Environmental data acquisition techniques.

**Assessment:** Seminar(s) (40%), term paper (60%).

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### APG5047S GEO-INFORMATICS

18 credits, 40 hours of directed reading and research.

**Course outline:** Advanced Database Systems, Spatial indexing, Hierarchical structures, 3-D modeling Systems and Virtual Reality, Advanced Systems Development, Advanced GIS application Development.

**Assessment:** Seminar(s) (40%), term paper (60%).

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### APG5050Z MCPUD DISSERTATION

Qualifying course for MCPUD, taken in the second year.

120 credits.

**Prerequisites:** APG5055F.

**Course outline:** The course consists of a project on an approved subject usually chosen by the student. Fieldwork is an integral requirement of the course.

**Assessment:** Based upon project work.

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### APG5051Z MCRP DISSERTATION

Qualifying course for MCRP, taken in the second year.

120 credits.

**Prerequisites:** APG5020F.

**Course outline:** This course consist of a project on an approved subject usually chosen by the student. Fieldwork is an integral requirement of the course.

**Assessment:** Based on project work.

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### APG5052S MLA DISSERTATION

Qualifying course for MLA, taken in the second year.

100 credits.

**Prerequisites:** APG5029F.

**Course outline:** Major landscape project of student's choice undertaken under staff guidance.

**Assessment:** Project work.

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### APG5053F PLANTS AND DESIGN

Qualifying course for MLA.

12 credits.

**Course outline:** Vegetation types of Southern Africa, and limiting factors. Identification and utilization of plant material, principles of permaculture and horticulture. Planting plans, schedules and specifications.

**Assessment:** Assignments and workbook.

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### APG5055F URBAN DESIGN PROJECTS

Qualifying course for MCPUD, taken in the second year.

35 credits.

**Prerequisites:** APG4026S

**Course outline:** This course consists of urban design projects through which descriptive, explanatory, evaluative and interventive design skills are developed. Fieldwork is an integral requirement of the course.

**Assessment:** Based upon Project work and a comprehensive Studiowork Examination. Project

marks count 80% of final result Studiowork Examination counts 20% of final result.

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**APG5056F URBAN DESIGN THEORY**

Qualifying course for MCPUD, taken in the second year.

25 credits.

**Course outline:** Theories in urban design: urban design pioneers and their ideas; selected theorists and practitioners; review of the state of the art. Urban design policy: antecedents of urban design as government activity, urban design control frameworks, economics of urban design, contemporary urban design controls and techniques, policy arenas of urban design.

**Assessment:** By three papers.

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**APG6000W PHD THESIS: GEOMATICS**

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**APG6001F STUDIOWORK (ARCH5)**

48 credits.

**Course outline:** The course aims to prepare the student for Major Design Project, which is commenced in the latter part. It comprises a number of preliminary exercises intended to enable the exploration of concept formation from various perspectives, for example urban, tectonic, landscape/site.

**Assessment:** Examination (of all design work in Arch3, 4 and 5).

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**APG6002S STUDIOWORK (ARCH6)**

76 credits.

**Course outline:** The course is a self elected Major Design under the guidance of tutors, and is aimed to demonstrate the student's all-round architectural ability from the development of a programme to conceptual design, to developed detail design.

**Assessment:** Oral examination (And Thesis design).

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**APG7000W MASTERS DISSERTATION: ARCHITECTURE AND PLANNING**

180 credits.

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**APG7001Z MASTERS DISSERTATION: ARCHITECTURE AND PLANNING**

120 credits.

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**APG7002Z ARCHITECTURAL PROJECT**

32 credits.

**Course outline:** On the recommendation of the supervisor and with the agreement of the head of department, a student registered for an MArch or an MPhil (Arch) may be permitted to enter into a programme of individual study on an approved topic. A statement of objectives must be agreed upon, and the course of study will be guided by the supervisor. The programme will involve the student in about 280 hours of work, and a written report must be submitted. The work will be examined and an oral examination may be held at the discretion of the supervisor.

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**APG7005Z RESEARCH METHODS IN ARCHITECTURE & THE BUILT ENVIRONMENT A**

12 credits.

**Course outline:** The course introduces basic methods and theories to be used in the study of the history of architecture and the built environment. It includes introduction to the use of archival materials, public documents, manuscripts, oral history, interviews, site analyses and documentation for each type of research. Course work will be focused on Cape Town and its region, and will

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consist of readings and short research exercises from a variety of sources.

**Assessment:** Examination and yearmark.

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### APG7006Z RESEARCH METHODS IN ARCHITECTURE & THE BUILT ENVIRONMENT B

12 credits.

**Course outline:** Students will prepare a research proposal for a thesis to be written during the second semester. The proposal will include development of problem statement, design of research, methodology to be followed, sources to be consulted, bibliography, relation of this research to current research issues.

**Assessment:** Examination and yearmark.

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### APG7007Z RESEARCH PROJECT IN ARCHITECTURE AND THE BUILT ENVIRONMENT

32 credits.

**Course outline:** This course engages students in research projects in archives, libraries and sites in Cape Town and its region. All of the research projects will be components of a larger project, so each student will be researching a different aspect of one topic. Each student will conduct research, document the results of research, prepare a bibliography of sources utilized, and write a report of the research conducted.

**Assessment:** Research paper and yearmark.

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### APG7008Z THEORIES OF ARCHITECTURE AND THE BUILT ENVIRONMENT

12 credits.

**Course outline:** This course introduces students to contemporary theories of architecture and the built environment, with particular reference to Cape Town and its region. Included are readings on Cape Town as well as theoretical issues to be considered in the conduct of the research projects, including issues relating to culture and identity in the built environment, such as those based on gender, class, race and ethnicity; heritage assessment and evaluation in the built environment; construction of memory in places; globalisation and local culture; tradition and modernisation.

**Assessment:** Assignments and yearmark.

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### APG8000W PHD THESIS: ARCHITECTURE AND PLANNING

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### AST1000F INTRODUCTION TO ASTRONOMY

18 credits, 5 lectures per week, 6 practicals.

**Course co-ordinator(s):** Professor AP Fairall.

**Course outline:** Our place in the Universe. Early beliefs and historical development of astronomical knowledge. Telescopes and instrumentation. The Earth-Sun-Moon system. Planets of the Solar System. Stars. Our galaxy and others. Relativity and Cosmology. Life in the Universe.

**Assessment:** Class record: 50%, June examination 2 hours: 50%.

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### AST2002S ASTROPHYSICS

24 credits, 5 lectures per week, 1 practical per week.

**Course co-ordinator(s):** Dr PA Woudt.

**Prerequisites:** PHY1021F and PHY1022S (PHY1004W) or PHY1031F and PHY1032S (PHY1000W); MAM1000W.

**Course outline:** Radiation Laws, Black Body radiation. Planck function. Wien's Law. Stefan-Boltzmann Law. Hydrogen spectroscopy, stellar spectroscopy. Relativistic Doppler effect. Stellar distances, magnitudes, radii and masses. HR diagram. Hydrostatic equilibrium, stellar and planetary



structure. Nuclear energy, p-p cycle, CNO cycle, 3- $\hat{A}$ . The sun. Stellar evolution. White dwarfs, neutron stars, black holes. Our galaxy, 21-cm radiation, radio mapping, interstellar matter. Galaxies, dark matter. Hubble Law, expansion of the Universe, primordial nucleosynthesis, 2.726 K background radiation, the Big Bang model. Radio, infra-red, ultra-violet, x-ray and gamma-ray-astronomy.

**Assessment:** Class record: 50%, November examination 2 hours: 50%.

### **BUS1006S PEOPLE MANAGEMENT**

18 credits, first year status, 3 lectures per week and one two-hour tutorial every second week.

Please note that students who registered for the first time in 2007 will not be allowed to enrol for this course. The course is being phased out and only students who enrolled in 2006 and before will be eligible to enrol for the course.

**Course co-ordinator(s):** To be announced.

**Entrance requirements:** Entry to this course is restricted to (a) BBusSc students in special fields other than Organisational Psychology; (b) other Commerce students who do not intend to complete senior courses in Organisational Psychology and (c) students from other faculties who, at the discretion of the Head of Department are deemed to be appropriate candidates.

**Course outline:** The course focuses on people management for non-human resource managers. It is structured in such a way that it deals with those questions managers ask frequently about managing people. These questions will relate typically to issues of staffing, performance, training & development, fairness, talent management and organisational change.

**Assessment:** Coursework (on-line tutorial assignments and tests) 60%, October/November examination 40%.

**DP requirements:** Completion of all tests and tutorial assignments. Minimum of 35% for coursework.

### **BUS1036F/S EVIDENCE-BASED MANAGEMENT**

18 credits, 3 lectures per week, 1 one hour tutorial per week.

**Course co-ordinator(s):** Mr J Rosseau.

**Lecturers:** Mr J Rosseau, Mr R Irwin.

**Prerequisites:** None.

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

**DP requirements:** 40% required (on average) for all class work; submission of all assignments; attendance at a minimum of 80% tutorials.

**Examination requirements:** Essays and tutorial assignments 50%, 2 hour June/October examination 50%.

**Website:** <http://www.commerce.uct.ac.za/managementstudies/undergrad/>

### **BUS2010F/S MARKETING 1**

18 credits, 3 lectures per week, 1 one hour tutorial per week.

**Course co-ordinator(s):** Professor J Simpson.

**Prerequisites:** ECO1010F, ECO1011S, BUS1010F/S or BUS1036F/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

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the objectives of an organisation.

**Course outline:** The marketing concept, the marketing environment, consumer markets and industrial markets, buyer behaviour, marketing research, the use and importance of differentiation, market segmentation and target marketing, the marketing mix, product policy, pricing policy, distribution policy, promotion policy, marketing strategy, marketing organisation and implementation, measurement and control of marketing effectiveness including the marketing audit.

**DP requirements:** 40% class mark and the completion of all required assignments, attendance at 100% of tutorials.

**Examination requirements:** Essays, case studies, project and test 40%, 3 hour June examination 60%.

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### BUS2020F BUSINESS FINANCE

18 credits, 3 lectures per week, 1 one hour tutorial per week.

**Course co-ordinator(s):** Mr R Kruger

**Prerequisites:** STA1000S, STA1001F or MAM1000W or MAM1002, BUS1010F/S or BUS1036F/S, ECO1010F, ECO1011S, ACC1006F and ACC1011S concurrently.

**Objective:** To provide students with a broad introduction to financial markets, corporate finance and financial management.

**Course outline:** Introduction to corporate finance, financial intermediaries, time value of money, capital structure, financial leverage, leasing, dividends and dividend policy, financial analysis and planning, managing and financing working capital.

**DP requirements:** 40% for classwork, completion of all required assignments and tests, attendance at 80% of the tutorials.

**Examination requirements:** Classwork 40%, Final examination 60%.

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### CAS1001S AFRICA: CULTURE, IDENTITY AND GLOBALISATION

8 credits, 12 lectures, 10 tutorials.

**Course co-ordinator(s):** Dr N Shepherd.

**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 focussing on contexts and ideas which will be of direct benefit in professional practice, as well as on more abstract ideas which are generally enriching. The course takes a case-study approach, sampling a range of materials as a way of introducing students to some of the key words and concepts in Humanities-type study. Throughout, the emphasis is in finding readily accessible points of entry into sometimes complex issues and discourses, as well as providing "tools to think with": conceptual tools and an associated critical vocabulary which cut to the heart of contemporary contexts.

**Course contents:** The course is divided into three modules. The first, entitled Histories and Sites of Struggle provides a foundation for the course as a whole by giving some timelines and historical contexts which frame some notions of post-apartheid society; the second focuses on Identity in a Colonial and Postcolonial, Apartheid and post-Apartheid Context; and the last block investigates Conceptions of Development.

**Assessment:** Coursework 50%, final examination 50%.

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### CAS4005Z RACE, CULTURE AND IDENTITY IN AFRICA

16 credits, 12 double-period seminars.

**Course co-ordinator(s):** Dr Nick Shepherd

**Course outline:** The course is designed specifically with students, who are non African Studies specialists in mind, such as international students, or students from Faculties, such as Engineering and the Built Environment, Health Sciences, Science or Commerce. The mix of students, local and international as well as from a variety of disciplines, makes the interaction on the course an

enriching experience.

The course will address some of the major contemporary issues facing South Africa and the continent and will confront some of the stereotypes and misrepresentations of the culture and history of Africa. Taught with the aim of empowering aspirant professionals as they embark on careers, students will be provided with reading especially chosen for non-specialists. The course is taught using exciting multimedia resources; web-based material; film, books and journal articles, fiction and commentary; poetry, political writing; and site visits.

This course is of interest to students in faculties such as Engineering & the Built Environment who wish to gain knowledge of the African context in order to start understanding some of the challenges they might meet in practice once qualified. In addition, many professional institutes are now making courses such as this a requirement for professional accreditation as part of a programme of *Complementary Studies*.

**Assessment:** Coursework 50%, final examination 50%.

### CEM1000W CHEMISTRY 100

36 credits, 4 lectures per week, 1 practical per week, 1 tutorial per week.

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

**Assessment:** November examination 3 hours.

### CEM1008F CHEMISTRY FOR ENGINEERS

16 credits, 4 lectures per week, 1 practical per week.

**Course outline:** Basic chemical concepts, stoichiometry, some systematic inorganic chemistry, particularly metal oxides. Atomic structure and chemical bonding, with the emphasis on the structure of solids. Chemical equilibrium and aqueous solution chemistry, acids and bases. Thermochemistry. Basic electrochemistry and corrosion of metals, polymers.

**Assessment:** June examination 3 hours.

### CEM1009H CHEMISTRY 109

18 credits, 3 lectures per week, 2 tutorials per week, 1 practical per week.

**Note:** This course, together with CEM1010F or CEM1010S is equivalent to CEM1000W.

**Course outline:** Microscopic and macroscopic worlds, gases, atomic structure, chemical bonding and molecular structure, introduction to acids and bases, solutions, thermochemistry, kinetics, chemical equilibrium, acid-base equilibria, radiochemistry, introduction to the language of organic chemistry, functional groups and isomers in organic chemistry.

**Assessment:** November examination 3 hours.

### CEM1010F CHEMISTRY 110

18 credits, 5 lectures per week, 1 tutorial per week, 1 practical per week.

**Note:** This course, together with CEM1009H is equivalent to CEM1000W.

**Prerequisites:** CEM1009H.

**Course outline:** Volumetric analysis, chemical bonding, the solid state, liquids, colligative properties of solutions, acid-base equilibria, solubility products, chemical kinetics, oxidation and reduction, electrochemistry, introductory thermodynamics.

**Assessment:** June examination 3 hours.

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### CEM1010S CHEMISTRY 110

18 credits, 1 three-hour tutorial per week.

This half course is a tutorial-based reinforcement of CEM1010F available to students who have obtained a DP certificate for CEM1010F. There are no lectures, practicals or supplementary examinations for this course. Credit will not be given for both CEM1010F and CEM1010S. The half courses CEM1009H and CEM1010S together are equivalent to the first-year full course CEM1000W.

**Assessment:** November examination 3 hours.

Please note that this course will only be offered if a sufficient number of students register for the course.

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### CEM2007F PHYSICAL CHEMISTRY AND SPECTROSCOPY

24 credits, 5 lectures per week, 1 practical per week, 1 tutorial per week.

**Prerequisites:** CEM1000W or equivalent, first-year full course in Physics, first-year full or semester course in Mathematics. Concurrent registration for MAM2052F (Quantitative Skills for Scientists) is strongly recommended.

**Course outline:** Introduction to spectroscopy, molecular spectroscopy, thermodynamics, phase equilibria, electrochemistry, kinetics, solid-state chemistry, separation science. The practical course covers the lectured material.

**Assessment:** June examination 3 hours.

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### CEM2008S ORGANIC AND INORGANIC CHEMISTRY

24 credits, 5 lectures per week, 1 practical per week, 1 tutorial per week.

**Prerequisites:** CEM1000W or equivalent, first-year full course in Physics, first-year full or semester course in Mathematics. Completion of CEM2007F is strongly recommended.

**Course outline:** Main-group chemistry and trends in the Periodic Table, chemistry of the transition metals and co-ordination chemistry, structure elucidation of organic molecules, organic reactivity, reaction mechanisms and stereochemistry, elimination reactions and carbonyl group reactivity, substitution and addition reactions, chemical biology. The practical course covers the lectured material.

**Assessment:** November examination 3 hours.

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### CEM2009F ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

24 credits, 5 lectures per week, 1 practical per week.

**Prerequisites:** First-year full course in Chemistry, first-year full or semester course in Mathematics.

**Course outline:** What is Analytical Chemistry? Sample preparation, classical methods of quantitative analysis, instrumental methods of analysis, introduction to electrochemical and chromatographic methods, analysis of real samples. Applications to environmental problems will be emphasised throughout the course.

**Assessment:** June examination 3 hours.

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### CEM3004Z PHYSICAL CHEMISTRY LABORATORY

8 credits, 10 practicals on Wednesday and Friday afternoons to be arranged with the Department.

**Prerequisites:** CEM2007F.

**Course outline:** Experimental studies on distribution and chemical equilibria, electrochemistry, gas chromatography, heat capacity, absorption isotherms, sedimentation, ultraviolet and atomic absorption spectroscopy, diffusion, reaction kinetics and gas viscosity.

**Assessment:** Laboratory reports.

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**CEM3005W CHEMISTRY 305**

48 credits, 5 lectures per week, 2 practicals per week.

**Prerequisites:** CEM2007F, and CEM2008S, first-year full course in Mathematics and MAM2052F. The latter course may be taken concurrently with CEM3005W, and is not compulsory for students taking two second-year semester courses in Physics.

**Course outline:** Wave mechanics and spectroscopy, adsorption and heterogeneous catalysis, X-ray crystallography, dynamics, inorganic reaction mechanisms, organometallic chemistry, organic structure and reactivity, organic synthesis, organic dynamic stereochemistry. The practical course covers the lectured material.

**Assessment:** November examination two 3 hour papers.

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**CHE1000Z INTRODUCTION TO CHEMICAL ENGINEERING**

For BSc Conversion Programme students.

16 credits, 48 lectures, 18 tutorials/practicals.

**Course outline:** Introduction to the chemical process industry; units; unit operations; basic material and energy balancing. Problem solving. Introduction to MATLAB.

**Assessment:** Examination two 2 1/2 hours (February).

**DP requirements:** Satisfactory participation in practicals, tutorial and projects.

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**CHE1004W ENGINEERING 1**

32 credits, 96 lectures, 14 tutorials/practicals, 2 plant visits, 1 practical.

**Co-requisites:** MAM1003W.

**Course outline:** Studying and working in chemical engineering; unit conversions; introduction to processes and design; chemical engineering calculations; graphical analysis; MATLAB and modelling; design project.

**Assessment:** Class tests; projects, November examination 3 hours.

**DP requirements:** Pass Using Computer test, demonstration of basic competency in Unit Conversion; satisfactory completion of all projects and assignments, satisfactory attendance at all tutorial afternoons.

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**CHE2031F MATERIAL AND ENERGY BALANCES**

20 credits, 60 lectures, 12 tutorials.

**Prerequisites:** CHE1004W or CHE1000Z; CEM1000W, MAM1003W.

**Course outline:** Material balances without reaction, including the law of conservation of mass and development of a systematic approach to problem solving. Material balances with chemical reaction including nomenclature and conventions, limiting and excess reactants, tie substances and element balances. Material balances with recycle. Material and energy balances involving chemical equilibrium. Energy balances involving heat and work, including basic thermodynamics, development of the conservation of energy equation, enthalpy, heat capacity, heats of transition and the use of steam tables. Energy balances with chemical reaction involving total enthalpy, standard heats of formation, combustion and reaction, isothermal and adiabatic reactors. Simultaneous material and energy balances.

**Assessment:** Class tests; June examination 3 hours.

**DP requirements:** Satisfactory attendance at and submission of tutorials and minimum of 40% for class test average; submission of all specified hand-ins.

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**CHE2032F DESIGN OF CHEMICAL PROCESSES**

8 credits, 16 lectures, 9 tutorials/practicals, 3 Plant visits.

**Co-requisites:** CHE2031F.

**Course outline:** Important chemical process industries with special reference to South Africa. Introduction to economics of processes. Chemical Engineering drawing. Use of spreadsheets and

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MATLAB for mass balance calculations. Synthesis of chemical processes. Field trips to chemical process industry sites.

**Assessment:** Projects and assignments.

**DP requirements:** Attendance at all tutorials and field trips and satisfactory submission of all assignments.

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### CHE2033W CHEMICAL ENGINEERING LABORATORY 1

4 credits, 6 practicals.

**Co-requisites:** CHE2031F.

**Course outline:** Steady state mass and energy balancing, fluid flow measurements, pump characteristics, heat exchange.

**Assessment:** Reports, orals and tests.

**DP requirements:** Completion of all practicals and a minimum average of 50% for reports and oral presentations.

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### CHE2035S THERMODYNAMICS 1

12 credits, 36 lectures, 10 tutorials.

**Prerequisites:** CHE2031F.

**Course outline:** Basic concepts; extension and application of 1st Law of thermodynamics, Second Law of Thermodynamics, entropy balances, steam/refrigeration cycles, thermodynamic properties of real substances, equilibrium and stability of one-component systems.

**Assessment:** Class tests; November examination 3 hours.

**DP requirements:** Satisfactory attendance and submission of tutorials. Class test average of 40%.

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### CHE2040S DESIGN OF FLUID FLOW AND HEAT TRANSFER SYSTEMS

20 credits, 60 lectures, 24 tutorials.

**Prerequisites:** CHE1004W, CHE2031F (DP), MAM1003W, PHY1010W.

**Co-requisites:** CHE2033W, MAM2080W.

**Course outline:** Fluid Flow: Fluid statics; Flow of fluids: general energy and momentum relationships; Flow of Newtonian liquids in pipes: friction factors and pressure drop, velocity distribution for laminar flow using shell balances, turbulent flow, friction losses, flow over banks of tubes; Flow and pressure measurement: Fluid pressure, measurement of fluid flow; Pumping of liquids: centrifugal pump characteristics, matching of pump and system curves, power requirements. Heat Transfer: Heat transfer by conduction: plane walls, resistances in series, thick-walled tubes, spheres, unsteady conduction; Heat transfer by convection: natural and forced, inside and outside tubes, to spheres; Heat transfer by radiation: black bodies, grey bodies, gases; Condensation and boiling heat transfer; Shell and tube heat exchanger design: temperature differences, film coefficients, overall heat transfer coefficients, pressure drops; Insulation. Open-ended problem solving.

**Assessment:** Projects, class tests, November examination two 3 hour papers.

**DP requirements:** 40% average for class tests, satisfactory attendance at and submission of tutorials and projects.

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### CHE3000X PRACTICAL TRAINING

**Course outline:** Chemical Engineering students shall complete a period of six to eight weeks of practical work before registering for the 4th year of their studies if possible. The work should be project-based, and should require application of a significant body of knowledge or skills from the 2nd or 3rd year curriculum. Evidence of this work, either in the form of a technical report to the satisfaction of the programme convenor, or in the form of a letter of confirmation from a practising engineer, shall be submitted on the day of registration.

**DP requirements:** None.

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**CHE3035S BIOPROCESS ENGINEERING 1**

8 credits, 24 lectures, 2 tutorials, 2 practicals, 2 Plant visits.

**Prerequisites:** All second year core courses.

**Course outline:** An introduction to microbiology and biochemistry; the requirements of microbial processes; bioreactor design; bioprocess kinetics; sterilisation; selected case studies, visits to local bioprocess industries.

**Assessment:** Assignments and November examination 2 hours.

**DP requirements:** None.

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**CHE3039S CHEMISTRY AND CHEMICAL ENGINEERING OF CATALYTIC PROCESSES**

8 credits, 24 lectures.

**Prerequisites:** All second year core courses.

**Co-requisites:** Core courses of the third year.

**Course outline:** General introduction to the chemistry and kinetics of catalysis. Application of catalysts and reactor technology in processes such as petroleum refinery, methanol and Fischer-Tropsch synthesis and hydrocracking.

**Assessment:** November examination 2 hours.

**DP requirements:** None.

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**CHE3040S SOLID-FLUID OPERATIONS**

12 credits, 36 lectures, 12 tutorials.

**Prerequisites:** CHE2031F, CHE2034S and CHE2036S or CHE2040S

**Course outline:** Fluid and solid-fluid operations. Motion of a particle in a fluid and fluid through a bed of particles. Particle characterisation. Sedimentation, thickening, centrifugation, mixing and agitation, rheology, flow through packed beds, fluidisation, filtration.

**Assessment:** Class tests; November examination 3 hours.

**DP requirements:** Minimum course mark average of 40% and satisfactory submission of tutorials.

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**CHE3043S SEPARATION PROCESSES**

16 credits, 48 lectures, 10 tutorials.

**Prerequisites:** CHE2031F, CHE3046F, DP in CHE3063F.

**Course outline:** General principles of mass transfer operations in stagewise and continuous contact equipment, gas absorption, distillation, liquid-liquid extraction, membranes, adsorption.

**Assessment:** November examination, Design Project, class tests, tutorials.

**DP requirements:** 40% year mark, 40 % for design project, satisfactory completion of tutorials as specified in course handout.

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**CHE3044F REACTOR DESIGN 1**

12 credits, 36 lectures, 12 tutorials.

**Prerequisites:** CHE2031F, CEM2007F, DP in CHE2035S.

**Course outline:** Ideal reactors. Reactor staging. Chemical kinetics. Rate expressions from experimental data. Series, parallel and complex reactions. Residence time distributions. Non ideal reactor models.

**Assessment:** Class tests; June examination 3 hours.

**DP requirements:** Minimum class test average of 40% and satisfactory completion of tutorials.

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**CHE3045S REACTOR DESIGN 2**

16 credits, 48 lectures, 12 tutorials.

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**Prerequisites:** CHE2036S or CHE2040S, DP in CHE3044F, CHE3046F and CHE3063F.

**Course outline:** Non-Isothermal reactor design. Multiple steady states. Heterogeneous catalysis and rate expressions. Transport resistances in heterogeneous processes. Non-catalytic solid-fluid reactions and reactor design.

**Assessment:** Class tests; November examination 3 hours; Design Project.

**DP requirements:** Satisfactory completion and submission of tutorials and design project. 40% average class mark.

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### CHE3046F THERMODYNAMICS 2

12 credits, 36 lectures, 11 tutorials.

**Prerequisites:** CHE2031F, DP in CHE2035S.

**Course outline:** Thermodynamics of multicomponent systems, estimation of Gibbs Free Energy and fugacity of species in mixtures; phase equilibrium in mixtures; chemical equilibrium and balance equations for chemically reacting systems; applications of computational methods to solve thermodynamic problems.

**Assessment:** Class tests; June examination 3 hours.

**DP requirements:** Satisfactory completion of tutorials and minimum class test average of 40%.

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### CHE3049W CHEMICAL ENGINEERING LABORATORY II

16 credits, 8 lectures, 6 practicals.

**Prerequisites:** All second year core courses.

**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, crystallization, 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.

**Assessment:** Practicals, reports, presentations, class tests.

**DP requirements:** Completion of all practicals, reports, and presentations. Minimum of 50% for the course, technical reports and class test.

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### CHE3062S PROFESSIONAL COMMUNICATION STUDIES

For Chemical Engineering and Geomatics students.

12 credits, 24 lectures.

**Co-requisites:** CHE3049W.

**Course outline:** This course covers 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. **Second-year students may not register for CHE3062S.**

**Assessment:** Oral examination (1 hour), October/November examination 2 hours.

**DP requirements:** 100% attendance and 50% minimum class test average.

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### CHE3063F MASS TRANSFER

16 credits, 48 lectures, 10 tutorials.

**Prerequisites:** CHE2031F, CHE2034S, CHE2036S, CHE2040S, MAM2080W.

**Course outline:** Molecular, Fick, Maxwell-Stefan diffusion, Shell balances. Film coefficients, boundary conditions, macroscopic balances using film coefficients. Boundary layer theory, basics, turbulent flow. Overall coefficients, Use of overall coefficients, interfacial mass transfer, analogies, practical analysis of mass transfer with simultaneous heat and momentum transfer.

**Assessment:** June examination, computer project, class tests, tutorials.



**DP requirements:** Year mark 40%, submission of computer project, satisfactory completion of tutorials as specified in course handout.

### **CHE3064S** MINERAL AND METALLURGICAL PROCESSING I

8 credits, 4 lectures, 5 practicals.

**Prerequisites:** All second year core courses.

**Course outline:** The course begins with a multimedia-based introduction to the field of mineral and metallurgical processing, from the mining operation to environmental rehabilitation. The course then requires students to perform experiments and to analyse the subsequent data from a cone crusher, ball mill, in-line pressure jig, flotation cell, leach cell, DC plasma-arc furnace and electrowinning cell. Here, the ball mill, in-line pressure jig, flotation cell and DC plasma-arc furnace are pilot-scale units. Finally, students are required to develop a simplified process simulation of the above unit operations using a spreadsheet-based simulator (LIMN).

**Assessment:** Projects 25%, practicals 75%.

**DP requirements:** Complete all practicals and presentations, minimum of 50% aggregate for reports.

### **CHE4024F** INTRODUCTION TO ENVIRONMENTAL PROCESS ENGINEERING

8 credits, 24 lectures, 6 tutorials.

**Prerequisites:** All second year core courses.

**Course outline:** Interaction of industrial processes with the natural environment; mechanisms of pollution; air pollution theory and examples (Cape Town, the Highveld, global issues); energy-related environmental issues; industrial water use and effluent treatment; acid mine drainage; municipal and industrial solid waste management; life cycle assessment; sustainability and sustainable development.

**Assessment:** June examination 2 hours; project.

**DP requirements:** None.

### **CHE4029Z** PROFESSIONAL COMMUNICATION STUDIES

For Chemical Engineering students.

8 credits, 24 lectures.

**Prerequisites:** 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:** The syllabus includes 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.

**Assessment:** Examination by projects and presentations, Oral examination (1 hour).

**DP requirements:** 100% attendance and 50% minimum class test average.

### **CHE4036Z** CHEMICAL ENGINEERING DESIGN

28 credits.

**Prerequisites:** CHE4048F, CHE4049F.

All core third year courses, DP in CHE4042F.

**Co-requisites:** Maximum number of credits taken concurrently is 16.

Students will not be given a concession to do CHE3045S and CHE3043S 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:

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- 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;
- project evaluation.

The work will be presented in the form of intermediate technical reports, a concise executive summary and various oral presentations.

**Assessment:** Design Project.

**DP requirements:** None.

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### CHE4042F PROCESS DYNAMICS & CONTROL

16 credits, 48 lectures, 10 tutorials.

**Prerequisites:** All core third year courses.

**Course outline:** 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: Root Locus methods, Bode diagrams and stability, gain and phase margins, Ziegler-Nichols tuning. Feedforward and cascade control. Multi-input-multi-output systems: stability, interaction, relative gain array, decoupling.

**Assessment:** Examination 3 hours; computer assignment, tests and examination.

**DP requirements:** Satisfactory performance in the practical, tutorials and worksheets.

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### CHE4045Z CHEMICAL ENGINEERING PROJECT

32 credits.

**Prerequisites:** All core third year courses.

**Co-requisites:** Maximum number of credits taken concurrently is 16.

**Course outline:** lecture Outline: 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. Project Outline: An assigned experimental or theoretical investigation involving limited staff supervision. Assessment of performance based on engineering ability and initiative displayed in formulation of objectives, execution of the project and presentation of the results.

**Assessment:** Project.

**DP requirements:** None.

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### CHE4048F BUSINESS, SOCIETY AND ENVIRONMENT

20 credits, 48 lectures, 12 tutorials.

**Prerequisites:** All core third year courses.

**Co-requisites:** CHE4049F, CHE4029F.

**Course outline:** The course aims to provide a foundation for students to engage with their future roles as practicing professionals or entrepreneurs relative to expectations of society, and of employers. The course also introduces the contextual and conceptual aspects of the final year design project (CHE4036Z). The course covers: Benefit Indicators, Physical Risk in the Process Industries, Stakeholder Participation, Innovation and Entrepreneurship, Business Planning, Capital and Operating Cost Estimation, Profitability Assessment, Introduction to Optimisation, Engineering Ethics.

**Assessment:** June examination 3 hours, Business Planning Project, HS&E Project, Class test.

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**CHE4049F PROCESS SYNTHESIS AND EQUIPMENT DESIGN**

20 credits, 48 lectures, studio sessions, 8 tutorials.

**Prerequisites:** 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 sizing of major equipment as learnt in third year, and minor equipment, pipe work and heat exchangers as learnt in second year. It places emphasis on design philosophy, overview and the global picture of process systems. It covers: Process Flowsheeting Conventions, Flowsheet Case Studies, Process Synthesis Theory and Heuristics, Chemical Engineering Flowsheeting Packages, Energy Integration, Design of Pressure Vessels and Control Valves, Process Control Philosophy, Hazard and Operability Assessment, Plant Layout.

**Assessment:** Flowsheeting Synthesis, Modelling and Equipment Design Projects, Simulation Hands on Test; June examination (2 hours).

**DP requirements:** Satisfactory completion of all 3 projects.

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**CHE4050F MINERAL AND METALLURGICAL PROCESSING II**

8 credits, 14 lectures, 3 projects.

**Prerequisites:** 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 items and circuits. The course then presents selected theories/models used for the design, modelling and simulation of industrial milling and flotation process items and circuits. The course concludes with an overview of the use of two milling and flotation simulators (JKSimMet and JKSimFlot). Students are required to demonstrate their understanding of the course material through three projects.

**DP requirements:** Complete all projects, minimum of 50% aggregate for reports.

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**CHE4051W PROCESS INDUSTRIES**

8 credits.

**Prerequisites:** 3 year BSc Degree.

**Course outline: Fieldwork:** The students will undertake a selection of 3 field studies selected from local industries relevant to their chosen specialisation. The students will plan these visits, collect relevant information prior to the visit, compile a programme for each visit and report on their findings. In each of these, they will be expected to compile the process flow sheet for the manufacture of a specific product and to gather detailed knowledge on 3 unit operations used in the process. The assignments will be compiled in the open-ended format, requiring the student to investigate the theory underpinning the process, to plan and conduct the visit, collect and process information, and to present their findings as a technical report and seminar in each case. **Fieldwork:** The students will undertake a selection of 3 field studies selected from local industries relevant to their chosen specialisation. The students will plan these visits, collect relevant information prior to the visit, compile a programme for each visit and report on their findings. In each of these, they will be expected to compile the process flow sheet for the manufacture of a specific product and to gather detailed knowledge on 3 unit operations used in the process. The assignments will be compiled in the open-ended format, requiring the student to investigate the theory underpinning the process, to plan and conduct the visit, collect and process information, and to present their findings as a technical report and seminar in each case.

**Assignment:** In addition to the plant visits, the students will undertake the review of a potential new product in their discipline, considering routes to production, market, product specification etc. In addition to the plant visits, the students will undertake the review of a potential new product in their discipline, considering routes to production, market, product specification etc.

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### CHE4052W PROCESS TECHNOLOGY LABORATORY FOR SCIENTISTS

8 credits.

**Prerequisites:** 3 year BSc Degree.

**Course outline: Lectures:** Students will attend a set of 8 lectures (shared with the courses CHE3049W or CHE2033W) in which they will be taught the elements of safety in the laboratory, experimental design and statistics for experimental analysis.

**Practicals:** The students will conduct a selection of 4 practical experiments selected from those available within the chemical engineering curriculum. These experiments will be conducted in the open-ended format, requiring the student to investigate the theory of the experiment, to plan an experimental approach, to conduct the experiment, collect data, analyse the data both qualitatively and quantitatively, and to present their research findings as a technical report in each case. Practical will be drawn from the following: filtration, fluid flow, crystallisation and precipitation, protein production and recovery, fermentation, residence time distribution, milling, fluidisation, flooding and loading, analysis of chemical kinetics, process control.

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### CHE5000W MASTERS DISSERTATION: CHEMICAL ENGINEERING

180 credits.

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### CHE5002Z MASTERS DISSERTATION: CHEMICAL ENGINEERING

120 credits.

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### CHE5022Z INTRODUCTION TO CATALYSIS

16 credits.

**Course outline:** Catalyst preparation (zeolites; metal-based catalysts); Basic principles in heterogeneous catalysis, catalyst testing (reactions, product analysis); acid catalysed reactions; metal catalysed reactions; bi-functional catalysis; oxidation catalysis; diffusion and adsorption.

**Assessment:** Examination 3 hours.

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### CHE5027Z ADVANCED REACTION KINETICS IN HETEROGENEOUS SYSTEMS

8 credits.

**Course outline:** Collision theory, adsorption, micro-kinetic analysis of heterogeneous catalysed reactions. Kinetics of specific systems; microbial enzyme kinetics, kinetics of polymerisation; oxidation reactions, mineral leaching.

**Assessment:** Examination 2 hours and assignments.

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### CHE5030Z ADVANCED ENGINEERING STATISTICS 1

8 credits.

**Course outline:** Fundamentals; Probability models; introduction to experimental design; parameter estimation from single response data.

**Assessment:** Project and/or examination.

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### CHE5032Z APPLIED MATHEMATICS & MODELING 1

8 credits.

**Course outline:** Computer arithmetic; Numerical techniques: linear algebra, non-linear equations, differential equations (stiff, non-stiff), initial value problems, boundary value problems, partial differential equations, collocation, finite elements, non-linear parameter estimation with complex models, sensitivity analysis, applied in chemical engineering; Programming computer solutions.

**Assessment:** Project and/or examination.

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**CHE5033Z APPLIED MATHEMATICS & MODELING 2**

8 credits.

**Course outline:** Formulation of chemical engineering models, boundary value problems, partial differential equation problems, solution techniques, use of software, programming.

**Assessment:** Project and/or examination.

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**CHE5038Z BIODYNAMICS AND BIOENERGETICS**

This course cannot be taken with CHE5070Z. 8 credits.

**Prerequisites:** BSc(Eng) or equivalent four year BSc(Hons) degree.

**Course outline:** The stoichiometry of microbial growth and product formation. The concept for degree-of-reduction. Determination of nutrient requirement, oxygen requirements and heat output during microbial growth. The use of Gibbs Free Energy to determine theoretical growth yields. The rate equations for microbial growths, substrate utilization and product formation. The classical approach using the Monod equation and modifications thereof. Microbial growth kinetics based on a rate equation for specific substrate utilization. The effects of substrate and product inhibition. Maintenance requirements and endogenous respiration.

**Assessment:** Examination 3 hours, assignments.

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**CHE5040Z CHEMICALS FROM OIL**

12 credits.

**Course outline:** Oil refinery processes: distillation; catalytic cracker; reformer; visbreaker; delayed coker. Purification of chemicals from oil refinery product streams. Processing of chemicals from oil refinery: ethene, propene, C4-fraction, aromatics.

**Assessment:** Examination 2 hours.

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**CHE5041Z INSTRUMENTAL ANALYSIS 1**

4 credits.

**Course outline:** Introduction to instrumental measurements; amplification of signals; noise; temperature measurement; pressure measurement; evaluation of analytical data.

**Assessment:** Examination 1 hour.

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**CHE5042Z INSTRUMENTAL ANALYSIS 2**

4 credits.

**Course outline:** Chromatographic methods; chromatographic separation; peak broadening; column efficiency; instrumentation for GLC; instrumentation for HPLC; detectors; quantitative analyses.

**Assessment:** Examination 1 hour.

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**CHE5043Z INSTRUMENTAL ANALYSIS 3**

4 credits.

**Course outline:** Spectroscopic methods; electromagnetic radiation; optical instrumentation; quantitative absorption measurements; UV/VIS, IR, XRD, surface characterisation techniques.

**Assessment:** Examination 2 hours.

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**CHE5045Z CHEMICALS FROM SYNTHESIS GAS**

12 credits.

**Course outline:** Methanol synthesis; Fischer-Tropsch synthesis; Purification of chemicals from Fischer-Tropsch process stream. Processing of chemicals.

**Assessment:** Examination 3 hours.

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### CHE5047Z INTRODUCTION TO MOLECULAR MODELING

8 credits.

**Course outline:** Molecular modelling of solids and fluid-phase components of interest in catalysis and other fields. Course provides background theoretical understanding for molecular modelling as well as subject specific experience with the use of the leading commercial modelling software. Includes the building of molecular structures ab initio, the use of data libraries as well as the use of various force-field energy minimisation techniques.

**Assessment:** Examination 2 hours.

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### CHE5048Z CRYSTALLIZATION AND PRECIPITATION

12 credits, 26 lectures, 6 tutorials.

**Course outline:** Crystallisation and precipitation are considered as separation processes, where a solid phase is created from a liquid phase. The course covers crystallisation methods and supersaturation, particle size distribution (PSD), crystal morphology, mother liquor inclusions, uptake of impurities, primary nucleation, growth mechanisms and growth rate expressions, the population balance equation, agglomeration and special considerations for precipitation.

**Assessment:** Project(s).

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### CHE5049Z CHEMICAL ENGINEERING TOPICS FOR SCIENTISTS

Not offered to Chemical Engineering graduates

16 credits, 48 lectures, 12 tutorials.

**Course outline:** Material and energy balances; reactor configuration; reaction kinetics; fluid flow in pipe reactors and particulate systems.

**Assessment:** Examination 3 hours, assignments.

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### CHE5051Z MICROBIAL PHYSIOLOGY AND DYNAMICS

8 credits.

**Prerequisites:** BSc(Eng) or equivalent four year BSc(Hons) degree.

**Course outline:** Fundamentals of microbiology, macromolecules and metabolism; metabolic engineering; microbial media and culture maintenance; gene expression and control.

**Assessment:** Examination 3 hours, assignments.

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### CHE5052Z MOLECULAR BIOLOGY AND BIOCATALYSIS

8 credits, 24 lectures, 3 assignments.

**Course outline:** Gene cloning and expression; genetically engineered organisms in processes: process constraints; regulatory constraints and GMO's; Microbial species identification using molecular biology; definition of biocatalysis; enzymes as biocatalysts; enzyme kinetics; enzyme applications in biocatalysis; biotransformations using whole cell systems.

**Assessment:** Examination and year mark.

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### CHE5053Z BIOPROCESS DESIGN TECHNOLOGY

This course cannot be taken with CHE5070Z.

8 credits.

**Prerequisites:** BSc(Eng) or equivalent four year BSc(Hons) degree.

**Course outline:** Introduction to bioprocess design. Mixing and oxygen transfer; bioreactor design and scale up; sterilisation; mixed cultures; downstream processing.

**Assessment:** Examination 3 hours and assignment.

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### CHE5054Z BIOTECHNOLOGY LABORATORY

8 credits

**Course outline:** Basic microbiology, fermentation technology, brewing, protein extraction and electrophoresis, DNA extraction, PCR, Fluorescence microscopy, enzyme kinetics, biotransformations.

**Assessment:** Assignments and practical examination.

### **CHE5055Z RESEARCH COMMUNICATION AND METHODOLOGY**

16 credits, 20 lectures, 4 assignments and final report.

**Course outline:**

- Methodology of planning, conducting and analysis of research;
- formulation of key questions and hypotheses; development of experimental plan;
- conducting experiments/data accumulation/interpretation of data;
- training in accessing of relevant literature;
- organisation of papers: references, key words, and most important relevant findings;
- critical interpretation of literature;
- formulation of research proposal;
- structuring of scientific publications (thesis, review and research papers);
- conference/seminar/poster presentations.

**Assessment:** Examination and year mark.

### **CHE5056Z BIOLEACHING OF SULPHIDE MATERIALS**

8 credits, 20 lectures, 4 tutorials.

**Course outline:** Scope of bioleaching and its historical developments; industrial applications: dump, heap and tank leaching and the use of thermophiles; microorganisms: microbial ecology of bioleach systems; mechanism and kinetics: chemical reaction mechanisms; kinetics and rate equations; modelling: chemical process modelling; future developments: current research activities and developmental challenges.

**Assessment:** Examination.

### **CHE5057Z FUNDAMENTALS OF HYDROMETALLURGY**

12 credits, 28 lectures, 4 tutorials.

**Course outline:** Aqueous thermodynamics; kinetics of heterogeneous reactions; material and energy balances in hydrometallurgy.

**Assessment:** Examination and year mark.

### **CHE5058Z HYDROMETALLURGY UNIT OPERATIONS**

16 credits, 30 lectures, 4 tutorials.

**Course outline:** Advanced topics in leaching: theory; applications to leaching practice; precipitation and crystallisation.

**Assessment:** Examination and year mark.

### **CHE5059Z HYDROMETALLURGICAL PRACTICE**

16 credits, 25 lectures, 4 tutorials.

**Course outline:** Flowsheet development and design; environmental practice; metallurgical accounting practice; techno-economic assessment of process options.

**Assessment:** Examination and year mark.

### **CHE5060Z SOLVENT EXTRACTION**

8 credits, 20 lectures, 4 tutorials.

**Course outline:** Solvent Extraction: practice; engineering; modelling.

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**Assessment:** Examination and year mark.

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### CHE5061Z ADVANCED TOPICS IN REDUCTION

8 credits, 20 lectures, 4 tutorials.

**Course outline:** Metal reduction: theory - chemical reaction kinetics and thermodynamics; engineering - chemical process design and engineering; modelling - chemical process modelling.

**Assessment:** Examination and year mark.

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### CHE5062Z ELECTROWINNING AND REFINING PRACTICE, MODELING AND CONTROL

8 credits, 20 lectures, 4 tutorials.

**Course outline:** Electrowinning and refining: Practice - chemical process design, engineering and operation; Modeling - chemical process modelling; Control - chemical process control.

**Assessment:** Examination and year mark.

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### CHE5063Z ADVANCED TOPICS IN ADSORPTION AND ION EXCHANGE

8 credits, 20 lectures, 4 tutorials.

**Course outline:** Introduction: scope of adsorption and ion exchange and its historical development; theory: adsorption and ion exchange process systems engineering; industrial applications: adsorption and ion exchange process applications; modelling and control: chemical process modelling and control.

**Assessment:** Examination and year mark.

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### CHE5064Z SUSTAINABILITY IN CHEMICAL ENGINEERING

8 credits

**Prerequisites:** BSc(Eng) or equivalent four year BSc(Hons) degree. Students of excellent academic standing may be given concession to register for this course in the final year of their BSc(Eng) degree.

**Course outline:** Sustainability is fast becoming a major factor in decision making in most industries employing chemical engineering graduates. Since the IChemE and its sister associations signed the London Communiqué in 1997, sustainability has become understood as a key design and operation criterion for chemical engineers to consider. This course seeks to provide graduate students with an awareness of the issues surrounding a sustainable process industry and an appreciation for its importance. The course will examine the central role of chemical engineering in achieving balance amongst economic, environmental, and social benefits and impacts for projects conducted by companies operating in the oil, chemicals, minerals and energy sectors, and will address related challenges of intensive agriculture and provision of water. It seeks to go further to provide a framework and a set of tools which will assist the process engineer in providing rational input in terms of sustainability into decision making, with quantification wherever possible.

**Assessment:** Examination and assignments.

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### CHE5065Z AN INTRODUCTION TO THE DISCRETE ELEMENT METHOD AND TO SMOOTHED PARTICLE HYDRODYNAMICS

16 credits.

**Course outline:** Fundamentals of the Discrete Element Method (DEM) and of Smoothed Particle Hydrodynamics (SPH). Use of a particular commercial DEM code to simulate the behaviour of both granular materials and brittle solids. The basics of SPH code creation and solution of sample problems of fluid flow and elastic material response.

**Assessment:** Assignments and examination.



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**CHE5066Z COMPUTING FOR ENGINEERS**

8 credits, 24 lectures.

**Prerequisites:** BSc(Eng).

**Course outline:** Introduction to Delphi and OOP. Numerical Codes in Delphi. Introduction to CAPE-OPEN/APEN.

**Assessment:** Project and/or examination.

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**CHE5067Z ADVANCED PROCESS SYNTHESIS AND FLOWSHEETING**

8 credits, 24 lectures.

**Prerequisites:** BSc(Eng).

**Course outline:** (i) Option generation via combinatorial logic (ii) Feasibility tests for chemical process flowsheets (iii) Means end analysis as a tool for flowsheet synthesis (iv) Mass and Energy balance for flowsheets with recycles- stream tearing and partitioning (v) Algorithms to solve mass and energy balance for complex flowsheets - e.g. Inside-Out Algorithm. (vi) Design problem versus simulator approach, i.e. why can't simulators solve the inverse problem?

**Assessment:** Projects and/or examination.

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**CHE5068Z PROCESS CONTROL AND MANAGEMENT**

8 credits, 24 lectures, 12 tutorials.

**Prerequisites:** BSc(Eng).

**Course outline:**

**(A) Control:**

- i). Advanced Control: e.g. feed-forward control, self-tuning regulators, model-reference adaptive control
- ii) Model predictive control
- iii) Statistical process control
- iv) Artificial Intelligence in process control - Neural networks and fuzzy logic
- v) plant-wide control
- vi) safety systems

**(B) Management:**

- i) Quality control
- ii) Production planning.
- iii) Optimal control
- iv) Program Evaluation and Review Techniques (PERT) and Critical Path Method (CPM).

**Assessment:** Project and/or examination.

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**CHE5069Z ADVANCED THERMODYNAMICS AND SEPARATION PROCESSES**

8 credits, 24 lectures.

**Prerequisites:** BSc(Eng).

**Course outline:** Advanced Thermodynamics OR Fluid Phase Equilibria: (i) Activity models - Margules, van-laar, NRTL (ii) Physical property estimation - UNIFAC methods (iii) Non-ideal phase equilibrium diagram (VLE) (iv) Gibbs energy minimization Advanced Separation Process OR Non-ideal separation: (i) Separation Barriers - homogeneous and heterogeneous azeotropes; (ii) Pinch analysis (node pinches, saddles and tangent pinches) and feasibility of equilibrium-based separation methods. (ii) Residue curve Maps (RCM) and distillation region diagram (DRD) in ternary space (iii) Extension of RCM and DRD to more than 3 components - Attainable Region Methods (iv) Computer-aided solvent design for azeotropic distillation. (v) Residue curve analysis for reactive distillation.

**Assessment:** Project and/or examination.

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**CHE5070Z** ADVANCED BIOPROCESS ENGINEERING

This course cannot be taken with CHE5038Z and CHE5053Z.

16 credits, 36 lectures, 12 tutorials.

**Prerequisites:** BSc(Eng) or equivalent four year BSc(Hons) degree.

**Co-requisites:**

**Course outline:** Introduction to bioprocess design, stoichiometry of microbial growth and product formation. Mixing and oxygen transfer, Bioreactor design and scale up, Sterilisation, Material and energy balances for microbial systems, Biokinetic analysis of batch, fed-batch and continuous systems, Mixed cultures and mixed culture kinetics, Downstream processing.

**Assessment:** Examination 3 hours, projects and assignments.

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**CHE5071Z** APPLIED NUMERICAL ANALYSIS IN BIOCHEMICAL SYSTEMS

8 credits.

**Course outline:** Intro to statistics, matrix algebra, differential equations, modelling biochemical systems, programming in MatLab, advanced spreadsheeting, visual basic.

**Assessment:** Project and/or examination.

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**CHE5072Z** FUNDAMENTALS OF PROCESS MODELLING

4 credits.

**Course outline:** Micro-, meso-, macro-scale modelling; Population balance modelling; Dynamics and stability of chemical systems.

**Assessment:** Project and/or examination.

**DP requirements:** Attendance 70%.

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**CHE5073Z** ESSENTIAL TECHNICAL TOOLS

16 credits.

**Course outline:** Problem solving, risk assessment, sampling theory and practice, comparative statistics for minerals engineers, mass balancing and data reconciliation using Microsoft Excel, Project Management and Microsoft Project.

**Assessment:** Examination and year mark.

**DP requirements:** Attain no less than 50% for the year mark.

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**CHE5074Z** ADVANCED COMMINATION, LEVEL 1

16 credits.

**Course outline:** Comminution principles (equipment power draw, classification principles, etc).

**Assessment:** Examination and year mark.

**DP requirements:** Attain no less than 50% for the year mark.

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**CHE5075Z** ADVANCED COMMINATION, LEVEL 2

16 credits.

**Prerequisites:** CHE5074Z.

**Course outline:** Comminution theory (rock breakage, ore characterisation, etc). Steady state models of unit operations (crushers, screens, cyclones, mills). Circuit optimisation - the use of recycle streams.

**Assessment:** Examination and year mark.

**DP requirements:** Attain no less than 50% for the year mark.

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**CHE5076Z** CONCEPTUAL FRAMEWORK OF MINERALS BEATIFICATION

8 credits.

**Course outline:** The economics of mined commodities, with examples taken from the relevant mining sub-industry (e.g. from the Platinum or Gold industries). Mining, Smelting and Refining theory and practise for engineers not practising in these fields. Introduction to project analysis (issues such as viability and sensitivity).

**Assessment:** Examination and year mark.

**DP requirements:** Completion of all assignments.

## CHE6000W PHD THESIS: CHEMICAL ENGINEERING

### CIV1004W ENGINEERING 1

32 credits.

**Course outline:** The course provides opportunities for the development of the essential skills required in engineering within a civil engineering context. 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 IT.

**Assessment:** Continuous assessment by projects, assignments and tests.

### CIV1006S BUILDING SCIENCE 1

16 credits, 4 lectures per week.

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

**Assessment:** November examination 2 hours.

### CIV2011F MECHANICS OF MATERIALS

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** MAM1042S.

**Course outline:** 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; simplifications for bars, beams and shafts.

**Assessment:** June examination 3 hours.

### CIV2020X PRACTICAL EXPERIENCE

**Course outline:** Civil Engineering students are required 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 the academic studies.

### CIV2031S STRUCTURAL ENGINEERING 1

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** CIV2011F.

**Course outline:** Introduction to various structural systems; conditions of equilibrium; external and

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internal structural indeterminacies. 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: geometric instability. Properties of structural timber; permissible-stress approach to design; design of timber structures.

**Assessment:** November examination 3 hours.

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### CIV2034S SPATIAL DATA ACQUISITION AND MANAGEMENT

16 credits, 48 lectures, 6 tutorials, 12 practicals.

**Prerequisites:** CIV1004W, MAM1003W (DP).

**Course outline:** Spatial data acquisition: Spatial data for Civil Engineering Applications, Distance Measurement, Co-ordinate systems, Introduction to Land Surveying, Determination of Heights, Levelling, Theodolite Measurement and Calculations, Traverse, Tacheometry. Fundamentals of GPS, Photogrammetry and Remote Sensing and their application in Civil Engineering.

Spatial data management: Introduction to GIS; Georeferencing, Projections & Scale, Uncertainty, Error and Sensitivity in GIS, Spatial Query and Analysis; Data Models in GIS, GIS Applications in Civil Engineering.

Infrastructure planning and design project.

**Assessment:** Group projects, class tests and practical work.

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### CIV2035X CIVIL ENGINEERING CAMP

4 credits, 2 weeks.

**Prerequisites:** CIV2034S (DP).

**Course outline:** Infrastructure planning and design project. Spatial Data Acquisition. Setting Out, Distance Measurement, Levelling Traverse, Tacheometry, GPS, Error and Accuracy. Use of GIS for data integration of various spatial and non-spatial data, metadata design. Spatial Query and Analysis.

**Assessment:** Group project and practical work.

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### CIV2036F FUNDAMENTALS OF WATER TREATMENT

16 credits, 48 lectures, 12 practicals/tutorials.

**Prerequisites:** CEM1008F.

**Course outline:** Objectives of wastewater treatment. Wastewater chemical and physical characterization; measurement of energy, nitrogen and phosphorus in municipal wastewater; effect of settlement and filtration. Overview of unit operations in wastewater treatment. Potable water and wastewater quality criteria. Water treatment: Objectives, processes and systems. Surface water characterization: Alkalinity, acidity, pH, buffer capacity and titration curves, log-species pH diagrams of the inorganic carbon system; pH control. Chemistry of surface and underground waters, changes and controls in water treatment systems; plant design; aqueous, gas and solid phase equilibria.

**Assessment:** June examination 3 hours.

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### CIV2037F EXPERIMENTAL METHODS & STATISTICS

16 credits, 36 lectures, 24 practicals.

**Prerequisites:** CIV1004W.

**Co-requisites:** CIV2011F.

**Course outline:** Concepts of statistics, measures of central tendency, measures of dispersion, frequency distributions, introduction to probability, regression analysis and correlation, hypothesis testing and goodness of fit tests, analysis of variance, introduction to experimentation, instrumentation & data acquisition, measurement of flow, temperature, and pH, measurement of strain, measurement of force, torque & pressure, measurement of vibration. Professional

Communication Studies module on technical writing and presentation skills.

**Assessment:** Continuous assessment by projects, assignments and tests.

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### **CIV2038S** HYDRAULIC ENGINEERING 1 - FLUID MECHANICS AND PIPE FLOW

16 credits, 46 lectures, 3 practicals, 7 tutorials.

**Prerequisites:** MAM1003W (DP), PHY1010W (DP).

**Course outline:** Hydrostatics: pressure; pressure forces, stability. Principles of fluid flow: classification; the continuity, energy & momentum equations and their applications. Real and ideal fluids: behaviour of real fluids; viscous flow; the boundary layer; separation and cavitation. Flows in pipes: laminar & turbulent flow; local head losses; the design of pipe systems. Pump selection. Field excursion.

**Assessment:** November examination 3 hours.

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### **CIV3031F** STRUCTURAL ENGINEERING 2

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** CIV2031S.

**Course outline:** Flexibility versus stiffness methods in structural analysis. Analysis of statically indeterminate structures by the force method: trusses, beams and frames. Design loads for steel structures; ultimate limit-state design philosophy; design of structural steelwork: ties, struts, purlins, girts, columns, beams, trusses, frames, connections. Individual design project.

**Assessment:** June examination 3 hours.

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### **CIV3034S** GEOTECHNICAL ENGINEERING 1

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** CIV2011F, GEO1008F.

**Course outline:** Introduction to soil mechanics. Physical characteristics of soils: particles, texture, phases, soil structure, grain size, distribution, classification. Water in soil: capillarity, shrinkage, heave; steady flow, permeability, seepage, flow nets. Compressibility and consolidation: effective stress, rate of consolidation, vertical stress and settlement. Shear strength of soils.

**Assessment:** November examination 3 hours.

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### **CIV3035S** STRUCTURAL ENGINEERING 3

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** CIV3031F (DP).

**Course outline:** Analysis of statically indeterminate structures by the displacement method; direct-stiffness method; computer-oriented matrix formulation. Properties of structural concrete, reinforcing and prestressing steel; elastic design of concrete structures; Serviceability limit-state design of reinforced and prestressed concrete elements (beams and slabs). Laboratory and analysis projects.

**Assessment:** November examination 3 hours.

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### **CIV3038F** HYDRAULIC ENGINEERING 2 - OPEN CHANNEL FLOW

16 credits, 45 lectures, 9 tutorials.

**Prerequisites:** CIV2038S (DP).

**Course outline:** Open channel flow: classification; the steady flow equations; uniform, gradually and rapidly varied flow; hydraulic structures, e.g. weirs, flumes, spillways, control gates; river & canal engineering. Flood hydrology: factors affecting runoff; selected prediction methods; reservoir routing. Drought hydrology: flow measurements; mass balances (both numerical and graphical); storage-yield relationships for reservoirs. Dimensional analysis and theory of models.

**Assessment:** June examination 3 hours.

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### **CIV3040F** URBAN ENGINEERING 1 - CITIES, TRANSPORT AND ROADS

24 credits, 60 lectures, 24 practicals.

**Prerequisites:** CIV2034F/S, CIV2037F/S (DP).

**Course outline:** Course Outline: Introduction on the functioning of the city, Transport in context, transport and land-use; transport and the economy; transport and society; transport and sustainability. Modes of transport. Traffic engineering: road space design, pavement engineering, traffic flow theory and traffic data collection. Transport policy and the decision maker. The transport planning process and transport modelling. The use of GIS in the transportation context. Professional Communication Studies module on technical writing and presentation skills.

**Assessment:** June examination 3 hours.

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### **CIV3041S** URBAN ENGINEERING 2 - WATER SERVICES

16 credits, 48 lectures, 12 tutorials/practicals, 1 project.

**Prerequisites:** CIV2034S (DP), CIV2036F, CIV2038S (DP), CIV3038F (DP).

**Course outline:** An overview of the National Water Act and the Water Services Act. Levels of service for both water supply and sanitation. Water demand and wastewater generation. The design of water reticulation and sewerage including elements of biological process modelling. Reactor kinetics. Material mass balances. Development of the steady state activated sludge model and application to wastewater treatment system design. Sewage sludge treatment and disposal. Urban Drainage.

**Assessment:** November examination 3 hours.

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### **CIV4031F** STRUCTURAL ENGINEERING 4

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** CIV3031F, CIV3035S, MAM2080W.

**Course outline:** : Ultimate limit-state design of structural steelwork; plastic analysis of steel beams and frames; ultimate limit-state design of reinforced concrete beams and columns; yield-line analysis of concrete slabs; ultimate limit-state design of prestressed concrete beams. Introduction to the design of structures as integrated systems: the full design process; conceptualisation; alternative schemes. Design project. Laboratory project.

**Assessment:** June examination 4 hours.

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### **CIV4033Z** PROFESSIONAL PRACTICE

24 credits, 56 lectures, 14 practicals, July vacation project.

**Prerequisites:** CIV3040F, ECO1006F/ECO1007S (DP).

**Co-requisites:** CIV4031F, CIV4034F, CIV4040F (At least two of these courses).

**Course outline:** : The concepts of the project life cycle, the organisation of the construction process and the various forms of contract arrangements. Contract law: conditions of contract & documentation; methods of sharing risk. Planning & resourcing including network diagrams. Contact lectures with industry professionals setting the context of consulting and contracting within the overall economic environment. Time value of money, cash flows and interest rates. Professional Communication Studies module encompassing report writing, group presentations and a written project.

**Assessment:** Continuous assessment by class tests, essays, projects and presentations.

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### **CIV4034F** GEOTECHNICAL ENGINEERING 2

16 credits, 48 lectures, 12 tutorials/practicals.

**Prerequisites:** CIV3034S.

**Course outline:** Limit considerations, active and passive earth pressure, slope stability and bearing capacity failure. Ground investigation. Foundations of shallow and piled structures. Gravity walls

and sheet pile wall design, anchorages, sliding block stability. Dewatering control systems, filter criteria, theory of wells. Geotechnical design.

**Assessment:** June examination 4 hours.

### **CIV4035C DESIGN PROJECT**

24 credits, 6 weeks full time duration.

**Prerequisites:** CIV4033Z (DP). No simultaneous registration of more than 1 other course.

**Course outline:** Planning and design of a major civil engineering project involving a number of civil engineering and other closely related disciplines, and applying professional communications.

**Assessment:** Assessment by prescribed submissions and contributions.

### **CIV4036D THESIS**

36 credits, 9 weeks full time duration.

**Prerequisites:** CIV4033Z (DP). No simultaneous registration of more than 1 other course.

**Course outline:** An individual investigation into an assigned problem in Civil Engineering.

**Assessment:** Assessment by thesis and poster.

### **CIV4040F URBAN ENGINEERING 3 - CITY AND INFRASTRUCTURE MANAGEMENT**

16 credits; 48 lectures; 12 practicals.

**Prerequisites:** CIV3040F, CIV3041S (DP) and ECO1006F/ECO1007S (DP).

**Course outline:** This course aims to provide the student with an understanding of and the necessary skills required for the management of the delivery of municipal services; including:

- City management: Urban systems; legislation, institutional structures, plan formulation; budgeting and decision making.
- Societal aspects: Demographic, social and economic information, community development and community participation.
- Infrastructure and service delivery: Project costing (life cycle costing, BOT, BOOT, PPP), evaluation and prioritization; delivery alternatives; financing alternatives; municipal infrastructure management; and maintenance, rehabilitation and upgrading strategies.
- Solid waste management: Collection and disposal.

**Assessment:** June examination 3 hours.

### **CIV5000W MASTERS DISSERTATION: CIVIL ENGINEERING**

180 credits.

### **CIV5000Z MASTERS DISSERTATION: CIVIL ENGINEERING**

120 credits.

### **CIV5001Z CIVIL ENGINEERING REPORT**

This course is only offered to candidates for the Postgraduate Diploma in Engineering.

40 credits.

**Course outline:** A student registered for a diploma may be permitted to enter into a programme of individual study on a specialised topic within the engineering field. The course of study will be guided by a supervisor appropriate to the field selected. The scope of work may be experimental (laboratory or field), or new methods applicable to engineering design, or a comprehensive review. The programme will involve the student in about 360 hours of work, and a written report must be submitted in the format of a minor thesis, which will be examined by two examiners.

**Assessment:** Project report(s).

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### CIV5002Z STRUCTURAL CONCRETE PROPERTIES AND PRACTICE

16 credits.

**Course outline:** Cements, admixtures, cement extenders, aggregates; desirable properties for concrete; plastic and hardened properties, including strength, creep, shrinkage etc; concrete mix design; prediction of concrete structural properties; concrete failure and fracture; design approaches; concrete quality control. Special concretes, industrial visits, seminars, projects, laboratories.

**Assessment:** Examination and projects.

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### CIV5006Z ADVANCED STRUCTURAL CONCRETE ENGINEERING I

16 credits, 30 lectures.

**Course outline:** Yield line analysis and design of concrete slabs; Hillerborg strip method of analysis and design of concrete slabs; ultimate design of composite structural systems.

**Assessment:** Examination.

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### CIV5007S ADVANCED CONSTRUCTION LAW

12 credits.

**Prerequisites:** CIV5025F.

**Course outline:** Interpretation of the construction and building contracts and their formation. Liability of the professionals. Remedies in the event of failure to perform and the effect of insolvency. Sub-contracts. Dispute resolution.

**Assessment:** Examination.

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### CIV5017Z MASTERS PROJECT

60 credits.

**Course outline:** Candidates will undertake a project of a development, review, or practical nature on a prescribed Civil Engineering topic. The project may be undertaken individually or as a group project and a project report must be written. The project will require approximately 400 hours of work. In addition, the candidate must present a seminar.

**Assessment:** Project(s).

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### CIV5025F CONTRACT LAW

12 credits.

**Course outline:** The course reviews the Law of Contract to develop a framework for the analysis of standard documentation for both main and subsidiary civil engineering contracts. Important aspects of mediation, arbitration and court procedures are stressed as is the need to identify and resolve legal problems through timeous negotiation. Disputes which have gone to law or arbitration will be studied to illustrate principles.

**Assessment:** Examination.

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### CIV5030Z CIVIL ENGINEERING PROJECT

20 credits.

**Prerequisites:** Completion of appropriate postgraduate courses.

**Course outline:** On the recommendation of the supervisor and with the agreement of the Head of Department, a student registered for an MSc(Eng) or MSc(ApplSci) may be permitted to enter into a programme of individual study on a specialised topic. A statement of objectives must be agreed upon, and the course of study will be guided by the supervisor. The programme will involve the student in about 200 hours of work, and a written report must be submitted. The written report will be examined, and a further oral examination may be held.

Details of project topics are available from the Department.



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**CIV5032Z INTRODUCTION TO WASTEWATER TREATMENT AND WASTEWATER CHARACTERIZATION**

4 credits.

**Course outline:** Water resources of SA; water quality in SA, water cycle. SA water law - National Water Act and Water Services Act. Levels of service. Objectives of wastewater treatment. Wastewater chemical and physical characterization; measurement of energy, nitrogen and phosphorus in municipal wastewater; effect of settlement and filtration. Overview of unit operations in wastewater treatment.

**Assessment:** Assignments and examination.

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**CIV5041Z BRIDGE ANALYSIS AND DESIGN**

16 credits.

**Course outline:** Bridge loading, analysis and design philosophy. Analysis techniques with particular emphasis on the requirements pertaining to bridge structures. Reinforced and prestressed bridge design procedures.

**Assessment:** Examination and projects.

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**CIV5045Z THE ACTIVATED SLUDGE SYSTEM**

10 credits.

**Prerequisites:** CIV5032Z.

**Course outline:** Biological process modelling of the activated sludge system including nitrification; material mass balances; reactor kinetics; biological process kinetic equations of ordinary heterotrophic organism and autotrophic nitrifier organism growth and endogenous respiration; development of the steady state activated sludge model; application to design, selection of sludge age, impact of primary settling, sewage sludge disposal.

**Assessment:** Assignments and examination.

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**CIV5046Z SEDIMENTATION IN WATER AND WASTEWATER TREATMENT**

8 credits.

**Prerequisites:** CIV5032Z.

**Course outline:** Classes of settling; factors affecting settling tanks; column test for water-treatment solids settling characterization; application to sizing settling tanks (classes 1 and 2 settling); effect of flocculation; flux theory and application to sizing wastewater treatment plant settling tanks (classes 3 and 4); measures of activated sludge settleability and relationships between them; comparison of flux theory with other design procedures; computational fluid dynamics modelling of settling tanks.

**Assessment:** Assignments and examination.

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**CIV5047Z SEWAGE SLUDGE TREATMENT**

8 credits.

**Prerequisites:** CIV5032Z.

**Co-requisites:** CIV5046Z.

**Course outline:** Introduction to sewage sludge reuse and disposal guidelines in South Africa; characterization of primary and waste activated sludge in the context of mass balances over the entire wastewater treatment plant; sludge thickening with gravity sedimentation and flotation; development and validation of steady state aerobic digestion model for primary and waste activated sludge stabilisation and application to design and analysis including oxygen transfer and sludge thickening considerations; kinetics, stoichiometry and weak acid/base chemistry of anaerobic digestion; development, validation and application of steady state anaerobic digestion model, generation of sludge treatment liquors and the impact of their recirculation on effluent quality, nutrient (N and P) reduction in sludge treatment liquors.

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**Assessment:** Assignments and examination.

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### CIV5048Z STEADY STATE DESIGN OF BIOLOGICAL NUTRIENT REMOVAL SYSTEMS

20 credits.

**Prerequisites:** CIV5045Z.

**Course outline:** Ensuring nitrification; nitrification capacity, kinetics of denitrification, development of the steady state nitrification denitrification (ND) model; effect of ND on reactor volume, effluent alkalinity and oxygen demand; the role of readily biodegradable (RB) and slowly biodegradable (SB) organics; denitrification potential; effect of the influent TKN/COD ratio on unaerated mass fraction, N removal and effluent quality; calculation of inter-reactor recycles ratios for design and analysis of pre-, post- and combined denitrification systems. Characteristics of polyphosphate accumulating organisms (PAOs); development and use of biological excess phosphorus removal (BEPR) steady state model; design and analysis of NDBEPR of systems, chemical P precipitation and its effect on BEPR; novel applications; the impact of membrane solid/liquid separation and external nitrification on NDBEPR system design.

**Assessment:** Assignments and examination.

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### CIV5049Z MODELLING AND SIMULATION OF WASTEWATER TREATMENT SYSTEMS

12 credits.

**Prerequisites:** CIV5048Z.

**Course outline:** Kinetics of the readily biodegradable (RBCOD) and slowly biodegradable (SBCOD) organics utilization by ordinary heterotrophic organisms (OHOs), nitrification by autotrophic nitrifying organisms (ANOs) in aerobic systems; modifications for application to anoxic-aerobic systems; kinetics of RBCOD conversion to short chain fatty acids (SCFA) in the anaerobic reactor, kinetics of SCFA uptake, P release and substrate storage under anaerobic conditions and substrate utilisation (growth) and P uptake and aerobic conditions by PAO's; model presentation in Petersen matrix format; links to and simplifications of kinetics for steady state BNR models; programming, modelling and simulation of BNR activated sludge systems with the pre-coded UCTOLD and UCTPHO programmes and the ASIM or AQUASIM shell packages. Filamentous organism type and identification, control by means of kinetic and metabolic selection; causes and control of filamentous organism proliferation in BNR systems.

**Assessment:** Assignments and examination.

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### CIV5050Z INTEGRATED WASTEWATER TREATMENT PLANT DESIGN

20 credits.

**Prerequisites:** CIV5045F, CIV5046Z, CIV5047Z.

**Course outline:** Calculating daily composite average flow and loads from diurnal data; influent flow balancing; integrated wastewater treatment plant modelling and design; major project brief; economic evaluation of different wastewater treatment plant layouts to achieve different technical, environmental and economic objectives.

**Assessment:** Major project.

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### CIV5051Z AQUATIC CHEMISTRY

14 credits.

**Course outline:** Chemical thermodynamics; acids and bases, activity, pH equilibria of weak acid base systems, master variable diagrams, titration of acids and bases, reference species; Alkalinity Acidity and pH, buffering intensity, detailed treatment of the carbonate system; precipitation and dissolution, Caldwell-Lawrence conditioning diagrams, critical evaluation of the Langelier index; terrestrial and ground water stabilization.

**Assessment:** Assignments and examination.

### **CIV5052Z ADVANCED AQUATIC CHEMISTRY**

14 credits.

**Prerequisites:** CIV5051SZ.

**Course outline:** Mixed weak acid systems; alkalinity, acidity and Deffeyes types single aqueous phase diagrams; application to pH control in anaerobic digester; the nitrogen and sulphur systems; Kinetics of precipitation reactions; redox equilibrium systems; Pourbaix (pe-pH) diagrams; application to the chemistry of iron, manganese, lead, chlorine and nitrates in treated and wastewaters; kinetics of redox reactions; applications to physico-chemical treatment processes.

**Assessment:** Assignments and examination.

### **CIV5054Z ADVANCED CHEMICAL, PHYSICAL AND BIOLOGICAL PROCESSES MODELLING**

10 credits.

**Prerequisites:** CIV5049Z, CIV5051Z.

**Co-requisites:** CIV5052Z.

**Course outline:** Aqueous mixed weak acid base chemistry of the carbonate, phosphate, ammonia, short chain fatty acid and sulphur systems; kinetics of gas evolution and stripping; modelling multiple mineral precipitation in 3 phases such as in mineral precipitation in anaerobic digester liquor aeration; integrated chemical, physical and biological processes modelling of activated sludge and anaerobic digestion; modelling acidogenic, methanogenic and sulphidogenic systems.

**Assessment:** Assignments and examination.

### **CIV5055Z STRUCTURAL PERFORMANCE ASSESSMENT**

16 credits.

**Prerequisites:** CIV5086Z.

**Course outline:** Philosophy of structural performance assessment, Performance indicators, Strategies for structural performance assessment, Introduction to theoretical modal analysis Experimental modal analysis, instrumentation, data acquisition, data quality assurance, modal parameter estimation and validation, Introduction to model updating, Model updating methods, structural modifications, Correlation between tests and FEM models, Structural Monitoring, Measurement of live load strains/stresses, Probabilistic data analysis, Material performance assessment, Performance assessment, Estimation of remaining life.

**Assessment:** Examination.

### **CIV5064Z DEVELOPING CITIES: ISSUES AND STRATEGIES**

20 credits.

**Course outline:** Urbanisation; spatial structuring forces. Problems and issues of developing cities; municipal finance and funding; land tenure.

**Assessment:** Examination 50%, assignments 50%.

### **CIV5065Z URBAN RENEWAL**

20 credits.

**Course outline:** Urban renewal context and policy; informal settlement upgrading; 'township' revitalisation; city centre regeneration; municipal engineering services; community services; housing.

**Assessment:** Examination 50%, assignments 50%.

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### CIV5067Z MUNICIPAL INFRASTRUCTURE MANAGEMENT

20 credits.

**Course outline:** Overview of Municipal Infrastructure Management (MIM), basic MIM, setting up MIM, MIM techniques, advanced MIM techniques.

**Assessment:** Examination 50%, assignments 50%.

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### CIV5072Z COMMUNITY PARTICIPATION IN URBAN MANAGEMENT

20 credits.

**Course outline:** Historical analysis. The theoretical basis for participation. The structure of the participation process. Types of community structures. The interaction between community organizations and government. Community participation in urban upgrading. The development of an upgrading methodology for informal settlements. Management and institutional development for low-income communities and informal settlements. Participatory project planning.

**Assessment:** Examination.

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### CIV5076Z INFORMATION TECHNOLOGY IN URBAN INFRASTRUCTURE

20 credits.

**Course outline:** Components and functions of GIS, problem solving and data analysis with GIS, the concept of metadata, spatial data acquisition and creation, introduction to Spatial Data Management, decision making using spatial data, urban management using GIS, development planning and monitoring using GIS, database design for infrastructure network planning, transportation planning using GIS and real-time traffic monitoring. Project on the development of a utilities based GIS network.

**Assessment:** Examination.

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### CIV5079Z URBAN DRAINAGE MODELLING

12 credits, 4-day block course followed by major assignment.

**Course outline:** Introduction to the USEPA SWMM program and its hydrology / hydraulics and general modelling procedures. The RAIN, RUNOFF, TRANSPORT, EXTRAN, STORAGE, TEMPERATURE, COMBINE and STATISTICS modules. Event versus continuous modelling. Introduction to PCSWMM. Auto-sensitivity, calibration and error analysis tools. The GIS interface. Precipitation data acquisition and management, and storm dynamics. Best Management Practices (BMPs). Internet-based decision support and optimisation.

**Assessment:** Major assignment.

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### CIV5085S ADVANCED STRUCTURAL STEEL ENGINEERING

16 credits.

**Prerequisites:** None.

**Course outline:** Design philosophies in structural steel; design of members; buckling and instability phenomena; steel connections; application to design of industrial, commercial, residential buildings. Specialised topics: fire engineering; plate girders; composite construction.

**Assessment:** Examination 60%, course work 40%.

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### CIV5086Z ADVANCED STRUCTURAL MECHANICS WITH APPLICATIONS

16 credits.

**Prerequisites:** None.

**Course outline:** Vibration modelling and structural dynamics; application to seismic-resistant, storm-resistant and blast-resistant design of engineering structures; buckling and instability phenomena; application to the design of thin-walled structures.

**Assessment:** Assignments and examination.

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**CIV5096Z URBAN DRAINAGE POLLUTION CONTROL**

12 credits, 4 assignments over 12 weeks.

**Course outline:** Introduction to public water pollution: Hardin's "Tragedy of the Commons", sustainable development, new management ideas. Urban catchment, litter management. Pollution control plans: watershed inventory, problem definition and scoping, developing workable management options, assessment methods. The Source Loading and Management Model (SLAMM).

**Assessment:** Four assignments to be submitted and marked via the Web.

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**CIV5100F PLATE AND SHELL STRUCTURES 1**

16 credits.

**Course outline:** The course is intended to be a comprehensive treatment of plate and shell theories, and their application to the solution of various problems in structural engineering. Plate and Shell Structures I will cover plates subjected to bending and twisting (slope, curvature, twist, bending moments, transverse shears and twisting moments); the derivation of the bending equation for transversally loaded plates (rectangular and polar co-ordinates), solutions for rectangular plates and circular plates, practical applications, introduction to shell structures; the membrane hypothesis for shells, and the membrane theory of axisymmetrically loaded shells of revolution.

**Assessment:** Examination.

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**CIV5103Z REHABILITATION AND REPAIR OF CONCRETE STRUCTURES**

16 credits.

**Course outline:** Condition surveys and assessment of deterioration of concrete structures; repair materials and strategies; compatibility aspects; structural requirements and procedures for rehabilitation; durability and repair audits; service life predictions; economics of repair and life-cycle costing; practical and contractual aspects.

**Assessment:** Examination.

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**CIV5104S PLATE AND SHELL STRUCTURES 2**

16 credits.

**Prerequisites:** CIV5100F

**Course outline:** The course is intended to be a comprehensive treatment of plate and shell theories, and their application to the solution of various problems in structural engineering. Plate and Shell Structures II will carry on from where Plate and Shell Structures I ended, and covers application of the membrane theory of axisymmetrically loaded shells of revolution, the membrane theory of non-axisymmetrically loaded shells of revolution and its application, axisymmetric bending of cylindrical shells and shells of revolution, flexibility analysis of plate and shell systems, membrane analysis of general cylinders, analysis of paraboloidal shell roofs, and practical aspects for reinforced concrete shells.

**Assessment:** Examination.

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**CIV5105S ADVANCED STRUCTURAL CONCRETE ENGINEERING 2**

16 credits.

**Prerequisites:** CIV5006Z.

**Course outline:** Design of reinforced concrete columns for slenderness and biaxial bending, design of reinforced and prestressed beams for flexure, shear and torsion, design of flat slab concrete structures.

**Assessment:** Examination.

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### CIV5106Z TOPICS IN ADVANCED CONCRETE MATERIALS

16 credits.

**Course outline:** Cements, cement extenders, admixtures and aggregates for concrete; concrete deterioration and durability; deterioration mechanisms and processes; performance of concretes in aggressive environments; achievement of durable concrete; protection of concrete. Case studies, laboratory sessions, site visits.

**Assessment:** Examination and projects.

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### CIV6000W PHD THESIS: CIVIL ENGINEERING

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### CML1001F/CML1004S BUSINESS LAW I

Business Law I has one general course code (CML1001F) for the first semester course and one general course code (CML1004S) for the second semester. However, the students are allocated to different groups on registration and to distinguish each group a number is added to the general course code eg LG02 - 62775. Although the syllabus is the same for all groups different tests and examinations are set for each group. Students in one group are not permitted to attend another group's lectures.

18 credits, 5 lectures per week.

**Course co-ordinator(s):** Mr J Knopp.

**Course outline:** Introduction to law, general principles of contract; sale; lease; credit agreements, agency.

**Assessment:** Class test 1 - 20%; test 2 - 30%; final examination June/November 2hrs 15 min - 50%.

**DP requirements:** Students must write both tests and obtain an average of 40% for the two. More details included in the course reader.

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### CML2001F COMPANY LAW

Company Law has one general course code (CML2001F) for the first semester. However, the students are allocated to different groups on registration and to distinguish each group a number is added to the general course code eg LG04 - 64964. Although the syllabus is the same for all groups different tests and examinations are set for each group. Students in one group are not permitted to attend another group's lectures.

18 credits, 5 lectures per week.

**Course co-ordinator(s):** Mr C Rademeyer.

**Prerequisites:** Business Law I

**Course outline:** The common law and statutory provisions relating to the nature, formation and management of partnerships, trusts, companies and close corporations.

**Assessment:** Class test 1 - 20%; test 2 - 30%; final examination June 2hrs 15 min - 50%.

**DP requirements:** Students must write both tests and obtain an average of 40% for the two. More details included in the course reader.

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### CML2005F LABOUR LAW I

18 credits, 5 lectures per week.

**Course co-ordinator(s):** Mr J Knopp

**Prerequisites:** 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:** The common law contract of employment. Legislative interventions and protections including the Basic conditions of the Employment Act; the Skill Development Act, and the Unemployment Insurance Act. Discipline and dismissals under the Labour Relations Act of 1995. Unfair discrimination in employment and recruitment and selection. Employment equity legislation. Collective labour law as provided for under the Labour Relations Act and the Constitution. Freedom of association and organisational rights. Collective bargaining and dispute

resolution. Strikes and lockouts. Industrial democracy and worker participation.

**Assessment:** Class test 1 - 20%; test 2 - 30%; final examination June 2hrs 15 min - 50%.

**DP requirements:** Students must write both tests and obtain an average of 40% for the two. More details included in the course reader.

### CML2010S BUSINESS LAW 2

Business Law II has one general course code (CML2010S) for the second semester. However, the students are allocated to different groups on registration and to distinguish each group a number is added to the general course code eg LG02 - 65100. Although the syllabus is the same for all groups different tests and examinations are set for each group. Students in one group are not permitted to attend another group's lectures.

18 credits, 5 lectures per week.

**Course co-ordinator(s):** Mr AJ Barnard.

**Prerequisites:** CML1001F or equivalent. No undergraduate student in the first year of study may register for Business Law II.

**Course outline:** Negotiable Instruments; insurance, insolvency and secured transactions, intellectual property.

**Assessment:** Class test 1 - 20%; test 2 - 30%; final examination November 2hrs 15 min - 50%.

**DP requirements:** Students must write both tests and obtain an average of 40% for the two. More details included in the course reader.

### CON1004W CONSTRUCTION TECHNOLOGY 1

32 credits, 4 lectures per week, seminars, 1 studio session per week, field trip(s).

**Course outline:** Construction Technology appropriate for assembly of a simple single and double-storey dwelling, including: construction of such a dwelling; selection of materials and components used; construction details; typical plans, sections and elevations; and requirements of good practise and laws and bye-laws.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examinations.

### CON1007X PRACTICAL TRAINING

**Course outline:** 160 hours (4 weeks) of approved employment experience. 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 logbook.

### CON1010F CONSTRUCTION INFORMATION SYSTEMS

8 credits, 2 lectures per week, tutorials, practicals.

**Course outline:** Introduction to computers; introduction to networks; data storage, manipulation/analysis and reporting using spreadsheets (MS Excel) and relational databases (MS Access); problem-solving with spreadsheets and databases.

**Assessment:** June/November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

### CON1011F PROPERTY STUDIES 1A

16 credits, 4 lectures per week, tutorials, practicals.

**Course outline:** Property Development: 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;

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Sectional title and group housing; Development of retirement centres; Introduction to commercial property development; Development of: Office buildings, parking garages, shopping centers, industrial parks; Rehabilitation and conversion of buildings.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON1012S PROPERTY STUDIES 1B

16 credits, 4 lectures per week, tutorials.

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

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON1015F PROPERTY INFORMATION SYSTEMS

8 credits, 2 lectures per week, tutorials, practicals.

**Course outline:** Introduction to computers; introduction to networks; data storage, manipulation/analysis and reporting using spreadsheets (MS Excel) and relational databases (MS Access); problem-solving with spreadsheets and databases.

**Assessment:** June/November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON1017S PROPERTY INVESTMENT MATHEMATICS 1

8 credits, 1 lecture per week, 2 tutorials per week.

**Course outline:** Simple Interest, Equivalence, Compound Interest, Present Value, Annuities, General Annuities, Sinking funds, Amortization.

**Assessment:** November examination 2 hours 70%, year mark 30%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON1018W BUILDING TECHNOLOGY 1T

16 credits, 2 lectures per week, 1 studio session per week.

**Course outline:** An appreciation of the construction industry, its participants, roles and responsibilities. An understanding of the construction assembly process associated with simple buildings, together with an appreciation of the relationship between fabric, assembly and design. Architectural drawing directed to the understanding and transmission of graphic information. Introduction to site surveying including measurement, levelling, etc. The Surveyor General. The Registrar of Deeds.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examinations.

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### CON1019F/S PROFESSIONAL COMMUNICATION STUDIES

CON1019F for Property Studies students; CON1019S for Construction Studies students.

16 credits, 4 lectures per week, tutorials.

**Course outline:** The aim of the course is 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; to prepare and write business and technical reports.



**Assessment:** CON1019F: June examination 2 hours, Oral examination 1 hour.

CON1019S: November examination 2 hours, Oral examination 1 hour.

**DP requirements:** 100% attendance and 50% minimum class test average.

### **CON2006W CONSTRUCTION TECHNOLOGY 2**

32 credits, 4 lectures per week, seminars, 1 studio session per week, field trip(s).

**Prerequisites:** CON1004W.

**Course outline:** 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.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examinations.

### **CON2013X PRACTICAL TRAINING**

**Prerequisites:** CON1007X.

**Course outline:** 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 logbook.

### **CON2020S CONSTRUCTION MANAGEMENT 1**

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** BUS1010F or BUS1036F/S.

**Course outline:** The company and its environment: Customer profile; patterns of demand; types of service or product provided; formation and growth of the firm; corporate objectives; organization and structure. Corporate strategy: Strategic planning; tactical planning. In Search of Excellence: Work ethic, company culture; quality management; professional ethics. Construction Marketing and Building Procurement Systems: Innovative methods; construction markets; competitive bidding. Financial Management: Flow of funds and control.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

### **CON2022W MEASUREMENT AND DESIGN APPRAISAL 1**

16 credits, 2 lectures per week, 1 studio session per week.

**Prerequisites:** CON1004W.

**Course outline:** The theoretical aspects of the course are covered in lectures on: Principles of measurement and the documentation thereof; and 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.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examinations.

### **CON2024S PROPERTY STUDIES 2A**

16 credits, 4 lectures per week, tutorials.

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**Prerequisites:** CON1011F, CON1012S, STA1000S, CON2030F, BUS2020F.

**Co-requisites:** CON2029S.

**Course outline:** Nature and scope of investment. Nature and scope of property investment. The investment decision process. The property development process. Decision making among alternatives. Property evaluation: principles of feasibility studies; feasibility studies for residential, commercial and industrial developments; principles of economic viability studies; economic viability studies for township, sectional title, retirement village, office, shopping centre, and industrial developments. Whole life appraisal. Risk management: the nature of risk; risk analysis; risk management and control.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON2027F REAL PROPERTY LAW 1

16 credits, 4 lectures per week, tutorials.

**Co-requisites:** CML1002F (or equivalent).

**Course outline:** 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; fencing.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON2029S MEASUREMENT

8 credits, 2 lectures per week.

**Prerequisites:** CON1018W.

**Course outline:** 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.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON2030F PROPERTY INVESTMENT MATHEMATICS 2

8 credits, 2 lectures per week, tutorials.

**Prerequisites:** CON1017S.

**Course outline:** Evaluation Techniques for Property Development and Investment Decisions: Rate of Return, Simple Payback, Discounted Payback and Discounted Cash Flow (NPV and IRR).

**Assessment:** June examination 2 hours 70%, year mark 30%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON2031S PROPERTY STUDIES 2B

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** CON1011F, CON1012S, STA1000S, ECO1010F.

**Course outline:** The Valuation Profession: 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; The Valuation Report.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

### CON3012W CONSTRUCTION TECHNOLOGY 3

32 credits, 2 lectures per week, seminars, 1 studio session per week, field trip(s).

**Prerequisites:** CON2006W.

**Course outline:** Construction Technology and services appropriate for the assembly of light weight long span structures and multi-storey buildings, including: plumbing and drainage - 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.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

### CON3023X PRACTICAL TRAINING

**Course outline:** 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 logbook.

### CON3030S CONSTRUCTION COSTING

16 credits, 2 lectures per week, 1 studio session per week.

**Prerequisites:** CON1010F or CON1015F, CON1004W or CON1018W, CON2022W or CON2029S and CON3043W.

**Co-requisites:** CON3040W.

**Course outline:** 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; pricing preliminaries.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

### CON3031W MEASUREMENT AND DESIGN APPRAISAL 2

32 credits, 4 lectures per week, 1 studio session as required.

**Prerequisites:** CON2006W and CON2022W.

**Co-requisites:** CON3012W and CON3043W.

**Course outline:** The theoretical aspects of the course are covered in lectures and detailed studies on:

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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 the prerequisite course 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.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON3032W APPLIED CONTRACT LAW 1

12 credits, 2 lectures per week, seminars.

**Prerequisites:** CML1002F or CML1001F or CML1006S.

**Course outline:** The JBCC Principle Building Agreement; the Arbitration Act; Case studies.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON3033F PROPERTY STUDIES 1

16 credits, 4 lectures per week, 1 tutorial session per week.

**Prerequisites:** STA1001F/S.

**Course outline:** Introduction to Investment. Characteristics of Property as an investment. Financial Mathematics for Cost Engineering and Property Development Decisions. Evaluation Techniques for Property Development and Investment Decision.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON3034F PROPERTY STUDIES 3A

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** CON2024S, CON2030F, CON2031S, ECO1010F, ECO1011S.

**Course outline:** Property economics: 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; Value Added Tax.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON3035S PROPERTY STUDIES 3B

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** CON2024S, CON2031S, STA1001F, ACC1006F/S, ECO1010F, ECO1011S.

**Course outline:** Management of building design and construction: 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; marketing of commercial and industrial properties.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON3036W PROPERTY AND CONTRACT LAW**

16 credits, 2 lectures per week, seminars, tutorials.

**Prerequisites:** CML1002F or CML1001F or CML1006S; CON2027F.

**Course outline:** JBCC Principal Building Agreement; Arbitration Act; Alternative dispute resolution; Case law.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON3038W CONSTRUCTION MANAGEMENT 2**

32 credits, 4 lectures per week, seminars, tutorials, field trip(s), Computer laboratory sessions.

**Prerequisites:** CON2020S or CON3039S.

**Course outline:** An introduction to 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; work study. Construction procurement systems. Management accounting in construction. Industry structures and development.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON3039S CONSTRUCTION MANAGEMENT 1T**

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** BUS1010F or BUS1036F/S.

**Course outline:** The company and its environment: Customer profile; patterns of demand; types of service or product provided; formation and growth of the firm; corporate objectives; organization and structure. Corporate strategy: Strategic planning; tactical planning. In Search of Excellence: Work ethic, company culture; quality management; professional ethics. Construction Marketing and Building Procurement Systems: Innovative methods; construction markets; competitive bidding. Financial Management: Flow of funds and control.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON3040W COST ENGINEERING 1T**

16 credits, 2 lectures per week, seminars, tutorials.

**Prerequisites:** CON1018W and CON2029S or CON2006W and CON2022W.

**Course outline:** An appreciation of client/developer motivation and needs. 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.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examinations.

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**CON3041F PROPERTY STUDIES 3C**

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** CON2024S or CON2030F, CON2031S, CON1017S, CON1018W, STA1001F, ECO1010F.

**Course outline:** An introduction to case law relating to the valuation of fixed property; property

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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; the valuation report.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON3043W COST ENGINEERING UNDER UNCERTAINTY

16 credits, 2 lectures per week, seminars, tutorials.

**Prerequisites:** CON1017S, CON2006W, CON2022W, CON2029W/S.

**Course outline:** 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; 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.

**Assessment:** June examination 2 hours 25%, November examination 2 hours 25%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examinations.

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### CON4030F PROPERTY STUDIES 2

16 credits, 4 lectures per week, project(s), seminars, tutorials.

**Prerequisites:** CON3033F.

**Course outline:** Feasibility studies; risk assessment techniques; capital budgeting and sources of finance; the property development process; whole life appraisal; maintenance management; property valuation methods.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON4032F MEASUREMENT AND DESIGN APPRAISAL 3

12 credits, 2 lectures per week, 1 studio session per week, project(s).

**Prerequisites:** CON3012W, CON3031W.

**Course outline:** Design appraisal, measurement and preparation of tender documentation for complex buildings and specialist installations (electrical and mechanical). The theoretical component involves a study of: (i) critical design appraisal and the improvement of constructability and cost-efficiency; (ii) compiling the Preliminaries Bill; and (iii) descriptive clauses in the Standard System of Measuring of Building Work. The practical component involves the application of the principles of measurement to advanced/unconventional forms of building construction and specialist installations by means of elemental quantification, covering: Bulk Earthworks; Planking, Strutting and Shoring; Piling; Underpinning; Basements; Electrical Installations; and Mechanical Installations. The practicals require computerised documentation using WinQS and/or QSPlus software.

**Assessment:** June examination 3 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON4033W APPLIED CONTRACT LAW 2

16 credits, 2 lectures per week, seminar(s).

**Prerequisites:** CML1002F or CML1001F or CML1006S, CON3032W.

**Course outline:** Insolvency Act. Case studies of construction and building disputes. Alternative dispute resolution. Government and New Engineering forms of contract. Common international contracts.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON4034W PROFESSIONAL PRACTICE

20 credits

First Semester: 4 lectures per week, seminars, tutorials.

Second Semester: Simulated Office Project, studio sessions as required.

**Prerequisites:** CON3031W.

**Co-requisites:** CON432F.

**Course outline:** The Quantity Surveying Profession Act (No. 49 of 2000), Rules promulgated under the Act, and the implications of the Code of Conduct for registered practitioners; the commission; the Quantity Surveyor-Client Agreement; professional liability and professional indemnity insurance; fee scales; PROCAP; the Quantity Surveying function during the pre-contract, tender, post-contract, and final account stages; preparation and presentation of cost plans and Bills of Quantities, administration and adjudication of competitive bids, valuation for interim payment certificates, recovery statement, valuation of and payment for materials on and off-site; escalation; preparation and presentation of Final Accounts. Simulated Office project.

**Assessment:** June examination 2 hours 50%, Simulated project review 35%, year mark 15%.

**DP requirements:** 40% subminimum in both course work and examination. Submit Simulated Office Project Report.

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### CON4035X PRACTICAL TRAINING

**Course outline:** 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 logbook.

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### CON4036W RESEARCH REPORT

16 credits, 13 lectures, seminar(s).

**Prerequisites:** CON1019F.

**Co-requisites:** STA1000F.

**Course outline:** Selection of research problem; preparation of the research proposal; undertake research and investigation into the topic; analysis of findings; drawing conclusions; making recommendations; presentation of a research report.

**Assessment:** November examination - Research report 80%, presentation of research, 20%.

**DP requirements:** Presentation of research mid-year.

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### CON4037S CIVIL ENGINEERING MEASUREMENT

16 credits, 2 lectures per week, 1 studio session as required.

**Prerequisites:** CON3012W.

**Co-requisites:** CON4032F.

**Course outline:** Measurement and scheduling of Civil Engineering construction. The theoretical aspects of the course cover the SABS 1200 Specifications and the SABS 0120: Part 4 Typical Schedules of Quantities for: Site Clearance; Earthworks; and Concrete (Structural). The practical component involves the application of the principles of measurement to the elements: Site Clearance; Earthworks; and Concrete (Structural).

**Assessment:** November examination 3 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON4038F ADVANCED CONSTRUCTION MANAGEMENT

16 credits, 4 lectures per week, seminars, tutorials, field trip(s).

**Prerequisites:** CON3012W, CON3038W.

**Course outline:** The concept of project management compared with the management of construction projects. Typical management organisation structures for a major project. Site establishment and organisation. Production management, including resource scheduling, procurement and control. Contractual risk management and contracting strategies. Human relations management including: industrial relations practice; and health and safety requirements.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON4039S INTEGRATED MANAGEMENT PROJECT

16 credits, 2 lectures per week, field trips, tutorials, seminars.

**Prerequisites:** CON4038F, CON3031W.

**Course outline:** Using the documents for an actual construction project, simulate all activities performed during the pre-tender and construction phases of a project such as obtaining bids from suppliers and subcontractors, preparing the estimate, preparing the site layout, preparing all planning activities required; analysing production requirements such as concrete cycles and formwork selection, plant and material management; health and safety risk assessment; financial management such as interim certificate and final account preparation and reconciliation.

**Assessment:** November examination (presentation of portfolio and oral).

**DP requirements:** 50% subminimum in examination.

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### CON4041F ADVANCED PROPERTY STUDIES A

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** CON3034F, CON3035S, CON3041F.

**Course outline:** Expropriation: The legislation; the process; compensation; methods of valuation. Property Valuation: Influence of re-zoning on value; valuation of farmland; usually non-negotiable properties; large shopping centres; air space; interest in time-share; leasehold interests; retirement villages; mining rights. Valuation of properties classified as "special" in terms of function, design, construction, or location; market/non-market properties; properties subject to particular legislation.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON4042F ADVANCED PROPERTY STUDIES B

16 credits, 4 lectures per week, seminar(s).

**Prerequisites:** CON3034F, CON3035S, CON3036W.

**Course outline:** Introduction to Facilities Management.

*Management of building operations:* Operation of building operating systems; building maintenance and repairs; cleaning services; security services; cost control and financial reporting.

*Real property management:* Introduction to property management; role of property management; maintenance of the long-term property acquisition/lease programme; purchase of land and buildings; principles of property maintenance; leasing and insurance; leasing non-owned premises; marketing and leasing of owned premises; lease management; service and management of tenants; management of residential, group housing, sectional title, office, shopping center and industrial developments; cost control and reporting.

*Office Facility Planning:* Determining workplace area standards; specifying common facilities; programming short- and long-term office space needs; maintaining the office space inventory; space allocation to individuals and user-groups.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.



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**CON4043S APPLIED PROPERTY LAW**

16 credits, 4 lectures per week, tutorials.

**Prerequisites:** CML2011S (or equivalent), CON3036W.

**Course outline:** Detailed study of the statutes and ordinances affecting property development and valuation. Detailed study of case law relating to: malafides of valuation court; what constitutes immovable property; method of valuation; separate valuations of land and buildings; valuation of an interest in land; restrictive conditions effect on value; Expropriation Act; Expropriation in terms of Provincial ordinances; valuation of subdivided property; method of valuation.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON4045F HOUSING DEVELOPMENT AND MANAGEMENT IT**

16 credits, 4 lectures per week, seminars, tutorials.

**Course outline:** Development theories, South Africa's housing problem, housing and it's role in city-making, housing theory and policy, appropriate technology, housing delivery systems. Management issues in housing. Field trips/case studies.

**Assessment:** June examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON4047W TREATISE**

32 credits, 13 lectures, seminar(s).

**Prerequisites:** CON1019F, STA1000S.

**Course outline:** Selection of research problem; preparation of the research proposal; conducting empirical research; analysis of findings; drawing conclusions; making recommendations; presentation of a research report.

**Assessment:** November examination - Research report 80%, presentation of research 20%.

**DP requirements:** Presentation of research - mid-year.

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**CON4048S ADVANCED PROPERTY STUDIES C**

16 credits, 4 lectures or tutorials per week.

**Prerequisites:** CON3034F, CON3035S, CON3041S.

**Course outline:** Modern portfolio theory: portfolio risk and return; applied portfolio theory; index models; portfolio construction (structure, selection and management).

Property Portfolio: compiling an efficient property portfolio; IPD and property data sources; trading properties; diversification strategies. The property component of institutional investor portfolios; the property listed sector including property unit trusts and property loan stocks; property market research and analysis; quantitative techniques for analysis of market data.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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**CON4049S CONSTRUCTION INNOVATION**

16 credits, 2 lectures per week, field trip(s), tutorials, seminars.

**Prerequisites:** CON3038W, CON3012W.

**Course outline:** Cycles of innovation; dissemination of technology; relationship between technology, economic practice and structures of the industry using examples such as lean production, intelligent buildings, standardisation and pre-assembly, constructability/buildability, design management and sustainable construction.

**Assessment:** November examination - 2 hours 50%, year mark 50%.

**DP requirements:** 40% subminimum in both course work and examination.

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### CON5006Z PROPERTY DEVELOPMENT

20 credits, one week block lectures.

**Prerequisites:** STA5081Z.

**Course outline:** Investment evaluations; property development evaluation, incorporating: environmental impact assessments; land assembly and servicing; economic viability analysis; management and marketing of property developments; risk assessment; and whole life appraisal.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5007Z PROPERTY LAW

20 credits, one week block lectures.

**Course outline:** The Meaning and Function of Law and Legal Rules; the Main Divisions of the Law; the Structure of the Courts, Officers of the Courts and Different Court Procedures; Sources of South African Law; Basic Concepts of Private Law; an Outline of South Africa's Constitution; the Bill of Rights and Land Use; the Expropriation Act; the Impact of the Environmental Clause and Environmental Legislation on Land Use; Sectional Title and Share Block Schemes; General Principles of the Law of Contract; Specific or Applied Contracts: Sale and Lease; Forms of Security; Contractual and Property Rights; Insolvency law: The Effect of Insolvency on Property and Uncompleted Contracts; Commercial Agency; Estate Agents; Alternative Dispute Resolution; Case Studies.

**Assessment:** Three hour examination at end of module 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5008Z URBAN LAND ECONOMICS

20 credits, one week block lectures.

**Course outline:** Urban economics and urban problems. The urbanization process. The urban hierarchy. Urban rent. Theories of urban spatial structure. Location theory. Problems in developing countries.

**Assessment:** Three hour examination at end of module 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5009Z PROPERTY FINANCE

20 credits, one week block lectures.

**Prerequisites:** STA5081Z.

**Course outline:** Application of business finance theory to property. Mathematics of finance. Property investment decision-making; capital budgeting; financing decision and capital structure; capital markets; sources and flows of capital for property investments; and types of financial instruments.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5010Z RESEARCH REPORT (PROPERTY STUDIES)

60 credits.

**Prerequisites:** CON5037Z and STA5082Z.

**Course outline:** Students to select a research topic, prepare a proposal, undertake empirical research, analyse the findings, draw conclusions and present a research report.

**Assessment:** Research report.

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**CON5013Z PROPERTY VALUATION**

20 credits, one week block lectures.

**Prerequisites:** STA5081Z.

**Course outline:** Time value of money; nature and scope of property valuation; concepts and theory of value; determinants of value; the valuation process and methods of property valuation; law relating to rating; expropriation and property valuation.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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**CON5014Z PROJECT MANAGEMENT AND SYSTEMS THEORY**

20 credits, one week block lectures.

**Course outline:** An overview of the Project Management Knowledge Areas, Project Management Processes and the relationship of Project Management to other management disciplines. The Project Management Body of Knowledge and its place in the trans-disciplinary study of the abstract organisation of projects, investigation of both the principles common to all complex projects; and the models which can be used to describe them. Emphasis is placed on real systems that are open to, and interact with, their environment. The relationship between the business environment and the project environment.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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**CON5016Z PROJECT PLANNING AND IMPLEMENTATION**

20 credits, one week block lectures.

**Course outline:** The need for planning which include the rules for planning and control; scope management, project strategy, project methodology; project scheduling techniques; project budgeting; change management and project integration.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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**CON5018Z HUMAN RESOURCE MANAGEMENT AND INTERPERSONAL COMMUNICATION**

20 credits, one week block lectures.

**Course outline:** The Human Resource management needs of project management, changes in employment practice, interfacing with stakeholders, group dynamics, leadership, motivation methods of achieving objectives through others in a people intensive environment, communication, conflict resolution, negotiation, ethics and culture and the management organisation structures used in project teams.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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**CON5021Z PROPERTY PORTFOLIO MANAGEMENT**

20 credits, one week block lectures.

**Prerequisites:** STA5081Z.

**Course outline:** Portfolio Management: The Property Cycle; The Economic Cycle; Modern Portfolio Theory; The Property Portfolio Operational Property/Asset Management: Introduction to Property Management; Legal Aspects/Tenant Issues; Maintenance/Services; Investment Strategy and Value; current trends; Case Studies. Strategic Property/Asset Management; Shopping Centre Management: Management; Leasing; Financial Control. Facilities Management: Space planning and management; Relocation; Maintenance management and Life cycle costing; Energy management; environmental issues; Outsourcing.

**Assessment:** Three hour examination 50%, Assignments 50%.

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**DP requirements:** 50% subminimum in both course work and examination.

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### CON5022Z TOTAL QUALITY MANAGEMENT IN A PROJECT ENVIRONMENT

20 credits, one week block lectures.

**Course outline:** Total Quality Management as a set of management processes and systems and the application of TQM in Project Environments; risk management, new product development, value engineering, lean supply, supply chain management and safety, health and welfare.

**Assessment:** Three hour examination 50%, Assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5023Z RESEARCH REPORT (PROJECT MANAGEMENT)

60 credits.

**Prerequisites:** CON5037Z, STA5082Z.

**Course outline:** Statistics: data modelling using the Statistica software package. Methodology: selection of the research problems; preparation of the research proposal. Research Report: conducting empirical research; analysis of findings; drawing conclusions; making recommendations; presentation of a research report.

**Assessment:** Research report.

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### CON5024W MASTERS DISSERTATION: CONSTRUCTION ECONOMICS AND MANAGEMENT

180 credits.

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### CON5025Z MASTERS DISSERTATION: CONSTRUCTION ECONOMICS AND MANAGEMENT

120 credits.

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### CON5029Z PROJECT RISK MANAGEMENT

20 credits, one week block release lectures.

**Course outline:** The nature of risks and the nature of projects; risk perceptions and the communication of risk; systematic risk management; creating a project risk management framework; establishing risk registers and reviewing risk management performance.

**Assessment:** Three hour examination 50%, assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5030Z PROJECT FINANCE AND PROCUREMENT

20 credits, one week block release lectures.

**Course outline:** Identifying and scoping potential PPP projects; the concept of value-for-money; principles of risk transfer, compiling a public sector comparator and integrating of a wide range of tasks under single contract; organising bidding competitions; the sources of procurement and bid (transaction) costs; principles of a payment mechanism (performance related payment) and alternative models for private sector organisation.

**Assessment:** Three hour examination 50%, assignments 50%.

**DP requirements:** 50% subminimum in both course work and examination.

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### CON5032Z RESEARCH REPORT (HOUSING DEVELOPMENT AND MANAGEMENT)

60 credits.

**Prerequisites:** CON5037Z, STA5082Z.

**Course outline:** Statistics: data modelling using the Statistica software package. Methodology:

selection of the research problems; preparation of the research proposal. Research Report: conducting empirical research; analysis of findings; drawing conclusions; making recommendations; presentation of a research report.

**Assessment:** Research report.

**CON5033Z MASTER OF SCIENCE IN PROJECT MANAGEMENT:  
DISSERTATION**

120 credits.

**CON5034Z MASTER OF SCIENCE IN PROPERTY STUDIES: DISSERTATION**

120 credits.

**CON5035Z MASTER OF PHILOSOPHY IN HOUSING DEVELOPMENT AND  
MANAGEMENT: DISSERTATION**

120 credits.

**CON5036Z INTRODUCTION TO RESEARCH**

4 credits, distance learning (attendance required for examination only)

**Course outline:** Research and writing skills; plagiarism; research ethics; critical analysis of literature; creating an argument; writing in an academic style; referencing conventions.

**Assessment:** One-and-a-half-hour examination at end of module 100%.

**CON5037Z RESEARCH METHODOLOGY**

6 credits, half week block lectures.

**Prerequisites:** For MSc Property Studies candidates: CON5006Z, CON5007Z, CON5008Z, CON5009Z, CON5013Z, CON5021Z, CON5036Z.

For MSc Project Management candidates: CON5014Z, CON5016Z, CON5018Z, CON5022Z, CON5036Z.

For MPhil Transport Studies candidates: None.

**Course outline:** Research methodology, the research experience; knowledge and problems; the proposal chapter; designing the research; theoretical frameworks; overview of research methods - from quantitative to qualitative; case studies; writing the literature review, data presentation and analysis; concluding research.

**Assessment:** Evaluation of Research Proposal at end of module 100%.

**DP requirements:** 100% attendance at lectures in block week.

**CON5038Z PROPERTY DEVELOPMENT AND FINANCE**

20 credits, one week block lectures.

**Course outline:** Mathematics of finance. Property taxation. Overview of managerial finance theory. Working capital management. Long term asset management. Property investment decision-making. The financing decision and capital structure. Capital markets. Sources and flows of capital for property investments. Types of financial instruments. Investment evaluation. Environmental impact assessment. Risk assessment. Land assembly and servicing. Economic viability analysis. The construction stage. Marketing of improvements. Whole life appraisal.

**Assessment:** Three hour exam 40%; assignment 60%

**CON5039Z PROJECT IMPLEMENTATION AND MANAGEMENT**

20 credits, one week block lectures.

**Course outline:** Programme and project management: work breakdown structures; project cycle management; budgeting and cash flows; developing indicators; monitoring and evaluation systems

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and cycles. Procurement Management: principles; modes; brief writing; control of outsourced works; control of outsourced services; monitoring reporting. Institutional Aspects: legislative requirements and options; operating in the context of intergovernmental relations; contractual forms and options; contract management; government budgeting and project packaging; managing integration and IDPs. Planning and project cycle methodologies.

**Assessment:** Three hour exam 40%; assignment 60%

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### CON6009W PHD THESIS: CONSTRUCTION ECONOMICS AND MANAGEMENT

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#### CSC1015F COMPUTER SCIENCE 1A

18 credits, 4 lectures per week, 1 practical per week.

**Prerequisites:** Mathematics Higer Grade D symbol or better.

**Co-requisites:** MAM1000W OR MAM1003W.

**Course outline:** Introduction to computers, World Wide Web and Netcentric computing. Object Orientated Programming, problem solving and algorithm development with Java. Introduction to Databases. Sorting and searching. Number representation, Boolean algebra and simple circuits.

**Assessment:** June examination 3 hours 60% (Subminima: 45%), Test(s) 15% (Subminima: 45%), Practicals 25% (Subminima: 50%).

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#### CSC1016S COMPUTER SCIENCE 1B

18 credits, 4 lectures per week, 1 practical per week.

**Prerequisites:** CSC1015F (Sup), 70% or more in CSC1017F.

**Co-requisites:** MAM1000W or MAM1003W or CSC1018F.

**Course outline:** Linear Abstract Data Structures, including Lists, Stacks and queues. Binary Trees and their applications. Applets, events and graphics. Computer Architecture - the design and structure of a computer. An introduction to Assembler level programming.

**Assessment:** November examination 3 hours 60% (Subminima: 45%), Test(s) 15% (Subminima: 45%), Practicals 25% (Subminima: 50%).

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#### CSC1017F COMPUTER SCIENCE FOR ENGINEERS

16 credits, 4 lectures per week, 1 practical per week.

**Course outline:** Introduction to computing using Windows, e-mail, and the World Wide Web. Introduction to programming with Java. Basic elements of Java - the building blocks of a program. Program control, repetition, selection and conditional loops. Applications, arrays, matrices, numerical methods and input/output files (43 lectures).

**Assessment:** June examination 3 hours 60% (Subminima: 45%), Test(s) 15% (Subminima: 45%), Practicals 25% (Subminima: 50%).

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#### CSC1018F COMPUTER SCIENCE 118

18 credits.

**Prerequisites:** Mathematics Higher Grade, at least a D symbol. Computer Studies Higher Grade, an A symbol. Passing a Java competency examination.

**Co-requisites:** MAM100W.

**Objective:** This course is an alternative to CSC115F. It is intended for students who have mastered the Java programming language as part of Computer Studies at school level and wish to learn an alternative programming paradigm.

**Course outline:** The following fundamental Computer Science concepts are taught:

- the Object Orientated approach to programm design and implementation
- general techniques for algorithmic Problem Solving
- methodologies for Software Engineering, including the use of UML diagrams.

This will be taught within the context of Python Open Source interpreted scripting language. The course will be timetabled with one lecture and practical assignment per week. This will be combined with structured self-learning.

**Assessment:** Tests count 15%, practical work counts 35%, one 3-hour paper written in June counts 50%. Subminima: 45% for practicals and 45% for theory.

### **CSC2001F** COMPUTER SCIENCE 2A

24 credits, 5 lectures per week, 1 practical per week.

**Course outline:** CONCEPTS OF C++: C++ vs Java. Building a C++ program, Basic Constructs, Overloading and Inheritance.

ADVANCED C++: Templates, Advances STL Containers and Iterators, Operator Overloading, Exceptions, File I/O.

DATA STRUCTURES: Abstract data types and assertions: Linear structures - lists, strings, stacks, queues; recursive algorithms, tree structures - binary trees, AVL trees, B-Trees; graphs - graph traversals, minimum spanning trees, sets, hashing, priority queues.

SOFTWARE ENGINEERING: Object Orientated Analysis, Design and Testing using DATA using UML.

ETHICAL AND PROFESSIONAL ISSUES IN COMPUTING: Philosophical background, Professionalism, Privacy, Property rights, Accountability, Ethics and the Internet.

**Assessment:** Essays and tests 17%, June examination 3 hours 50%, Practical and projects 33%.

### **CSC2002S** COMPUTER SCIENCE 2B

24 credits, 5 lectures per week, 1 practical per week.

**Prerequisites:** CSC2001F (or Supp), MAM1000W or equivalent. It is strongly recommended that students concurrently register for Mathematics 2 or Applied Mathematics 2 or Mathematical Statistics 2.

**Course outline:** ARCHITECTURE: Abstractions, performance, instructions, arithmetic, the processor; datapath & control, pipelining, memory hierarchy, peripherals and paralld processors.

SOFTWARE ENGINEERING: Project Management, System Engineering, Software Metrics (Conceptor Principles). Object Orientated Metrics, Case Tools, Perspective.

ETHICAL AND PROFESSIONAL ISSUES IN COMPUTING: Philosophical background, Professionalism, Privacy, Property rights, Accountability, Ethics and the Internet.

HUMAN COMPUTER INTERACTION: Productivity paradox, Interaction styles, Event based programming, User Centered Design, User modelling, Standards and Guidelines, Evaluation techniques and Ethnography.

**Assessment:** Essays and tests 17%, November examination 3 hours 50%, Practical and projects 33%.

### **CSC2003S** COMPUTER GAMES AND SIMULATION

24 credits, 5 lectures per week, 1 practical per week.

**Prerequisites:** CSC2001F, MAM1000W or equivalent.

**Course outline:** Introduction to Game Development, Game concepts, Game Engines, Modeling and Simulation, Discrete Simulation, Agents, Game Representations, Search Strategies, Gaming Strategies, Artificial Life, Terrain Simulation.

**Assessment:** Essays and tests, November examination 3 hours 50%, Practical and projects.

### **CSC3002F** COMPUTER SCIENCE 302

36 credits, 5 lectures per week, 2 practicals per week.

**Prerequisites:** (CSC2002S or CSC2000W). (MAM2000W or STA2004F and STA2005S, or MAM2040H and MAM2041H or MAM2080W and MAM2081W (or equivalents) are highly recommended).

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**Course outline:** This course consists of: Operating systems (30), Networks (30).

**Assessment:** June examination 3 hours 50% (Subminima: 45%), Test(s) 17% (Subminima: 45%), Practicals 33% (Subminima: 45%).

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### CSC3003S COMPUTER SCIENCE 303

36 credits, 5 lectures per week, 2 practicals per week.

**Prerequisites:** CSC2000W (MAM2000W or STA2004F and STA2005S, or MAM2040H and MAM2041H or MAM2080W and MAM2081W (or equivalents) are highly recommended).

**Course outline:** This course consists of: information Management (30); and Theory of Algorithms (30).

**Assessment:** November examination 3 hours 50% (Subminima: 45%), Test(s) 17% (Subminima: 45%), Practicals 33% (Subminima: 45%).

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### CSC3012Z OPERATING SYSTEMS I

8 credits, 5 lectures and 2 practicals per week for 3 weeks.

**Prerequisites:** CSC2002S.

**Course outline:** Topics from: Abstract model: OS organisation: computer organisation: device management: process management: scheduling: synchronisation principles: deadlock: memory management: file management: protection and security: remote files.

**Assessment:** June examination 50%, Tests 17%, projects 33%.

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### CSC3013Z NETWORKS

8 credits, 5 lectures and 2 practicals per week for 3 weeks.

**Course outline:** Topics from: ISO Reference Model, Electronic optical signals, channels, Data Link protocol, Network login.

**Assessment:** June examination 50%, Tests 17%, Projects 33%.

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### CSC3014C INFORMATION MANAGEMENT

18 credits, 30 lectures and 1 practical per week

**Prerequisites:** CSC2001F, CSC2002S.

**Course outline:** Information models and systems, Database systems, Data modeling, Relational Databases, Database query languages, Relational Database design, Information storage and retrieval.

**Assessment:** Tests 17%, Projects 33%, 1.5 hr written examination 50%.

**DP requirements:** 45% subminimum for tests and examination; 45% subminimum for practical.

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### CSC3015D THEORY OF ALGORITHMS

18 credits, 30 lectures and 1 practical per week

**Prerequisites:** CSC2001F, CSC2002S.

**Course outline:** Basic Algorithm Analysis; Algorithmic Strategies; Fundamental Computing Algorithms, Distributed Algorithms; Basic Computability; Complexity classes P and NP; Automata Theory.

**Assessment:** Tests 17%, Projects 33%, 1.5 hr written examination 50%.

**DP requirements:** 45% subminimum for tests and examination; 45% subminimum for practical.

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### CSC3020H THREE DIMENSIONAL AND DISTRIBUTED GAMES DESIGN

36 credits, 2.5 lectures per week, 1 practical per week.

**Prerequisites:** CSC2000W (MAM2000W or STA2004F and STA2005S, or MAM2040H and MAM2041H or MAM2080W and MAM2081W (or equivalents) are highly recommended).

**Course outline:** Topics from Compilers, Distributed Computing, webbased computing, Computer Graphics, Multi-user Games, Mobile Gaming.



**Assessment:** November examination 3 hours 50% (Subminima: 45%), Test(s) 17% (Subminima: 45%), Practicals 33% (Subminima: 45%).

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### CSC4015Z OPERATING SYSTEMS 2

10 credits, 5 lectures and 2 practicals per week for 3 weeks.

**Prerequisites:** CSC2002S.

**Course outline:** Topics from: Abstract model: OS organisation: computer organisation: device management: process management: scheduling: synchronisation principles: deadlock: memory management: file management: protection and security: remote files.

**Assessment:** November examination 50%, Tests 17%, Projects 33%.

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### 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 credits, lectures, tutorials.

**Course outline:** The course covers the following areas: microeconomics, international trade and the balance of payments, macroeconomics, financial markets, the public sector, South African economic and environmental issues. The course focuses on the application of economic principles.

**Assessment:** Tests, essays and tutorials 45%; November examination 55%.

**DP requirements:** An average year mark of at least 35%.

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### ECO1010F/S MICROECONOMICS

18 credits, 48 lectures, 12 tutorials.

**Prerequisites:** Matric points of 45 calculated on the Science Faculty rating. Senior students not fulfilling this requirement must have passed the equivalent of 6 semester courses.

**Course outline:** The course focuses on demand and supply analysis; consumer behaviour; production functions and production costs; market forms and income distribution.

**Assessment:** Tests, essays and tutorials 45%; June/November examination 55%.

**DP requirements:** An average year mark of at least 35%.

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### ECO1011S MACROECONOMICS

18 credits, 48 lectures, 12 tutorials.

**Prerequisites:** ECO1010F/S.

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

**Assessment:** Tests, essays and tutorials 45%; November examination 55%.

**DP requirements:** An average year mark of at least 35%.

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### ECO2003F MICROECONOMICS 203

18 credits, second year, first semester course, 4 lectures and 1 tutorial/workshops per week.

**Prerequisites:** ECO1010F/S Microeconomics.

**Course outline:** The course formalizes consumer and producer optimisation, and explores factor markets under perfect and imperfect competition before introducing general equilibrium theory graphically and algebraically. The final section, on industrial organisation, looks at models that relax the critical assumptions of GE. All sections of the course incorporate applications. The sequence and number of lectures allocated to topics is variable.

**Assessment:** Class work 40% (tests and essays), June examination 3 hours 60%.

**DP requirements:** An average year mark of at least 35%.

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**Additional Information:** Course information, such as the 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.

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### ECO2004S MACROECONOMICS 204

18 credits, second year, second semester, 5 lectures/workshops per week.

**Prerequisites:** ECO110F/S Microeconomics and ECO111S Macroeconomics. A student will be permitted to take ECO204S without having passed ECO203F, although it is desirable to pass ECO203F prior to taking ECO204S.

**Course outline:** The course builds upon ECO111S as follows: Intermediate macroeconomics, including one, two and three sector macroeconomic models, unemployment, inflation and the Philips Curve, balance of payments and exchange rate policy, fiscal and monetary policy, within the IS-LM-BP framework, and economic growth models. All sections of the course incorporate applications, primarily with a South African focus. The sequence and number of lectures allocated to topics is variable.

**Assessment:** Class record 40% (tests and essays), November examination 3 hours 60%.

**DP requirements:** An average year mark of at least 35%. Tutorial attendance and submission of assignments. Attendance at class tests.

**Additional Information:** Course information, such as the 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.

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### EEE1000X PRACTICAL TRAINING

**Course outline:** Electrical Engineering students shall produce to the satisfaction of the head of department, a certificate showing evidence of completion of suitable work in the basic workshop processes 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. Such evidence must be produced by 31 March of the year following such training. 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.

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### EEE1003W COMPUTING FOR ELECTRICAL ENGINEERS

16 credits, 96 Contact Sessions.

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

**Assessment:** June examination 2 hours, November examination 2 hours.

**DP requirements:** 40% for the best five of eight class tests.

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### EEE1004W ENGINEERING 1

32 credits.

**Course outline:**

**Module A: Introduction to studying engineering at UCT.**

Course structure, credits vs study hours, study habits, resources. 4 lectures, 2 credits.

**Module B: Laboratory.**

Use of test instruments, exposure to basic electrical phenomena, elementary electronic modules and their use in problem solving. Practical skills: use of plug-in breadboard, soldering, fabricating

circuits using strip boards. Completion of this module involves a hands-on proficiency test. 20 1-hour sessions, 2 credits.

**Module C: Electrical phenomena from an engineering viewpoint.**

Electrical Engineering; sources of energy, power distribution and use, heat, light and motive power. Alternating current and three-phase supply. Core electrical engineering concepts: amplification, feedback control and computing. Digital signal representation. Automotive electronics. 20 lectures, 4 credits.

**Module D: Practical elementary electronics.**

A range of signal-processing modules with practical applications. This provides the basic descriptive and theoretical input required for the performance of Modules B and E. 52 lectures, 8 credits.

**Module E: Approach to Engineering Design.**

Lectures on some basic aspects of design; the generate-and-test cycle, worst-case design; elementary statistical aspects of design, design tasks involving the application of the foregoing principles to the design of simple electrical and electronic circuits and systems. There will also be exposure to the use of the Matlab programming language to design problems and a hands-on Matlab proficiency test. 20 lectures, 16 credits.

**Assessment:** Modules C and D are evaluated by a 3-hour test in June and a 3-hour examination in November.

**DP requirements:** Satisfactory completion of Modules A, B and E.

**EEE2026S ELECTRICAL ENGINEERING PART 2**

Only for students in the Science Faculty.

**Prerequisites:** EEE2032F.

**Course outline:** Refer to the course outlines for modules D, E and F of EEE2033S.

**Assessment:** Programming test and November examination (Module D (2 hours), Module E (2 hours)).

**DP requirements:** Satisfactory completion of coursework for each and every module.

**EEE2030F ELECTRICAL ENGINEERING 1**

For students in Mechanical Engineering Department only.

12 credits, 30 lectures, 6 tutorials.

**Prerequisites:** MAM1003W, PHY1010W.

**Course outline:** Electrical quantities, circuit components, Network theorems, AC circuits including Phasor diagrams, resonance, RMS values, power and power factor. Transducers, electronic devices.

**Assessment:** June examination 3 hours.

**DP requirements:** Completion and handin of all tutorials.

**EEE2031S ELECTRICAL ENGINEERING 2**

For students in Mechanical Engineering Department only

12 credits, 30 lectures, 6 tutorials, 2 practicals.

**Prerequisites:** EEE2030F DP required.

**Course outline:** Single phase diagrams for resistive, inductive and capacitive loads; complex power; power factor correction; 3-phase systems; magnetic circuits; the single phase transformer; d.c machines.

**Assessment:** November examination 80%, year mark 20%.

**DP requirements:** Completion and hand in of all tutorials.

**EEE2035F SIGNALS AND SYSTEMS I**

12 credits, 36 lectures and tutorials.

**Prerequisites:** MAM1003W.

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**Co-requisites:** MAM2080W (or equivalent).

**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.

**Assessment:** June examination 60%, year mark 40%.

**DP requirements:** Satisfactory completion of coursework.

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### EEE2036F PROBABILITY & STATISTICAL DESIGN IN ENGINEERING

12 credits, 36 lectures; tutorials as required.

**Prerequisites:** MAM1003W.

**Course outline:** : Fundamental concepts of sample spaces; counting, combinations and permutations; and probability. Modelling and analysis of engineering phenomena as random variables, both discrete and continuous; functions of random variables; conditioning; derived distributions; expectation, mean and variance; transforms; convolution; covariance and correlation; least squares estimation. Some topics may extend to limit theorems. Probability and design problems in daily life as well as in engineering.

**Assessment:** June examination 50%, year mark 50%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

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### EEE2037W FUNDAMENTALS OF ELECTRONIC ENGINEERING

32 credits, 84 lectures; 12 tutorials, 18 practicals.

**Prerequisites:** MAM1003W or PHY1010W or equivalent.

**Course outline: Module B Digital Electronics**

12 credits, 24 lectures, 12 tutorials, 12 practicals.

**Outline:** Digital logic gates and devices that form the basis of digital computers; computer simulation package and design of digital circuits; evaluation of software simulation and hardware implementation.

**Assessment:** June Examination of module B 2 hours.

**DP requirements:** Satisfactory completion of coursework.

**Module D Introduction to Microprocessors**

8 credits, 24 lectures.

**Outline:** Analog and digital systems; the modular approach to instrumentation; dynamic response, bandwidth and noise; sampling and A to D conversion; digital processing and interfacing; simple microprocessor systems; simple control loops.

**Assessment:** November Examination of D and E modules 3 hours (80%) and year mark (20%).

**DP requirements:** Satisfactory completion of coursework.

**Analog Electronics**

8 credits, 24 lectures, 4 tutorials and 1 practical.

**Outline:** The characterisation and operation of electronic devices such as the bipolar transistor, field effect devices and thyristor. Operation of these devices involving biasing and amplification. The application of these devices as components in electronic circuits such as Op amps and other analog integrated circuits. Application of electronic devices and ICs into everyday circuits like basic linear power supplies, amplifiers and switching circuits.

**Assessment:** November Examination of D and E modules 3 hours (80%) and Year mark (20%).

**DP requirements:** Satisfactory completion of coursework.

**Module F Laboratories** 4 credits, 4 practicals. Outline: Projects on opamps/voltage regulators, filter, logic, transistors.

**Assessment:** On practical work.

**DP requirements:** Satisfactory completion of coursework for each and every module.

### EEE2038W FUNDAMENTALS OF ELECTRICAL ENGINEERING

24 credits, 60 lectures; 18 tutorials, 4 practicals.

**Prerequisites:** MAM1003W or PHY1010W or equivalent.

#### **Course outline: Module A Electrical Circuits**

12 credits, 24 lectures, 12 tutorials.

**Outline:** DC circuits, voltage, current and power network theorems. Transient circuit analysis. Single phase AC circuit theory. Complex numbers and vector diagrams. Power factor correction. Three phase circuits. Electronic devices, operational amplifiers.

**Assessment:** June examination 2 hours.

**DP requirements:** Satisfactory completion of coursework.

#### **Module C Power Engineering**

36 lectures, 6 tutorials, 4 practicals.

**Outline:** Phasor diagrams for resistive, inductive and capacitive loads; complex power; power factor correction; 3-phase systems; magnetic circuits; the single phase transformer; d.c. machines.

**Assessment:** November examination 2 hours.

**DP requirements:** Satisfactory completion of coursework.

### EEE3000X PRACTICAL TRAINING

**Course outline:** Electrical Engineering students shall produce a 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 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.

**DP requirements:** Not applicable.

### EEE3017W DIGITAL ELECTRONICS

16 credits, 48 lectures, 8 practicals.

**Prerequisites:** EEE2021W or EEE2032F and either EEE2033S or EEE2034S or EEE2026S.

**Course outline:** Algorithmic state machines, processors, interfacing, data converters, networks, instrument busses, automatic test systems, C programming, memory technologies, process control.

**Assessment:** November examination 2 hours 45%, year mark 55%.

**DP requirements:** Satisfactory completion of coursework.

### EEE3031S ENERGY UTILIZATION

8 credits, 24 lectures.

**Prerequisites:** EEE2032F and EEE2034F.

**Course outline:** Introduction to the features, characteristics and operations of three phase AC induction and synchronous machines. Introduction to power electronics.

**Assessment:** November examination 1½ hours.

**DP requirements:** Completion of two laboratory experiments and the submission of two laboratory reports.

### EEE3040F ELECTRONIC CIRCUITS

20 credits, 48 lectures, 12 tutorials, 12 practicals.

**Prerequisites:** EEE2032F and either EEE2033S or EEE2034S or EEE2026S.

**Course outline:** Small- signal characterisation and application of discrete devices. Bandwidth

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considerations; multistage amplifiers; architecture of operational amplifiers; feedback - basic concepts and frequency considerations; linear regulators and current limiting schemes; heatsink design; oscillators; op-amps and discrete devices as voltage-to current converters; effect of bias current; input voltage offset; slew rate etc on amplifier behaviour, Schmitt trigger circuits; PSpice analysis.

**Assessment:** June examination 80%, year mark 20%.

**DP requirements:** Satisfactory completion of laboratory work.

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### EEE3044S ENERGY CONVERSION AND UTILIZATION

For Electro-Mechanical and Mechanical Engineering students only.

8 credits, 24 lectures.

**Prerequisites:** EEE2031S.

**Course outline:** The structure and components of a power system; AC power theory; electrical loads and tariffs; DC machines; AC machines.

**Assessment:** November examination three 3 hour papers.

**DP requirements:** Satisfactory completion of course and laboratory work.

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### EEE3055F ELECTROMAGNETIC ENGINEERING

20 credits, 48 lectures, 12 tutorials, 12 practicals.

**Prerequisites:** MAM2080W, EEE2032F and EEE2033s or EEE2034S, PHY2010S or equivalent.

**Course outline:**

**Module A:** Electromagnetic Field Theory.

Electromagnetic field theory, giving the derivation and some applications of Maxwell's equations in an electrical engineering context.

**Course Outline:** Time-varying electromagnetic fields; Maxwell's equations; continuity and displacement current; basis of Kirchoff's laws; propagation of plane waves in lossless and lossy media; power density and Poynting vector; reflection and refraction of plane waves; radiation from antennas.

**Module B:** Transmission Line Theory.

**Course Outline:** 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'S CHART, standing waves, high frequency loss-less lines, line matching examples.

**Assessment:** June examination 3 hours.

**DP requirements:** Satisfactory completion of coursework. Completion of laboratory session.

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### EEE3057S POWER ENGINEERING

20 credits, 48 lectures, 6 tutorials, 4 practicals, 1 Field trips.

**Prerequisites:** EEE2032F and EEE2033S or EEE2034S.

**Course outline:**

**Module A Course Outline:** Introduction to the features, characteristics and operation of three phase AC induction and synchronous machines. Introduction to power electronics.

**Module B Course Outline:** Introduction to power systems engineering. Structure of a power system; AC power; electrical loads and tariffs, introduction to power systems.

**Assessment:** November examination 3 hours.

**DP requirements:** Satisfactory completion of coursework and attendance at class visit.

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**EEE3061W MECHATRONICS DESIGN 1**

For Mechatronics and Electro-Mechanical Engineering students only.

12 credits, 24 lectures, 24 practicals, 6 tutorials.

**Prerequisites:** EEE2032F and EEE2034S.

**Course outline:** Elements of electromechanical systems. Industrial sensors, programmable logic controllers (PLCs), power electronics, actuators. Top-down and bottom-up strategies. Specifications, tenders, intellectual property and licensing. Case histories in mechatronic design.

**Assessment:** November examination 1½ hours.

**DP requirements:** Submission of all projects and class mark of 40% plus.

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**EEE3062F DIGITAL ELECTRONICS**

For Electro-Mechanical Engineering students only.

12 credits, 24 lectures, 6 tutorials, 6 practicals.

**Course outline:** What is a digital system? Boolean Algebra, Logic Gates and Logic Functions, Minimisation, Number System and Binary Arithmetic, Combinational circuits, Flip-Flops and sequential circuits.

**Assessment:** June examination 3 hours.

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**EEE3063F TRANSMISSION LINES**

10 credits, 24 lectures, 6 tutorials, 2 project(s).

**Prerequisites:** MAM2080W, EEE2032F and EEE2033S or EEE2034S.

**Course outline:** Overhead 3-phase power transmission lines. Short, medium and long line models. RF and microwave 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'S CHART, standing waves, high frequency loss-less lines, line matching examples.

**Assessment:** June examination 1½ hours.

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**EEE3064W DIGITAL ELECTRONICS AND MICROPROCESSORS**

16 credits, 48 lectures, 6 practicals.

**Prerequisites:** EEE2032F and EEE2033S or EEE2034S or EEE2026S.

**Course outline:** Advanced digital electronics with emphasis on VHDL and Algorithmic state machine design methods.

**Assessment:** November examination 2 hours combined with class mark.

**DP requirements:** Satisfactory completion of coursework.

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**EEE3067W DIGITAL ELECTRONICS AND MICROPROCESSORS**

For Science students only. Please see the Science Faculty Handbook for further details.

**Assessment:** November examination 3 hours.

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**EEE3068F ELECTRONIC CIRCUITS**

12 credits.

**Prerequisites:** EEE2032F or equivalent.

**Course outline:** Linear regulators and current limiting schemes, Heatsink design, Oscillators, Op-amps and discrete devices as voltage-to-current converters, Effect of bias current, input voltage offset, slew rate etc. on amplifier behaviour, Schmitt trigger circuits, Pspice analysis.

**Assessment:** June examination.

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**EEE3069W CONTROL ENGINEERING**

20 credits, 48 lectures, tutorials as required, practicals as required, design project.

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**Prerequisites:** MAM2080W, EEE2032F and EEE2033S or EEE3034S or equivalent.

**Course outline:** 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, feedforward and three-term controllers. Sensitivity analysis. Identification techniques. 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.

**Assessment:** November Examination 1.5 hours.

**DP requirements:** Satisfactory completion of coursework.

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### EEE3070S MEASUREMENT AND MICROPROCESSORS

8 credits. For Electro-Mechanical Engineering students.

**Course outline:** Refer to the course outline for Module D of EEE2033S.

**Assessment:** Programming test and November Examination.

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### EEE3071W ELECTRONIC COMPONENTS CIRCUITS AND MODULES

16 credits, 48 lectures.

**Prerequisites:** EEE20332F and EEE2033S or EEE2034S.

**Course outline:** Passive components: R, C, L. Real components. Simple circuits eg LP and HP filters. Semiconductors-descriptively and use of data sheets. Some of the less covered semiconductors: SCR, Triac, photo diodes, optocouplers etc. OPAMPS - what's inside, limits, real opamps, opamp types, common circuits plus circuits such as peak detectors, Voltage Regulators linear and switch-mode. Other converters. Building blocks: Mixer, multiplier, VCO, oscillators, PLL, timers, monostables (digital and analogue) RMS converter, etc. Some basic digital building blocks. Practical circuits. Applying the building blocks.

**Assessment:** Examination 75%, year mark 25%. Examination split: 1 hour June 25%, 2 hours November 50%.

**DP requirements:** At least 25% for all tutorials.

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### EEE3073S PROFESSIONAL COMMUNICATION STUDIES

For Electrical Engineering, Electrical and Computer Engineering and Mechatronics students

12 credits, 24 lectures.

**Course outline:** This course covers 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. **Second-year students may not register for EEE3073S.**

**Assessment:** Oral examination 1 hour, October/November examination 2 hours.

**DP requirements:** 100% attendance and 50% minimum class test average.

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### EEE3074W EMBEDDED SYSTEMS

20 credits, 24 lectures, 24 tutorials, 6 practicals.

**Entrance requirements:** EEE3064W, CSC2001F, CSC2002S.

**Course outline:** To introduce the student to the programming of an embedded system, controlled by, for example, a RISC processor (ARM9). After writing simple embedded code, the tool chains for loading, testing and debugging the code are introduced, followed by experience in writing drivers for various peripherals. By the end of the course, operating systems suitable for small embedded systems are used, where application complexity required this. The implications of multitasking and real time are stressed.

Course Outcomes: Program an embedded processor in C using an Open Source tool chain, test and



debug simple code on this processor using the JTAG interface. Write and use code to interface to specific peripherals attached to the embedded processor. Decide whether an operating system is required for an embedded system, configure and load the appropriate operating system. Write, test and debug C code running in user space of a simple operating system. Use simple network interfaces to the system, as supported by the operating system.

**Assessment:** 50% from 1.5 hour examination in June and in October, 50% from Class Mark (Practical Reports and Project Report).

**DP requirements:** Completion of all practical reports and project report.

### EEE3077W DIGITAL AND EMBEDDED SYSTEMS

For Science students only. Please see the Science Faculty Handbook for further details.

### EEE3078W DIGITAL EMBEDDED AND ADAPTIVE SYSTEMS

For Science students only. Please see the Science Faculty Handbook for further details.

### EEE3079W EMBEDDED AND ADAPTIVE SYSTEMS

For Science students only. Please see the Science Faculty Handbook for further details.

### EEE3080F COMMUNICATION NETWORK AND SYSTEM FUNDAMENTALS

20 credits, 48 lectures; tutorials and practicals as required.

**Prerequisites:** EEE2032F, EEE2033S.

**Course outline:** Introduction to Networks: Internet, protocol, network edge, core network and access networks, circuit switching and packet switching, physical media, delay and loss, layered architecture, Internet structure. Application layer: service, client-server paradigm. Application protocols: http, ftp, email, socket programming, POP, DNS. Transport layer: Introduction, UDP, reliable data transfer, TCP, connection management, congestion and congestion control. Network layer: Introduction, routing algorithms, network layer service models, virtual circuit versus datagram networks, routing algorithm, addressing, DHCP, IP datagram, fragmentation, ICMP, Intra-AS routing, router, OSPF, BGP, router, IPv6. 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, Interconnecting. Overview of communication systems, modulation and demodulation, propagation of signal and noise through a linear system model of communication systems.

**Assessment:** Examination 50%, Year mark 50%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

### EEE4001F DIGITAL SIGNAL PROCESSING

20 credits, 48 lectures, tutorials as required, practicals as required.

**Prerequisites:** EEE376F.

**Course outline:** Terminology: Discrete time signals and systems. The Discrete Fourier transform; properties and fast algorithms. The z-transform. Frequency response from s- and z-planes. FIR and IIR filter design and structures for digital filters. Basics of image processing, speech technology and radar signal processing.

**Assessment:** June Examination 60%, year mark 40%.

**DP requirements:** Satisfactory completion of coursework.

### EEE4002F TELECOMMUNICATIONS AND DATA NETWORKS

20 credits, 48 lectures, tutorials and practicals as required.

**Prerequisites:** EEE3075F or EEE3080F, MAM2080W.

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**Course outline:** This course consists of two parts.

Part 1: Wireless data networks and systems Wireless network systems: Cellular technology, GSM and General Packet Radio Service 2.5G Wireless, 3G Wireless: UMTS and CDMA2000, 3.5G and 4G Wireless, WirelessLAN, WirelessMAN, Bluetooth, ad hoc networks, Sensor area networks. Wireless network technology: wireless applications, wireless links, mobility in different wireless systems, wireless security. Part 2: Convergent telecommunication and data networks Network Convergence, standards, and evolution from Telecommunication network to IP network, API, Internetworking with PSTN, Service requirements, Next generation network including multiservice platform and softswitch, Data plane technologies, Control plane technology including H.323/H.248/SIP protocols, Multimedia in data networks.

**Assessment:** Examination 50%, year mark 50%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

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### EEE4003S BROADBAND NETWORKS

10 credits, 24 lectures, tutorials and practicals as required.

**Prerequisites:** EEE3075S or EEE3080F.

**Course outline:** The course provides an introduction to broadband networking, covering principles and fundamentals of the high performance technologies that enable the delivery of voice, video and data services, and providing a foundation for understanding the broadband communications infrastructure and the framework needed for broadband network solutions. High Speed Networks: Frame Relay, ATM, MPLS, High Speed LANS; High Speed Metropolitan Area Networks; Congestion and Traffic Management: Congestion Control in Data Networks and Internets, Link Level Flow and Error Control, TCP traffic control, Traffic and Congestion Control in ATM Networks; Internal Routing: Overview of Graph Theory and Least-cost Path, Interior Routing Protocol, Exterior Routing Protocol and Multicasting; Traffic Engineering and MPLS: Routing information distribution, MPLS TE tunnels in a network, MPLS Switched Path setup, Fast Reroute (FRR) to mitigate packet loss associated with link and node failures, Understand Simple Network Management Protocol (SNMP)- based measurement and accounting services for MPLS; Quality of Service in Broadband Networks: Integrated and Differentiated Services, Protocols for QoS Support, Scheduling and Policing Mechanisms, Integrate MPLS into the IP quality of service (QoS) spectrum of services, QoS in ATM Networks. MPLS signalling and routing protocols, PNNI signalling and routing protocols.

**Assessment:** November examination 2 hours 50%, year mark 50%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** <http://crg.ee.uct.ac.za/~eee4003s>.

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### EEE4006F PROFESSIONAL COMMUNICATION STUDIES

For Electrical Engineering, Electrical and Computer Engineering and Mechatronics students  
8 credits, 24 lectures.

**Prerequisites:** CHE3062S or EEE3073S or MEC3037S.

**Note:** Any student who has failed or not taken CHE326S and who wishes to register for EEE4006F may apply through his/her Department for a special concession.

**Co-requisites:** EEE4051Z.

**Course outline:** The syllabus includes 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.

**Assessment:** Examination by projects and presentations, oral examination 1 hour.

**DP requirements:** 100% attendance and 50% minimum class test average.

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**EEE4013F CONTROL SYSTEMS**

For Electro-Mechanical and Mechanical Engineering students only.

8 credits, 24 lectures, 2 practicals.

**Prerequisites:** MAM2080W. Students must be in their fourth year of registration and be in at least the third academic year of study.

**Course outline:** Terminology: open and closed loop system, block diagrams, dynamic system modelling, transient response, steady-state error criterion. System stability: Routh-Hurwitz criterion, root locus. Frequency response: Nyquist plot. Compensation: minor loop, feedback, feedforward and cascade configurations. Sensitivity analysis, System identification.

**Assessment:** June examination 2 hours.

**DP requirements:** Completion of all set work, i.e. tutorials, the writing of tests and satisfactory completion of all set laboratory/project work.

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**EEE4022S/F THESIS PROJECT**

40 credits.

**Prerequisites:** 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 thesis.

**Course outline:** The thesis is an important opportunity for the student, at the end of the degree programme, to tackle a real engineering project. The student is expected to work on the project both individually and under the guidance of a supervisor.

**Assessment:** Project report(s).

**DP requirements:** None.

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**EEE4026F DIGITAL COMMUNICATION ENGINEERING**

20 credits, 48 lectures, tutorials and practicals as required.

**Prerequisites:** EEE3058S

**Course outline:** Introduction to digital communication systems. Propagation. Modulation-Demodulation methods. Error control coding. Spread-spectrum. Diversity techniques. Optical communication systems. Systems engineering concepts, access schemes, performance analysis, radio link design, spectrum utilisation, capacity and throughput, digital wireless personal communications.

**Assessment:** June Examination 50%, year mark 50%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

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**EEE4036C ELECTRICAL ENGINEERING DESIGN**

8 credits 12 lectures, project.

**Prerequisites:** EEE3057W or EEE3058W/EEE3080F or EEE3069W.

**Course outline:** To draw together the prior material in the EE, E&CE and ME degrees, in the context of professional project and design work. The course consists of a block of lectures, and a group project which is intended to exercise the lecture material.

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; modeling, 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 -

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business modeling, requirements gathering, analysis and design, implementation, testing, deployment, project management, configuration and change management, environment.

Project - A design topic will be tackled, working as a small group under supervision of an academic staff member. A design report will be submitted.

**Assessment:** Project plan 50%. Two hour exam in August/September 50%. There is a sub-minimum requirement of 50% in the exam, in order pass the course.

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### EEE4051F NEW VENTURE PLANNING

8 credits, 24 lectures.

**Prerequisites:** MAM2080W, EEE2032F and EE2033S or EEE2034S.

**Course outline:** The entrepreneurial perspective; developing a new venture; what is a feasibility plan? Product concept and description; market assessment; industrial analysis; marketing plan; operations, development plans and management; financial projections.

**Assessment:** Individual learning log 5%

Presentations 10%, Project report(s) 85%.

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### EEE4080C ELECTRICAL MACHINES AND DRIVES

8 credits, 20 lectures, 3 tutorials.

**Prerequisites:** EEE3069W, EEE3031S or EEE3057S.

**Course outline:** Introduction to reference frame theory; dq-machine modelling; field orientated control of a permanent magnet synchronous motor; introduction to single-phase induction motors.

**Assessment:** September examination, 2 hours.

**DP requirements:** Submission of two tutorials, writing of one class test and achieve a class mark of at least 40%.

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### EEE4084F DIGITAL SYSTEMS

20 credits, 48 lectures, 12 practicals, 1 project.

**Prerequisites:** CSC4015Z, EEE3064W, EEE3017W.

**Course outline:** The objective of this course is to develop an understanding of the basic concepts involved in the design and development of embedded computing systems using computing software and hardware as components. Embedded Computing: Complex Systems and Microprocessors, Embedded System Design Process, Formalism for System Design; Program Design Analysis: Program Design, Models of programs, Analysis and optimization of Execution Time; Real Time Operating Systems: Context switching mechanisms, Scheduling policies, Rate monotonic scheduling, Message passing versus shared memory communication, Interprocess communication - mailboxes and RPC, Multirate Systems; Hardware Accelerators: CPUs and Accelerators, Accelerated System Design, Performance Analysis; Low Power Computing: Sources of energy consumption, Instruction level strategies for power management, Memory system power consumption, Power consumption with multiple processes, System level power management; Embedded Multiprocessors: Importance of multiprocessors as in performance, power and cost, Hardware software partitioning for single bus systems, Reconfigurable processors for embedded digital signal processing; Network Embedded Systems: Network based Design, Distributed Embedded Systems, Networks for Embedded Systems, Types of network fabrics, Network performance analysis, Internet-enabled embedded systems; Interfacing and Mixed-signal systems: How to partition analogue/digital processing in Interfaces, Digital processing and real time considerations; Network Processors: A Profile of network applications, Network processors, Analysis, Mapping applications onto network processors.

**Assessment:** June examination 40%, year mark 60%.

**DP requirements:** Satisfactory completion of coursework.

**Website:** <http://crg.ee.uct.ac.za/~eee4084Fs>.

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**EEE4086F RF & MICROWAVE SYSTEMS**

20 credits, 48 lectures, 6 practicals.

**Prerequisites:** EEE3055F or EEE3063F.

**Course outline:** Topics selected from the following: Noise factor and noise temperature. Microwave and RF components and transmission lines. Line of Sight microwave systems, link budgets. Mobile communications systems. Radar systems. Frequency planning. Regulatory aspects of Spectrum usage. Antenna technology, including simple antennas such as monopoles, baluns, dipoles, reflectors, arrays. Satellite communication systems. Fibre Optical systems and components.

**Assessment:** June examination 3 hours. 60% of final mark is made up from coursework and tests.

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**EEE4089F POWER DISTRIBUTION AND TRANSMISSION NETWORKS**

20 credits, 48 lectures, 3 practicals, 2 Field trips.

**Prerequisites:** EEE3057S.

**Course outline:** Distribution systems, protection systems, steady state operation of transmission lines, high voltage engineering, electricity pricing.

**Assessment:** June examination 3 hours and year mark.

**DP requirements:** Satisfactory completion of coursework and continuous assessment mark of at least 35%.

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**EEE4090F POWER SYSTEMS ANALYSIS OPERATION AND CONTROL**

20 credits, 48 lectures, 2 practicals, 2 field trips.

**Prerequisites:** EEE3057S.

**Course outline:** Load flow studies, fault calculation, Power system security states, optimisation of power, system operations, power system stability and control, Dynamic Security analysis, Grid operations and Competitive market conditions.

**Assessment:** June examination 3 hours and year mark.

**DP requirements:** Satisfactory completion of coursework and continuous assessment mark of at least 35%.

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**EEE4093F PROCESS CONTROL AND INSTRUMENTATION**

20 credits, 48 lectures, 12 tutorials, 12 practical sessions.

**Prerequisites:** EEE3069W, or greater than 60% in EEE4013F.

**Course outline:** Aims to provide an integrated view of the principles and practice of modern industrial control and its applications.

Various topics will be covered including: 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.

**Assessment:** Project, June examination 3 hours.

**DP requirements:** Attendance at all laboratory sessions and class mark of 40% plus.

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**EEE4096S NEURAL, FUZZY AND EVOLVING SYSTEMS**

8 credits, 24 lectures, project(s).

**Course outline:** An introduction to Pattern recognition, Machine Learning and Stochastic Optimisation. A practical hands-on introduction using programming in Matlab (which will be taught along with the subject matter). Additional introductory tutorials will be given for those unfamiliar with Matlab.

**Assessment:** November examination 2 hours.

**DP requirements:** 80% submission of all assignments, satisfactory completion of hands-on

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proficiency test.

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### EEE4098F ACOUSTICS: NOISE CONTROL ENGINEERING

12 credits, 36 lectures, 2 practicals, 5 tutorials.

**Prerequisites:** All second year core courses and one third year core course.

**Course outline:** Revision of fundamentals of vibration; control of structure-borne sound. Acoustic intensity; specific acoustic impedance; the decibel. Radiation of sound from point source and extended surfaces; radiation impedance; directivity. Hearing and speech; psychological and physiological effects of noise. Measurement and analysis of sound and vibration; accelerometer, sound level meter. A-weighting network. SA National Standards; Noise control regulations. Sound transmission through boundaries; criteria and rating of partitions; sound absorbing materials. Resonance and radiation from pipes; dissipative and reactive silencers. Sound fields in enclosures; reverberation time, pressure and power levels of noise sources.

**Assessment:** June examination 3 hours 80%, year mark 20%.

**DP requirements:** Complete all tutorials and laboratories.

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### EEE4099F ELECTRICAL MACHINES AND POWER ELECTRONICS

20 credits, 48 lectures.

**Prerequisites:** EEE2023S or equivalent.

**Course outline:** Switching and conduction losses of power semi-conductor devices. Uncontrolled and controlled naturally commutated/converters. DC to DC converters; buck, boost, buck-boost, flyback, and full bridge. 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 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.

**Assessment:** June Examination 3 hours 55%, year mark 45%.

**DP requirements:** Satisfactory completion of tutorials and laboratory and 40% plus for class mark.

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### EEE5000W MASTERS DISSERTATION: ELECTRICAL ENGINEERING

180 credits.

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### EEE5002S ADVANCED NOISE CONTROL ENGINEERING

8 credits, project(s), 1 tutorial per week, 24 lectures.

**Course outline:** Topics including one or more of the following: Sound radiation and propagation; human response to noise. Sound and vibration measurement, noise control approaches, noise source identification, reactive and dissipative silencers, room acoustics. Machinery noise, machine health and diagnostics, signal processing techniques, active noise cancelling. Environmental Noise.

**Assessment:** November examination 3 hours.

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### EEE5002Z MASTERS DISSERTATION: ELECTRICAL ENGINEERING

120 credits.

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### EEE5003Z ANALYSIS, OPERATING AND CONTROL OF POWER SYSTEMS

8 credits.

**Course outline:** The course is designed for postgraduates and decision makers in power industry. The course has been designed by the Power Group - UCT with the scope of transferring and developing knowledge which would enable the participants to master the current and future challenges in a competitive power industry.

**Assessment:** Continuous assessment.

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**EEE5004Z MASTERS PROJECT: TELECOMMUNICATIONS**

60 credits.

**Course outline:** Candidates for the Degree of MEng in Telecommunications will be required to complete a project to be selected in consultation with the Programme Convenor. A written project report is required.

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**EEE5017Z ADVANCED TOPICS IN INSTRUMENTATION**

(Not offered in 2005). 16 credits, 24 lectures, 12 tutorials, 6 projects.

**Prerequisites:** CSC1017F or equivalent, EEE3069W or equivalent

**Course outline:** The purpose and applications of instrumentation. Functional descriptions and characteristics of instruments. Measurement of fundamental variables. Industrial sensors and fieldbus systems. Embedded microprocessors in instruments. Data acquisition systems and practices. Nonlinearities in instrumentation systems. Feedback loops in instrumentation systems.

**Assessment:** Examination 3 hours.

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**EEE5018Z MULTIVARIABLE CONTROL SYSTEM DESIGN**

16 credits, 24 lectures, project.

**Prerequisites:** All core courses except EEE4085F/S

**Course outline:** The course will cover selected topics from: Structure of large-scale systems, system decomposition. Frequency domain design methods: inverse nyquist arrays, characteristic loci, direct nyquist arrays. State Space design methods: pole placement control, state observers. Adaptive control methods: parameter estimators, minimum variance, pole placement designs in self-tuning regulators, and model reference adaptive controllers.

**Assessment:** Examination 3 hours.

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**EEE5021S NEURAL, FUZZY AND EVOLVING SYSTEMS**

12 credits, 24 lectures, 1 project.

**Course outline:** An introduction to Pattern recognition, Machine Learning and Stochastic Optimisation. A practical hands-on introduction using programming in Matlab (which will be taught along with the subject matter). The material will be the same as that covered in the companion undergraduate course, but covered in greater depth with additional theoretic background. The course will culminate with a major individual project involving several soft-computing techniques.

**Assessment:** November examination 3 hours.

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**EEE5024F SPACE TECHNOLOGY**

8 credits, 4 lectures (two double periods) per week.

**Prerequisites:** BSc (Hons) or completed 3rd year Electrical Engineering (EE, ECE or ME).

**Course outline:** For many applications in both science and engineering, a satellite is an ideal but difficult platform. In this section you will learn how to take a user's requirement for a sensor or communication system, and extract the important parameters needed to carry out a proper system design. In this way, the needs of the user are satisfied with a minimum of over-engineering. We look briefly at the evolution of the use of satellites, starting with the first, earth orbiting, Soviet satellite. A satellite is only useful if we can communicate with it, for example, to receive navigation beacon signals, or, to relay messages, or, to receive updates from the onboard sensors. Satellites move according to the gravitational field of the surrounding planets, and the user has to understand the sometimes very inconvenient nature of these orbits so that an orbit can be designed to be the best compromise between orbital mechanics and the required visibility from earth (in the case of an earth orbiting satellite.) We visit a laboratory where satellites are built and tested.

**Assessment:** 50% from 1.5hr exam, 50% from project.

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### EEE5025Z WIRELESS DATA NETWORKS AND SYSTEMS

15 credits, 24 lectures, tutorials, practicals, and project as required.

**Prerequisites:** EEE3075F or equivalent.

**Course outline:** Wireless network systems: Cellular technology, GSM and General Packet Radio Service 2.5G Wireless, 3G Wireless: UMTS and CDMA2000, 3.5G and 4G Wireless, WirelessLAN, WirelessMAN, Bluetooth, ad hoc networks, Sensor area networks. Wireless network technology: wireless applications, wireless links, mobility in different wireless systems, wireless security.

**Assessment:** Examination 40%, year mark 60%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/index.html#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

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### EEE5026Z CONVERGENT TELECOMMUNICATION AND DATA NETWORKS

15 credits, 24 lectures, tutorials, practicals, and project as required.

**Prerequisites:** EEE3075F or equivalent.

**Course outline:** Network Convergence, standards, and evolution from Telecommunication network to IP network; API; Internetworking with PSTN; Service requirements; Next generation network including multi-service platform and softswitch; Data plane technologies; Control plane technology including H.323/H.248/SIP protocols; Multimedia in data networks.

**Assessment:** Examination 40%, year mark 60%

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/index.html#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

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### EEE5027Z NETWORK AND INTERNET SECURITY

15 credits, 24 lectures, tutorials, practicals, and project as required.

**Prerequisites:** EEE3075F or equivalent.

**Course outline:** Security services; conventional encryption (classical encryption techniques, DES/AES, key distribution, key generation); public-key cryptology (RSA algorithm, key management, certification hierarchies); authentication and digital signatures; LDAP directory services for authentication & authorisation; security protocol analysis; intruders, viruses and worms (intrusion detection); cryptographic algorithms (MD5, SHA, IDEA, SKIPJACK); authentication and key exchange (Kerberos, Diffie-Hellman); electronic mail security (PEM/PGP); world-wide web authentication (Basic, Digest, Mediated, RPA); world-wide web security (S-HTTP, SSL, capabilities); secure electronic commerce (SET/iKP); web-services security (WS-Security, SAML).

**Assessment:** Examination 40%, year mark 60%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/index.html#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

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### EEE5029Z BROADBAND NETWORKS

15 credits, 24 lectures, tutorials, practicals, and project as required.

**Prerequisites:** EEE3075F or equivalent.

**Course outline:** The course provides an introduction to broadband networking, covering principles and fundamentals of the high performance technologies that enable the delivery of voice, video and data services, and providing a foundation for understanding the broadband communications infrastructure and the framework needed for broadband network solutions. High Speed Networks: Frame Relay, ATM, MPLS, High Speed LANS; High Speed Metropolitan Area Networks; Congestion and Traffic Management: Congestion Control in Data Networks and Internets, Link Level Flow and Error Control, TCP traffic control, Traffic and Congestion Control in ATM Networks; Internal Routing: Overview of Graph Theory and Least-cost Path, Interior Routing



Protocol, Exterior Routing Protocol and Multicasting; Traffic Engineering and MPLS: Routing information distribution, MPLS TE tunnels in a network, MPLS Switched Path setup, Fast Reroute (FRR) to mitigate packet loss associated with link and node failures, Understand Simple Network Management Protocol (SNMP)- based measurement and accounting services for MPLS; Quality of Service in Broadband Networks: Integrated and Differentiated Services, Protocols for QoS Support, Scheduling and Policing Mechanisms, Integrate MPLS into the IP quality of service (QoS) spectrum of services, QoS in ATM Networks. MPLS signalling and routing protocols, PNNI signalling and routing protocols.

**Assessment:** Examination 40%, year mark 60%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/index.html#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

### EEE5030Z FORMAL METHODS AND ANALYSIS OF COMPUTER NETWORK

15 credits, 24 lectures, tutorials, practicals, and project as required.

**Prerequisites:** EEE3075F or equivalent.

**Course outline:** Basic Markov theory and queuing theory, Poisson processes and Bernoulli and Poisson Modulated Markov Processes for network traffic models. Finite state machine methods with SDL, UML, MSC. Also modelling network protocols with Ordinary and Stochastic Petri nets, process algebras and LOTOS.

**Assessment:** Examination 40%, year mark 60%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/index.html#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

### EEE5031Z DATA MODELLING, PREDICTION AND OPTIMISATION

12 credits.

**Course outline:** Nearest-neighbour and regression methods in classification, data representation, feature selection, kernel methods, kernel ridge regression, support vector machines, time series analysis, classical and spectral clustering, evolutionary and stochastic optimisation.

**Assessment:** Examination 100%.

### EEE5032Z DIGITAL COMMUNICATIONS

20 credits, 48 lectures; tutorials and practical exercises as required.

**Prerequisites:** EEE3058S or equivalent.

**Course outline:** Course outline: Propagation: radio wave propagation, antenna gain, channel characteristics, multipath fading and signal modelling, Fresnel zones, link budgeting, instrumentation and measurements, delay spread measurements. Modulation-Demodulation Methods: Advances in baseband and bandpass digital modulation, MODEM architectures and performance, noise and interference, modem performance for coherent and non-coherent systems without coding, multilevel modems, adaptive equalisation, synchronisation. Error Control Coding: the error control problem, interleaving, block coding, convolutional coding, advanced error control coding, effects of coding on throughput, automatic repeat request; trade-offs between modulation and coding. Spread-Spectrum Systems: elements of spread-spectrum systems, pseudo-noise sequences, direct sequence spread-spectrum system performance, direct sequence and frequency hopping code division multiple access, synchronisation, applications, detection and estimation. Diversity Techniques: diversity branch and signal paths, techniques for combining and switching, antenna diversity and space-time coding, performance improvement. Optical Communication Systems: optical fibre fundamentals, modulation schemes, line codes, wavelength division multiplexing. Systems Engineering: concepts, access schemes, performance comparison of advanced modulation techniques, radio link design, spectrum utilisation, capacity and throughput, digital wireless personal communications.

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**Assessment:** June Examination 50%, year mark 50%.

**DP requirements:** 80% attendance and satisfactory completion of coursework.

**Website:** Check <http://web.uct.ac.za/depts/commnetwork/#course> for information about the curriculum in broadband communication / telecommunication / wireless networks.

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### EEE5091Z MULTIDIMENSIONAL DIGITAL SIGNAL AND IMAGE PROCESSING

12 credits, 24 lectures, project(s).

**Prerequisites:** All core courses except EEE4085F/S.

**Course outline:** Review of 1-D Digital Signal processing. 2-D Transforms such as Fourier, Hadamard, K-L, etc. Multidimensional transforms; fast algorithms. Image enhancement, restoration, coding segmentation and analysis. Multidimensional feature extraction and pattern recognition. Machine vision.

**Assessment:** November examination 3 hours.

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### EEE6000W PHD THESIS: ELECTRICAL ENGINEERING

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### EGS4006F INTRODUCTION TO ENVIRONMENTAL ASSESSMENT AND MANAGEMENT

12 credits, 48 lectures, 8 practicals, 2 Field trips.

**Prerequisites:** Any one of CIV4031F, CIV4034F, CIV4040F, CIV4033Z.

**Course outline:** Introduction to environmental management and sustainable development. Environmental assessment: process, methods, reports, and public involvement. Environmental management of construction. Practical sessions: Case studies. Field Trips: Impact control during construction/operation, and course project.

**Assessment:** June examination 2½ hours.

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### END1007W MATHEMATICS

Administered by the ASPECT coordinator.

32 credits, 96 lectures, 144 hours tutorials/workshops.

**Course outline:** The aim of the course is to provide a thorough grounding in first year Mathematics for engineers. The course content is the same as MAM1003W. See the MAM103W entry for details.

**Assessment:** November examination two no longer than 2½ hour papers: 60%, year mark: 40%.

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### END1008Z INTRODUCTION TO COMMUNICATION

Administered by the ASPECT coordinator.

8 credits 30 lectures/workshop sessions.

**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 thus prepared for communication in engineering courses, as well as for the demands of the engineering profession. A project rounds off the activities of the year.

**Assessment:** November examination 3 hours.

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### END5035Z MANAGEMENT OF TRANSPORT SUPPLY AND DEMAND

20 credits, 40 lectures (block contact time over one week).

**Course outline:** The rationale for the management of transport systems through alternatives to large scale infrastructure provision. Traffic impact assessment and access management as a means of managing the impacts of new land use development on transport systems. Road safety management. 'Transport system management' as a means of managing transport supply. 'Travel demand management' as a means of managing travel behaviour. The use of 'intelligent transport systems' in

supply and demand management.

**Assessment:** Assignments and examination.

### **END5036Z LOCAL AREA TRANSPORT PLANNING, MANAGEMENT AND DESIGN**

20 credits, 40 lectures (block contact time over one week).

**Course outline:** The planning and implementation of transport improvements at a local area (as opposed to citywide) scale. Urban design, landscaping and geometric design of streets. The design and management of local area movement networks. Accommodating pedestrians, bicycles and persons with movement disabilities in local area movement networks.

**Assessment:** Assignments and examination.

### **END5037Z RESEARCH PROJECT**

(For MPhil candidates only).

60 credits.

**Prerequisites:** END5035Z, END5036Z, END5038Z, END5047Z.

**Course outline:** Selection of research problem/topic; preparation of research project/proposal; conducting a literature review; conducting of research, including information/data acquisition; and analysis, preparation of research project report.

**Assessment:** Projects.

### **END5038Z INTEGRATED LAND USE-TRANSPORT PLANNING**

20 credits, 40 lectures (block contact time over one week).

**Course outline:** Theoretical perspectives on the relationship between transport systems and urban activity systems. Co-evolution of transport systems and urban form. Sustainable transport and the problem of 'automobile dependent' cities. Planning paradigms and rationales for public intervention into land use and transport systems. Legislative, institutional and financial frameworks for land use and transport planning in South Africa. Conceptual framing and practical application of approaches to integrated land use-transport planning in the South African context. Local and international case studies and experiences.

**Assessment:** Assignments and examination.

### **END5039Z NON-MOTORISED TRANSPORTATION**

20 credits, 40 lectures (block contact time over one week).

**Course outline:** Current South African realities and the importance of non-motorised travel modes. Planning frameworks for non-motorised transportation infrastructure improvements and network management. Methods of site and network analysis, and approaches to modelling and simulation. Footway and pathway design. The design of pedestrian precincts. Low-cost bicycle supply and promotion. Cycleway and bicycle parking design. Pedestrian and bicycle crossing facilities. (NB. The course will not be offered in 2008 if insufficient students register.)

**Assessment:** Assignments and examination.

### **END5040W MASTERS DISSERTATION: TRANSPORT STUDIES**

180 credits.

### **END5041Z MASTERS DISSERTATION: TRANSPORT STUDIES**

120 credits.

### **END5042Z SUSTAINABLE URBAN SYSTEMS**

20 credits, 12 three hour seminars.

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**Prerequisites:** Four year degree but registered honours students accepted, subject to approval of HOD.

**Course outline:** The quest for sustainable development is a major contemporary challenge. A fundamental condition for achieving this is restructuring the processes of production-consumption-waste generation within urban/industrial complexes. This transdisciplinary course explores the need for, and ways of, undertaking 'restructuring', including the following: the imperative of Sustainable Development; Whole System Modeling, based on energy and mass balances and thermodynamics; General Systems Theory with respect to the interactions between industrial/Urban systems and ecological systems; Environmental/Ecological Economics; the concept of Industrial/Urban metabolism; case studies of Industrial and Urban Ecology in practice; Institutional and Decision Making Tools for Industrial/Urban sustainability.

**Assessment:** Assignments and seminar contributions 50%, project 50%.

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### END5043Z COMMUNITY DEVELOPMENT

20 credits.

**Course outline:** Sustainable livelihood, participation, governance, partnerships, development action plans, survey methods.

**Assessment:** Examination 50%, assignments 50%.

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### END5044Z PROFESSIONAL COMMUNICATION STUDIES: POSTGRADUATE

16 credits, 6 hours lectures, 4.5 hours tutorials, 12 hours practicals.

**Prerequisites:** Undergraduate degree.

**Course outline:** This course includes modules designed to improve technical and academic writing.

**Assessment:** Examination 21.5%, projects 78.5%.

**DP requirements:** 50% minimum in written and oral work.

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### END5045Z PUBLIC TRANSPORT PLANNING AND ECONOMICS

20 credits, 40 lectures (block contact time over one week).

**Course outline:** Public transport planning and mode economics. Legislative, institutional and financial frameworks for public transport planning, management and operation. Operating characteristics of different modes. Public transport operations. Public transport infrastructure. Finances and fare structures.

**Assessment:** Assignments and examination.

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### END5046Z RURAL TRANSPORT

20 credits, 40 lectures (block contact time over one week).

**Course outline:** Rural transport conditions in contemporary South Africa. Rural development and approaches to poverty alleviation. Rural transport services and infrastructure provision. Integrated Rural Accessibility Planning (IRAP). Legislative, institutional and financial frameworks for rural transport planning in South Africa. Sub-Saharan case studies. (NB. The course will not be offered in 2007 if insufficient students register.)

**Assessment:** Assignments and examination.

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### END5047Z TRANSPORT DEMAND ANALYSIS AND PROJECT ASSESSMENT

20 credits, 40 lectures (block contact time over one week).

**Course outline:** Travel data collection and survey design. Data processing and analysis. The link between methodological approaches to transport analysis and the analytical questions raised by different policy environments. Theoretical and philosophical backgrounds of assessment and evaluation methods. Techniques for the assessment and evaluation of urban transport proposals.

**Assessment:** Assignments and examination.

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**END5048Z TRANSPORT MODELING**

20 credits, 40 lectures (block contact time over one week).

**Course outline:** Theories of travel behaviour and traffic flow. Overview of model types from strategic to nanoscopic. Travel demand modelling methods, including, trip generation, trip distribution, mode choice and trip assignment. Output analysis. The link between models and the analytical questions raised by different policy environments.

**Assessment:** Assignments and examination.

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**END5049Z RESEARCH COMMUNICATION AND METHODS**

credits.

**Course outline:** Theories of travel behaviour and traffic flow. Overview of model types from strategic to nanoscopic. Travel demand modelling methods, including, trip generation, trip distribution, mode choice and trip assignment. Output analysis. The link between models and the analytical questions raised by different policy environments.

**Assessment:** Assignments and examination.

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**END5050X MASTERS PAPER REQUIREMENT**

**Course outline:** For candidates submitting either a full (160 credits) or half (80 credits) dissertation for the following degrees: MArch, MIndAdmin, MSc(ApplSc), MSc in Construction Economics and Management, MSc(Eng), MSc(ProjMan), MPhil, MSc (Property Studies). Refer to the appropriate degree rules.

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**ERT1000F INTRODUCTION TO EARTH AND ENVIRONMENTAL SCIENCES**

18 credits, 5 lectures per week, 1 practical per week.

This course is presented jointly by the Departments of Archaeology, Environmental and Geographical Science and Geological Sciences, but administered by Geological Sciences.

**Course co-ordinator(s):** Associate Professor JS Compton.

**Entrance requirements:** Senior Certificate Biology, Geography or Physical Science on the Higher Grade, or an 'A' on Standard Grade.

**Course outline:** Structure and dynamics of the Earth; stratigraphy and geological history; climatology; surface processes and evolution of landscapes; biogeography; humans and the environment.

**Practicals:** One practical per week, Monday or Tuesday or Thursday or Friday, 14h00-17h00.

**Fieldwork:** Students are required to attend two 1-day excursions in the Cape Peninsula.

**DP requirements:** An average of 30% on all marked classwork and tests.

**Examination requirements:** 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 examination will be written in November.

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**GEO1006S INTRODUCTION TO MINERALS, ROCKS AND STRUCTURE**

**Field Work:** Students are required to attend a one day excursion in the Cape Peninsula and a four day excursion through the South Western Cape during the September vacation.

18 credits, 1 practical per week, 5 lectures per week, one 1 day and one 4 day field trip.

**Prerequisites:** ERT1000F/1002S.

**Course outline:** Crystals and minerals; igneous and metamorphic rocks; structured geology; mineral deposits and economic geology; planetology.

**Assessment:** Class test(s) 35%, Field reports 15%, November examination one 2 hour theory examination counts 50% (sub-minimum 40%).

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**GEO1008F INTRODUCTION TO GEOLOGY FOR CIVIL ENGINEERS**

12 credits, 48 lectures, 12 practicals, including 2 afternoon field trips.

**Course outline:** Introduction 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.

**Assessment:** June examination 3 hours 60%, year mark 40%.

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**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 their engineering skills to the solution of problems in health care. Students are exposed to some basic aspects of human physiology and medical instrumentation, while they receive an overview of health care, biomechanics medical imaging and physiological flow studies. This course is particularly valuable for students considering postgraduate studies in Biomedical Engineering.

8 credits, 24 lectures.

**Prerequisites:** Students must be in their second year of study.

**Course outline:** Medical terminology; overview of health care and health care technology; physical diagnosis. Cardiopulmonary physiology; the circulatory system in health and disease; the electrical activity of the heart and the ECG; cardiac pacemakers; basic measurements of blood pressure and flow. Biomechanics of the musculoskeletal system; joint forces and torques; body segment parameters. Medical instrumentation design considerations. Medical imaging physics and applications.

**Assessment:** Class test(s) 40% (Two tests, each worth 20%), June examination 3 hours 60%.

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**HUB4045F INTRODUCTION TO MEDICAL IMAGING AND IMAGE PROCESSING**

12 credits, 26 lectures, 4 practical sessions.

**Prerequisites:** 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. The imaging modalities covered are X-rays, CT, Ultrasound, MRI and Nuclear Imaging.

**Assessment:** 3 assignments (20% each) and a final project (40%).

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**MAM1000W MATHEMATICS I**

36 credits, 5 lectures per week, 1 double-period tutorial per week.

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

**Assessment:** November examination two no longer than 3 hour papers: 66.67%, year mark: 33.33%.

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**MAM1003W MATHEMATICS 103**

1. MAM1003W is NOT equivalent to MAM1000W and MAM1003W does not normally give admission to MAM2000W. Students who have passed MAM1003W and who wish to enrol for MAM2000W should consult the MAM2000W course co-ordinator before 1 December in the year preceding the year in which they wish to register for MAM2000W. They will be expected to do some reading during the long vacation on those parts of the work of MAM1000W which are not included in MAM1003W. Their admission to MAM2000W will be at the discretion of the Head of the Department of Mathematics & Applied Mathematics, who will in each case take account of the student's performance in MAM1003W. A student who expects, before the start of his or her first

year, to include MAM2000W in his or her curriculum, should register for MAM1000W and not MAM1003W.

2. For students transferring to the Faculty of Science after having passed MAM1003W, an alternative option is to claim credit and exemption for MAM1004F.

32 credits, 4 lectures per week, 1 double-period tutorial per week.

**Course outline:** Differential and integral calculus of functions of one variable with applications to optimisation, rates of change, areas, volumes, Taylor series, an introduction to differential equations, complex numbers, vector geometry and matrix algebra.

**Assessment:** November examination two no longer than 2½ hour papers: 60%, year mark: 40%.

### MAM1042S ENGINEERING STATICS

16 credits, 4 lectures per week, 1 two hour tutorial per week.

**Course outline:** Topics from: 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, 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, distributed forces, composite bodies, pressure distributions, moments of inertia for areas and masses, parallel axis theorem.

**Assessment:** November examination no longer than 3 hours: 67%, year mark: 33%.

### MAM1043H MODELING AND APPLIED COMPUTING

18 credits, 2½ lectures per week, 1 practical every two weeks.

**Course outline:** Programming in a higher level computing language (Matlab or Octave), numerical methods, introduction to dynamical systems, modelling and simulation of discrete and continuous processes. This course can be taken in conjunction with MAM1044H as lectures are arranged to make this possible.

**Assessment:** November examination no longer than 3 hours: 67%; year mark: 33%.

### MAM1044H DYNAMICS

18 credits, 2½ lectures per week, 1 practical every two weeks.

**Course outline:** A systematic introduction to the elements of mechanics; kinematics in three dimensions. Newton's law of motion, models of forces (friction, elastic springs, fluid resistance). Conservation of energy and momentum. Simple systems of particles, including brief introduction to rigid systems. Orbital mechanics with applications to the planning of space missions to the outer planets. This course can be taken in conjunction with MAM1043H as lectures are arranged to make this possible.

**Assessment:** November examination no longer than 3 hours: 67%, year mark: 33%.

### MAM1045S MODELING AND PROGRAMMING WITH MATLAB FOR ELECTRICAL ENGINEERS

16 credits, 4 lectures per week, 1 double-period tutorial per week .

**Course outline:** MATLAB Basics: plotting, conditions, loops, functions, input and output, vectorising, matrices; Good programming: formatting, structure plans; Numerical Methods: roots, solving ODEs, least squares, sorting, Fourier synthesis, solving systems of linear equations.

**Assessment:** November examination no longer than 2 hours: 60%, year mark: 40%.

**DP requirements:** 30% Class record.

## 250 COURSES OFFERED

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### MAM2000W, MAM2001H, MAM2002S, MAM2003Z, MAM2004H

#### MATHEMATICS II, 201, 202, 203, 204

Modules under these codes may be taken. Refer to the Handbook of the Faculty of Science for details.

48 credits, 24 credits, 24 credits, 12 credits and 24 credits respectively.

**Prerequisites:** MAM1000W (See note (1) under MAM1003W entry).

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### MAM2044F INTRODUCTION TO MATHEMATICAL MODELING

This course is identical to module 2MM of MAM2046W for Science students.

12 credits, 30 lectures, 1 tutorial per week.

**Prerequisites:** MAM1003W or MAM1000W.

**Co-requisites:** Modules 2LA and 2AC of MAM2000W/2004H or MAM2080W.

**Course outline:** Formulation, construction and interpretation of mathematical models for problems in the natural and life sciences. Modelling with first and second order differential equations. Introduction to population modelling, heat transfer and fluid flow. Analytical, qualitative and numerical methods and solutions. Basic use of the Laplace transform.

**Assessment:** June examination no longer than 2 hours: 70%, year mark: 30%.

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### MAM2050S BOUNDARY-VALUE PROBLEMS

This course is identical to module 2BP of MAM2046W for Science students.

12 credits, 30 lectures, 1 tutorial per week.

**Prerequisites:** At least 40% in MAM2080W.

**Course outline:** Boundary-value problems. Green's functions, eigenvalue problems. Variational calculus, applications to Lagrangean and Hamiltonian mechanics. Diffusion, Laplace's and wave equation. Solution by separation of variables.

**Assessment:** November examination no longer than 2 hours: 70%, year mark: 30%.

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### MAM2053S NUMERICAL ANALYSIS AND SCIENTIFIC COMPUTING

12 credits, 30 lectures, 1 tutorial per week. Note: Credit cannot be obtained for both MAM2053S and MAM3080F.

**Prerequisites:** MAM2080W

**Course outline:** Solutions to 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.

**Assessment:** November examination no longer than 2 hours: 70%, year mark: 30%.

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### MAM2080W MATHEMATICS 280

This course is designed specifically for students in the Faculty of Engineering & the Built Environment. 32 credits, 4 lectures per week, 1 double-period tutorial per week.

**Prerequisites:** MAM1003W.

**Course outline:** Aim: To introduce engineering students to the tools and concepts of modelling engineering problems and to the methods for solving them. 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 in 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, Stokes' theorem. 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 to finding



principal axes. Solution of n-th order linear differential equations. The Laplace transform. Introduction to partial differential equations and the method of separation of variables.

**Assessment:** One paper written in June and one in November. Each paper is no longer than 2.5 hours: 30% each, year mark: 40%.

### **MAM2082F** COMPUTER PROGRAMMING IN MATLAB

Aim: To introduce basic scientific programming. 8 credits, 2 lectures per week.

**Prerequisites:** MAM1003W.

**Course outline:** Introduction to basic scientific programming techniques using Matlab: expressions, decisions, loops, script files, vector and matrix handling facilities, 2-D and 3-D graphics. Basic numerical methods. Examples of interest to engineers (linear and non-linear equations, simulation, chaos, mechanical vibrations).

**Assessment:** June examination no longer than 2 hours: 55%, year mark: 45%.

### **MAM3000W, MAM3001W, MAM3002H, MAM3003S, MAM3004Z** MATHEMATICS III, 301, 302, 303, 304

Modules under these codes may be taken. Refer to the Handbook of the Faculty of Science for details.

72 credits, 72 credits, 36 credits, 36 credits and 18 credits respectively.

### **MAM3043S** METHODS OF MATHEMATICAL PHYSICS

This course is identical to module 3MP of MAM3040W for Science students.

18 credits, 30 lectures, 1 tutorial per week.

**Prerequisites:** MAM2080W or equivalent courses.

**Course outline:** The Fourier-transform solution of linear PDEs on the line. The long-term asymptotic behaviour of solutions: the methods of Laplace, stationary phase and steepest descents. Nonlinear waves: the method of characteristics; the effect of dissipation; the Cole-Hopf transform for the Burgers equation; travelling fronts for the KPP equation. The effect of dispersion: KdV and nonlinear Schroedinger equation. Elliptic integrals and elliptic functions; dark and bright solitons; kinks and breathers for the sine-Gordon equation. Multisoliton solutions: the Hirota method and Baecklund transformations.

**Assessment:** June examination no longer than 2 hours: 75%, year mark: 25%.

### **MAM3049S** INTRODUCTION TO GENERAL RELATIVITY

This course is identical to module 3GR of MAM3040W for Science students.

18 credits, 30 lectures, 1 tutorial per week.

**Prerequisites:** MAM2080W or equivalent courses.

**Course outline:** Christoffel relations, geodesics, curvature, the Riemann tensor. The energy momentum tensor in electrodynamics and fluid dynamics. Principle of equivalence, Einstein's field equations. Black Holes. Gravitational Waves.

**Assessment:** November examination no longer than 3 hours: 75%, year mark: 25%.

### **MAM3050F** NUMERICAL MODELING

This course is identical to module 3AN of MAM3040W for Science students.

18 credits, 30 lectures, 1 tutorial per week.

**Prerequisites:** MAM2080W or equivalent courses.

**Course outline:** Advanced methods for ODEs, boundary value problems, differential eigenvalue problems. Numerical solutions of PDEs by the method of finite differences, finite elements and spectral methods.

**Assessment:** June examination no longer than 2 hours: 65%, year mark: 35%.

## 252 COURSES OFFERED

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### MAM3052S NONLINEAR DYNAMICS

This course is identical to module 3ND of MAM3040W for Science students.

18 credits, 30 lectures, 1 tutorial per week.

**Prerequisites:** MAM2080W or equivalent.

**Course outline:** Fixed points, bifurcations, phase portraits, conservative and reversible systems. Index theory, Poincaré-Bendixson theorem, Lienard systems, relaxation oscillators. Hopf bifurcations, quasi periodicity and Poincaré maps, applications to oscillating chemical reactions and Josephson junctions. Chaos on a strange attractor, Lorentz map, logistic map, Hénon map, Lyapunov exponents. Fractals.

**Assessment:** June examination no longer than 2 hours: 65%, year mark: 35%.

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### MAM3054S FLUID DYNAMICS

This course is identical to module 3FD of MAM3040W for Science students.

18 credits, 30 lectures per week, 1 tutorial per week.

**Prerequisites:** MAM2080W or equivalent courses.

**Course outline:** Description of fluids, equations of fluid flow for simple fluids, analytic techniques. Applications.

**Assessment:** November examination no longer than 2 hours: 75%, year mark 25%.

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### MAM3080F NUMERICAL METHODS

12 credits, 3 lectures per week, 1 double tutorial per week.

**Prerequisites:** At least 40% in MAM2080W.

**Course outline:** Solutions to non-linear equations and rates of convergence. Direct and iterative methods for solving linear systems, pivoting strategies, matrix factorization, norms, conditioning, eigenvalue problems. Solutions to initial value problems including higher order ordinary differential equations. Interpolation and approximation theory, splines, least squares. Numerical differentiation and integration. Error analysis and control. Applications to Mechanical and Chemical engineering.

**Assessment:** Three project tests and one theory test.

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### MEC1000X PRACTICAL TRAINING

**Course outline:** Electro-Mechanical and Mechanical Engineering students shall produce to the satisfaction of the head of department, a certificate showing evidence of completion of suitable work in the basic workshop processes during the period of at least six weeks in an approved industrial workshop, either before registration or during the long vacation following the year of first registration in the Faculty. Such evidence must be produced by 31 March of the year following such training. Alternatively students may produce a certificate showing evidence of completion of an approved structured intensive practical training course (e.g. at a Technikon/University of Technology).

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### MEC1002W ENGINEERING DRAWING

16 credits, 24 lectures, 20 tutorials, 4 CAD practical sessions.

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

**Assessment:** November examination 2½ hours 25%, year mark 75%.

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### MEC1003F ENGINEERING DRAWING

8 credits, 12 lectures, 12 tutorials, 4 CAD practical sessions.

**Course outline:** Use of drawing instruments, plane geometry; principles of: orthographic projection; pictorial projection; auxiliary projection; sections; the measurement of areas; descriptive geometry of points, lines and planes in space; an introduction to the basics of CAD.

**Assessment:** June examination 2½ hours 25%, year mark 75%.

### MEC1004W ENGINEERING I

32 credits, 6 lectures per week.

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

**Assessment:** By assignments and completed projects. In order to pass this course an average mark of 50% must be obtained. In addition, a minimum of 50% is required for the tests that count 25% of the final mark. Assessment breakdown: Projects 67%, tests 25%, Intro Studies 8%.

### MEC2000X PRACTICAL TRAINING

**Course outline:** Electro-Mechanical and Mechanical Engineering students shall produce to the satisfaction of the head of department, a certified employers report showing regular time-keeping and evidence of completion of suitable work in mechanical, electro-mechanical or materials engineering practice for a minimum period of six weeks at the end of the Second Year. The report shall include a diary recording activities during employment, and is to be submitted by the end of the fourth week of the term immediately following the period of employment. Selection of the employment and acceptance of the report require approval by head of the department.

### MEC2020W DESIGN I

32 credits, 48 lectures, 48 studio sessions.

**Prerequisites:** MEC1002W, MEC1004W, MEC1000X.

**Co-requisites:** All second year core courses.

**Course outline:** Machine drawing; Production processes and methods; Design Process and Design Reports. Use of units, standards and codes. Kinematics of linkages and mechanisms. Stress analysis of shafts. Selection of machine elements.

**Assessment:** November examination 40%, Oral examination 10%, year mark 50%.

### MEC2022S THERMOFLUIDS I

16 credits, 48 lectures, 3 laboratory sessions, 1 tutorial per week.

**Course outline:** Fluids and their properties; Basic concepts of Thermodynamics; Pressure and Head; Hydrostatics; Bouyancy; Properties of pure substances; The First Law of Thermodynamics; Closed systems; Control Volumes; Introduction to Heat Transfer; Motion of Fluid particles; Momentum equation and applications.

**Assessment:** November examination 3 hours 70%, year mark 30%.

### MEC2023F DYNAMICS I

16 credits, 48 lectures, 12 tutorials.

**Prerequisites:** MAM1003W, MAM1042S, PHY1010W.

**Course outline:** Particle kinematics; Coordinate systems; Particle Kinetics, Newton's laws, work and energy, momentum, impact and impulse. Rigid body dynamics, plane kinematics, plane kinetics. Measurements in dynamics.

**Assessment:** June examination 3 hours 60%, year mark 40%.

## 254 COURSES OFFERED

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### MEC2025F MECHANICS OF SOLIDS I

12 credits, 36 lectures, 10 tutorials.

**Prerequisites:** MAM1042S, DP for MAM1003W and PHY1010W.

**Course outline:** Statically determinate force systems, free body diagrams, Stress-strain relations, elastic constants, Statically determinate stress systems, direct stress, shear stress, bending stress, torsional stress, Bending moment diagrams, shear force diagrams, deflection of beams, Torsion, Struts. Stress and strain transformations, compound stress in 2 dimensions, Mohr's circle.

**Assessment:** June examination 3 hours 75%, year mark 25%.

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### MEC2026S PROJECT MANAGEMENT

8 credits, 24 lectures.

**Prerequisites:** 3rd year status.

**Course outline:** Project management approach, complexity of project environment, feasibility studies, management, risk, commissioning, reporting, planning, design, time, cost and quality, scheduling, control, contracts administration.

**Assessment:** Mid course 40%, Final examination 60%.

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### MEC2040F ELECTRICAL MATERIALS I

8 credits, 24 lectures, 4 tutorials.

**Prerequisites:** PHY1010W.

**Course outline:** 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.

**Assessment:** June examination 2 hours 70%, year mark 30%.

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### MEC2042F MATERIALS SCIENCE IN ENGINEERING

12 credits, 36 lectures, 5 tutorials, 2 practical sessions.

**Prerequisites:** CEM1008F or CEM1000W.

**Course outline:** An introduction to the science of engineering materials and the relationships between structure and properties. 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. Models of electrical conduction-development of band theory in metals, semi-conductors and insulators. Elements of corrosion science, deterioration and degradation of materials. The principles of reinforcement and design on the properties of composites. The selection of materials. Case studies.

**Assessment:** June examination 3 hours 70%, year mark 30%.

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### MEC2043F ELECTRICAL AND MECHANICAL MATERIALS

12 credits, 36 lectures, 6 tutorials.

**Prerequisites:** PHY1010W.

**Course outline:** 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.

**Assessment:** June examination 3 hours 70%, year mark 30%.

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**MEC3000X PRACTICAL TRAINING**

**Course outline:** Mechanical and Electro-Mechanical Engineering students shall produce to the satisfaction of the head of department, a certified employers report showing regular time-keeping and evidence of completion of suitable work in mechanical or electro-mechanical engineering practice for a minimum period of six weeks at the end of the Third Year. The report shall include a diary recording activities during employment, and is to be submitted by the end of the fourth week of the term immediately following the period of employment. Selection of the employment and acceptance of reports require approval by the head of the department.

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**MEC3014S PRODUCTION SYSTEMS**

8 credits, 24 lectures, 2 practicals.

**Course outline:** Cutting tools and cutting tool theory; Hydraulics; Introduction to numerically controlled machine tools. Pneumatics.

**Assessment:** November examination 2 hours 90%, year mark 10%.

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**MEC3023F MECHANICS OF SOLIDS II**

12 credits, 36 lectures, 3 practicals.

**Prerequisites:** MEC2025F, MAM2080W (DP).

**Course outline:** 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.

**Assessment:** June examination 3 hours 75%, year mark 25%.

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**MEC3031S DYNAMICS II**

16 credits, 48 lectures, 3 practicals.

**Prerequisites:** MEC2020W, MEC2023F, MEC2025F.

**Course outline:** Kinematics and efficiency of gears and gear trains; balancing of rotating machines; Crank-effort diagrams, balancing of reciprocating machinery; Flywheels; Vibration; critical speed of shafts; response analysis, single degree of freedom systems; Natural modes and frequencies; Mechanical control, gyroscopes, governors.

**Assessment:** November examination 3 hours 70%, year mark 30%.

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**MEC3033F THERMOFLUIDS II**

20 credits, 60 lectures, 4 laboratory sessions, 1 tutorial per week.

**Prerequisites:** MEC2022S.

**Course outline:** The energy equation; The Second Law of Thermodynamics; Entropy; Laminar and Turbulent flows; Gas, Vapour and Refrigeration cycles; Incompressible flow in pipe systems; Gas Vapour mixtures; Chemical reactions; Performance of Rotodynamic Machines.

**Assessment:** June examination 3 hours 80%, year mark 20%.

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**MEC3035F COMPUTER INTEGRATED MANUFACTURE AND ROBOTICS**

For Electro-Mechanical Engineering students only.

8 credits, 24 lectures, 2 practical sessions.

**Course outline:** 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; hardware interfacing.

**Assessment:** June examination 2 hours 30%, Practical examination 20%, year mark 50%.

## 256 COURSES OFFERED

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### MEC3035S COMPUTER INTEGRATED MANUFACTURE AND ROBOTICS

For Mechatronics students only.

8 credits, 24 lectures, 2 practical sessions.

**Course outline:** 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; hardware interfacing.

**Assessment:** November examination 2 hours 30%, Practical examination 20%, year mark 50%.

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### MEC3037S PROFESSIONAL COMMUNICATION STUDIES AND DEVELOPMENT

For Electro-Mechanical and Mechanical Engineering students.

12 credits, 24 lectures.

**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. **(Second-year students may not register for MEC3037S.)**

**Assessment:** Oral examination, October/November examination 2 hours.

**DP requirements:** 100% attendance and 50% minimum class test average.

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### MEC3044S THERMOFLUIDS III

12 credits, 36 lectures, 2 practicals.

**Prerequisites:** MEC3033F (DP).

**Course outline:** Similarity boundary layer theory; Incompressible flow around bodies; Radial flow and flow in curved paths; Surge control; Compressible flow; Shock waves; Combustion Processes and IC Engines.

**Assessment:** November examination 3 hours 80%, year mark 20%.

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### MEC3045F EXPERIMENTAL METHODS

12 credits, 36 lectures, practical Sessions.

**Course outline:** Terminology, standards, data analysis, uncertainty. Dimensional Analysis. Displacement, strain, pressure, flow and temperature measurements. Classical flow visualization techniques using electrical measurement techniques. Non- Destructive Evaluation techniques.

**Assessment:** June examination 3 hours 70%, year mark 30% from experiments and practicals.

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### MEC3050W DESIGN II

24 credits, 48 lectures, 24 tutorials.

**Prerequisites:** MEC2020W.

**Co-requisites:** All third year core courses.

**Course outline:** Advanced methods for ODEs, boundary value problems, differential eigenvalue problems. Numerical solutions of PDEs by the method of finite differences, finite elements and spectral methods.

**Assessment:** November examination 3 hours 50%, year mark: 50%.

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### MEC3060F MATERIALS UNDER STRESS

8 credits, 24 lectures, 3 tutorials, 4 practicals.

**Prerequisites:** MEC2042F.

**Course outline:** Elasticity and importance of modulus in engineering design. The influence of bond

strength and structure. Plastic flow in crystals and polycrystals by dislocation movement. Work hardening. Recrystallisation. Strengthening methods in metals. Effect of temperature, strain rate, stress state. Failure in metals. Ductile and brittle fracture. Critical flaw size and fracture toughness. Fatigue, creep, stress corrosion and wear processes; dislocation and other micro-mechanisms involved.

**Assessment:** June examination 2 hours 80%, year mark 20%.

### **MEC3068C FUNCTIONAL MATERIALS**

8 credits, 24 lectures, 3 tutorials.

**Prerequisites:** MEC2043F.

**Course outline:** Thermal properties of materials - specific heat, thermal conductivity, thermal expansion. Thermoelectric properties - Seebeck, Peltier, Thomson coefficients. The influence of electronic structure. Implications for design, figures of merit. Magnetic properties of materials - ferromagnetism, ferrimagnetism, paramagnetism, diamagnetism. Hysteresis in ferromagnetic and ferrimagnetic materials. Implications for design; case studies. Superconductivity - the influence of electronic structure; superconducting devices - applications and potential applications; material limitations. Dielectric properties of materials - dielectric constant; capacitance. Hysteresis; the influence of electronic structure. Selection of dielectrics for applications requiring different frequencies. Ferroelectric and piezoelectric materials and applications. Optical properties of materials - absorption and emission processes; optic fibres, solar cells. Sensor and actuator applications.

**Assessment:** September examination 2 hours 70%, year mark 30%.

### **MEC4022F INDUSTRIAL LAW**

8 credits, 24 lectures.

**Course outline:** Elements of the law of contract; agency; partnership; companies; and patents. Labour Law.

**Assessment:** June examination 2 hours 100%.

### **MEC4035F FRACTURE MECHANICS**

8 credits, 24 lectures, 2 practicals.

**Prerequisites:** MEC3050W.

**Course outline:** Fundamentals of fracture mechanics; triangle of integrity concept between fracture toughness, stress and flaw size. Review of linear elastic fracture mechanics (LEFM), stress intensity (K), and its shortcomings. Elastic plastic fracture mechanics (EPFM) and crack opening displacement (COD) and J integral toughness formulations.

Experimental measurement of COD and J integral and correlation of K, COD and J integral. Codified use of EPFM in practice and case studies. Review of fatigue from a fracture mechanics viewpoint

**Assessment:** June examination 3 hours 75%, year mark 25%.

### **MEC4036C POWER PLANT**

8 credits, 24 lectures, 2 practicals.

**Course outline:** Boilers; steam turbines; condensers and cooling circuits; renewable energy; solar power generation; hydrogen; energy conservation; fuel cells; energy storage; environmental aspects of power generation.

**Assessment:** September examination 2 hours 100%.

### **MEC4042Z INDUSTRIAL MANAGEMENT**

8 credits, 24 lectures, case study.

**Course outline:** Introduction to Management and Organisational Theory, Leadership,

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Organisational culture, Customer Value, Human Resources, Finance, Economics, Strategic Thinking, ethics and roles of managers.

**Assessment:** September examination 2 hours 50%, Group Report 30%, Continuous Assessment Tests 20%.

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### MEC4044Z MAINTENANCE MANAGEMENT AND RELIABILITY IN SYSTEMS

For non Electro-Mechanical Engineering students only.

8 credits, 24 lectures.

**Course outline:** This course has been designed to be within a framework of System Engineering. The topics include reliability, maintainability, life cycle costs, maintenance planning, TPM and RCM problem solving, safety, organisational relationships and systems.

**Assessment:** September examination 2 hours 55%, Group report 20%, Continuous assessment tests 25%.

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### MEC4045F NUMERICAL METHODS IN HEAT AND FLUID FLOW

12 credits, 36 lectures.

**Prerequisites:** MEC3033F, MEC3044S and MAM2082F.

**Course outline:** The course is primarily an introduction to the Finite Volume method for problems of heat conduction, potential and convection-diffusion type flows. The latter will be extended to 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. Topics include: discretisation, interpolation, boundary conditions, solution procedures, complex geometries.

**Assessment:** June examination 3 hours.

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### MEC4047F MECHANICAL VIBRATIONS

12 credits, 36 lectures.

**Prerequisites:** MEC3031S.

**Course outline:** Vibration is usually an undesirable effect in most machines and structures. Some machines, of course, are designed to vibrate in order to accomplish their objectives. In either case, the engineer must understand the effects of vibration and be able to analyze the causes and consequences. This course introduces the student to the modeling of vibrations in machines and structures: single- and multi- degree of freedom models; analytical and numerical solutions; practical applications.

**Assessment:** June examination 3 hours 60%, year mark 40%.

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### MEC4048F ADVANCED HEAT TRANSFER

12 credits, 36 lectures, 2 practicals.

**Prerequisites:** MAM2080W or equivalent.

**Course outline:** Laws of heat transfer; principles of conduction; steady and unsteady state heat transfer, convection, radiation; pc interaction and problem solving.

**Assessment:** June examination 3 hours 70%, year mark 30%.

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### MEC4049F TURBOMACHINES

8 credits, 24 lectures, 2 practicals.

**Prerequisites:** MEC3044S.

**Course outline:** Types of turbomachines; dimensionless specific speed, head flow and power coefficients; hydraulic pumps; hydraulic turbines; centrifugal compressors; axial flow compressors; steam and gas turbines.

**Assessment:** June examination 2 hours 80%, year mark 20%.



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**MEC4051F NEW VENTURE PLANNING**

8 credits, 24 lectures.

**Course outline:** The entrepreneurial perspective; developing a new venture (guest speaker); What is a feasibility plan? Product concept and description; market assessment; industrial analysis; marketing plan; operations, development plans and management; financial projections.

**Assessment:** Individual learning log 40%, Presentations 30%, Project report(s) 30%.

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**MEC4053Z MEASUREMENT AND CONTROL IN ENGINEERING SYSTEMS**

16 credits.

**Prerequisites:** EEE3070S, MEC3050W.

**Course outline:** To bring together elements of engineering previously covered in electrical and mechanical courses in a way that is as close to that expected in industrial practice. 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, flow rates etc.

**Assessment:** Practical examinations 30%, technical reports 10%, 3 hour examination 60%.

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**MEC4054Z QUALITY, RELIABILITY AND MAINTENANCE MANAGEMENT**

12 credits, 24 lectures, field work.

**Course outline:** Quality, Reliability, Maintenance Planning, Preventative Maintenance, Reliability Centred Maintenance, Total Productive Maintenance, condition monitoring, problem solving, safety, systems view..

**Assessment:** June examination 2 hours 65%, project 10%, continuous assessment tests and assignments 25%.

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**MEC4055Z DESIGN III**

16 credits, 12 lectures, 12 studios.

**Prerequisites:** MEC3050W and prerequisite/corequisite MEC2026S.

**Co-requisites:** Fourth year elective courses.

**Course outline:** To design a complex elector-mechanical system in a professional and effective manner; model, simulate and, where possible, optimise the performance of the product or its subsystems by means of a computer; design holistically, considering all factors from fact driven such as strength, rigidity and safety through to opinion driven ergonomics, environmental impact and societal acceptance; applying the Design Process to plan, structure and manage a design from idea to implementation; document and present a design as a report in an oral presentaion; effectively co-operate as a member of a design team; application of subject matter researched independently.

**Assessment:** Project 100%.

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**MEC4061F/Z INDIVIDUAL LABORATORY/RESEARCH PROJECT**

48 credits.

**Course outline:** Each student is required to conduct and report upon an individual project, which will in general require both experimental and design skills. Students are prescribed reading material and required to attend one afternoon's workshop on various topics on ethics, such as the ECSA Code of Conduct, professionalism, safety etc. Students are required to comment on ethical concerns of their project. The student will work part time on his/her project concurrently with his/her course work, and in addition a period of approximately eight weeks after the final written examinations is

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available for the completion of the project. Electro-Mechanical Engineering students are required to do projects with outcomes that include aspects of electrical and mechanical engineering.

**Assessment:** Project report(s) and oral examination 100%.

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### MEC4062Z AIR CONDITIONING AND REFRIGERATION

12 credits, 36 lectures, 1 practical.

**Course outline:** Evaluation and system performance of Compression Refrigeration. Optimising operating conditions in Absorption Refrigeration. Psychrometry; human comfort; Air-conditioning applications, heat losses, Solar radiation on buildings.

**Assessment:** September examination 3 hours 85%, year mark 15%.

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### MEC4063C INDUSTRIAL ECOLOGY

8 credits, 18 lectures/seminars.

**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; ecological economics.

**Assessment:** A project forms a major part of the course assessment 40%, year mark 60%.

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### MEC4065F FINITE ELEMENTS IN MECHANICAL DESIGN

16 credits, 24 lectures, 12 studio sessions.

**Prerequisites:** MEC3023F.

**Course outline:** This course introduces the formulation and application of the finite element method (FEM) in the context of structural and stress analysis. The course 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 program. Furthermore, students will be required to complete a project using a commercial FEM package. 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.

**Assessment:** Project and June examination 3 hours 50%, year mark 30%, project 20%.

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### MEC4087Z FAILURE ANALYSIS

8 credits, 24 lectures, 2 practicals.

**Prerequisites:** MEC2042F.

**Co-requisites:** MEC4035F.

**Course outline:** The methods of failure analysis, categories of failures: design, manufacturing, time in service. Importance of stress analysis and fracture mechanics. Case histories taken from industry concerning brittle fracture, ductile fracture, fatigue, corrosion and stress corrosion cracking and wear.

**Assessment:** Examination 70%, year mark 30%.

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### MEC4088F MANUFACTURING WITH MATERIALS

12 credits, 36 lectures, 3 tutorials, 3 practicals.

**Prerequisites:** MEC2042F.

**Course outline:** Manufacturing materials. Modeling deformation during processing. Manufacturing

process selection. Net shape casting processes. Forming processes, joining processes and machinability of materials. Surface engineering. Injection moulding, blow moulding and extrusion of polymeric materials. Manufacturing and business strategy. Case studies in product manufacture.

**Assessment:** Examination 70%, year mark 30%.

### **MEC4091S MATERIALS SCIENCE LABORATORY PROJECT**

48 credits.

**Prerequisites:** Completion of BSc degree.

**Course outline:** Students are required to attend a series of lectures and practicals on experimental techniques. Each student will be given an individual laboratory project on a problem relating to materials. A period of ten weeks is allocated for the project and on completion a treatise must be submitted for examination.

**Assessment:** Project(s) 100%.

### **MEC4092F INTERNAL COMBUSTION ENGINES**

12 credits, 36 lectures, 2 practicals.

**Course outline:** Spark-ignition engines; Diesel engines; normal combustion; modelling the thermodynamic processes; abnormal combustion; Engine design and combustion chamber influences; Practical causes of inefficiency; Engine performance maps, Fuels and Fuel systems; Exhaust emissions and their control, External environment, Future trends and technologies.

**Assessment:** June examination 2 hours 75%, year mark 25%.

### **MEC5000W MASTERS DISSERTATION: MECHANICAL ENGINEERING**

180 credits.

### **MEC5010Z MASTERS DISSERTATION: MECHANICAL ENGINEERING**

120 credits.

### **MEC5024S STRUCTURAL IMPACT**

12 credits.

**Course outline:** Static plastic behaviour of beams; plates and shells. Dynamic plastic behaviour of beams, plates and shells. Influence of transverse shear and rotary inertia. Influence of finite displacements; strain rate sensitive behaviour of materials; dynamic progressive buckling; plastic buckling. Scaling laws and experimental techniques.

**Assessment:** Project(s).

### **MEC5025Z MASTERS IN ENGINEERING MANAGEMENT: DISSERTATION**

120 credits.

**Prerequisites:** Completion of 80 credits of approved postgraduate coursework.

### **MEC5035Z PROJECT MANAGEMENT**

20 credits, 1 three hour lecture (one evening) per week.

**Prerequisites:** Registration for a postgraduate qualification

**Course outline:** The need for and objectives of project management. Organising for project management. Project manager qualities and competency. Planning and implementing a human resource management, team motivation, planning, feasibility studies. Managing project time, cost and quality. Estimating budgeting cost control. Procurement and expediting. Contractual arrangements and legal aspects. Communications, controlling meetings, handling contractors. Project commissioning. Risk analysis and hazard assessment. Conflict management. Time value of money and use of discounted cash flows for project appraisal and decision making. The perspective

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is managerial, with emphasis on the use of the techniques to aid project decision making. Information systems, projects in developing countries.

**Assessment:** Examination 60%, Project report(s) 30%, Assignments 10%.

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### MEC5036Z MANAGING FOR PERFORMANCE IMPROVEMENT

20 credits, 1 three hour lecture (one evening) per week.

**Prerequisites:** Registration for a postgraduate qualification

**Course outline:** Productivity: definition and importance. Productivity models, measurement and quality. People and productivity. The nature of quality, costs of quality and Kaizen, and 14000; organising and managing for quality, quality engineering, quality assurance and control; ISO9000 series, techniques of quality control, vendor rating; process capability, precontrol and advanced techniques; total quality management, quality friction development. Just-in-Time; human factors in quality, the zero defects approach; computer use in quality systems. Job design, BPR and work improvement. Value analysis and simultaneous/concurrent engineering. Theory of constraints. Total productive maintenance. Continuous productivity. Improvement programmes.

**Assessment:** Assignments 10%, Examination 60%, Project report(s) 30%.

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### MEC5037Z OPERATIONS MANAGEMENT PROJECT

20 credits.

**Course outline:** On the recommendation of the supervisor and with the agreement of the Head of Department, a student may be permitted to enter into a programme of individual study on a specialised topic. A statement of objectives must be agreed upon, and the course of study will be guided by the supervisor. the programme will involve the student in about 180 hours of work, and a written report must be submitted. The written report will be examined, and a further oral examination may be held.

**Assessment:** Project(s).

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### MEC5038Z ENGINEERING MANAGEMENT TECHNICAL REPORT

Postgraduate diploma candidates only.

40 credits.

**Prerequisites:** 20 credits towards the diploma

**Course outline:** A student registered for a diploma may be permitted to enter into a programme of individual study on a specialised topic within the engineering field. The course of study will be guided by a supervisor appropriate to the field selected. The scope of the work may be experimental or new methods applicable to engineering management, or a comprehensive review.

The programme will involve the student in about 360 hours of work, and a written report must be submitted in the format of a minor thesis, which will be examined by two examiners.

**Assessment:** Project report(s).

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### MEC5043Z DESIGN AND MANAGEMENT OF OPERATIONAL SYSTEMS

40 credits.

**Course outline:** Viable Systems Modeling . The Nature and Characteristics of Operational Systems. Core operational decision areas. The Operations Management Process.Socio-technical Systems.

**Assessment:** Examination, Portfolio of projects.

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### MEC5046Z SYSTEMS ENGINEERING PRACTICE

40 credits.

**Course outline:** Introduction to systems thinking. Economic and statistical concepts. Systems Feasibility Systems modelling and simulation. A system's approach to problem solving.

**Assessment:** Examination, Portfolio of projects.

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**MEC5047W MASTERS IN ENGINEERING MANAGEMENT: DISSERTATION**  
180 credits.

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**MEC5048S NON-DESTRUCTIVE TESTING AND EVALUATION**  
12 credits, 24 lectures.

**Prerequisites:** BSc(Eng) degree.

**Course outline:** Methods and guidance to non-destructive techniques. Selected topics in: Principles of Ultrasonic inspection and methods and their applicability. Electronic Speckle Pattern Interferometry as applied to flow detection. Shearography as the novel optical non-contacting defect detection method. Eddy current versatility for the measurement of thickness of coatings, the detection of seams, cracks, voids and inclusions. Leak detection devices and methods. Condition monitoring of bearings. Testing for flaws in composite materials by mechanical impedance.

**Assessment:** Examination 80%, year mark 20%.

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**MEC5049S ADVANCED REFRIGERATION**  
12 credits.

**Course outline:** Aspects of compression refrigeration. Effects that degrade vapour compression refrigeration; multiple compression; multiple evaporators; flash chambers; cascade systems; compressors (screw, turbine, piston). Aspects of absorption refrigeration. Theory of mixtures; absorption continuous cycle; mathematical and graphical analysis of the cycle; intermittent systems; lithium-bromide water system; water-ammonia-hydrogen system. Aspects of combined compression/absorption cycle; comparison of performance.

**Assessment:** Examination 3 hours.

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**MEC5051Z MECHANICAL ENGINEERING PROJECT**  
20 credits.

**Prerequisites:** Completion of appropriate postgraduate courses.

**Course outline:** On the recommendation of the supervisor and with the agreement of the Head of Department, a student registered for a Masters degree may be permitted to enter into a programme of individual study on a specialised topic. A statement of objectives and/or a syllabus must be agreed upon, and the course of study will be guided by a member of the department, usually the supervisor. The programme will involve the student in about 180 hours of work. This can include assignments and projects of an appropriate nature. The course will be assessed by examination or project or both and an oral examination may be held thereafter, if required.

**Assessment:** Examination and project.

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**MEC5052S GAS DYNAMICS**  
12 credits, 36 lectures.

**Course outline:** Basic equations of compressible flow; Wave propagation in compressible media; Isentropic flow of a perfect gas; Normal shock waves; Applications to nozzles and shock tubes; Oblique shock waves; Prandtl Meyer flow; Applications to supersonic nozzles, supersonic aerofoils; Flow with friction; Flow with heat addition or loss.

**Assessment:** November examination.

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**MEC5054Z INTRODUCTION TO BUSINESS ADMINISTRATION**  
40 credits.

**Course outline:** Introduction to business and the business environment. Marketing Management. Finance Management. Human Resources Management. Operations Management. General Management. Quantitative Methods in Management Economics. Accounting. Business and Society.

**Assessment:** Examination and project, portfolio of projects.

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**MEC5055Z MANUFACTURING TECHNOLOGY**

80 credits.

**Course outline:** This modular programme has been structured to enable students in a systematic way to understand the complexities of the field of Manufacturing Technology. Students will be required to complete sixteen modules and write four position papers during their 1st Year of registration. Four modules and one position paper per quarter. Each module will require one week to complete and will be examined orally. (Note: A minimum of thirty six hours of work per module will be expected). The position papers should be of a similar duration and will be examined in their written form and then each defended orally. Each position paper should reflect the student's current understanding of the topic and its implications for the future. In broad outline, the core modules cover; Systems approach to manufacturing management; CADD/CAM in manufacture; Traditional and non-traditional manufacturing processes; Automation; and Robotics.

- Module 01** "Systems approach to Manufacturing Management I." A framework for inquiring into and describing a manufacturing system as a whole by understanding its parts and its role in the bigger picture.
- Module 02** "Systems approach to Manufacturing Management II." Qualitative mapping and modelling of a manufacturing system using paper and pencil.
- Module 03** "Systems approach to Manufacturing Management III." Quantitative modelling of a manufacturing system using a computer and the "STELLA" programme
- Module 04** "CADD/CAM in Manufacture I." Modern design strategies centred around CADD data: Parametric modelling.
- Module 05** "CADD/CAM in Manufacture II" Modern design strategies centred around CADD data: Finite element analysis and process modelling.
- Module 06** "CADD/CAM in Manufacture III" Modern design strategies centred around CADD data: Sterolithography and rapid prototyping.
- Module 07** "CADD/CAM in Manufacture IV" Modern design strategies centred around CADD data: CNC tool path development.
- Module 08** "Traditional manufacturing processes I." Casting processes, theory and practice.
- Module 09** "Traditional manufacturing processes II." Forming processes, theory and practice.
- Module 10** "Traditional manufacturing processes III." Cutting processes, theory and practice.
- Module 11** "Non traditional manufacturing processes." Spark erosion, explosive forming, chemical machining, etc.
- Module 12** "Automation I." Low cost automation using pneumatic circuits.
- Module 13** "Automation II." Programmable Logic Controllers in automation.
- Module 14** "Automation III." Computer interfacing in a Flexible Manufacturing Cell.
- Module 15** "Joining of materials."
- Module 16** "Virtual reality and its role in manufacture."
- Module 17** "Metrology." Modern systems of measurement for manufacture."
- Module 18** "Total Quality Management" The role of TQM in manufacture and ISO 9000."
- Module 19** "Product Dissection and Reverse Engineering" Its role in the world of manufacture.

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**MEC5056Z ENERGY EFFICIENCY AND DEMAND SIDE MANAGEMENT**

20 credits, 36 lectures, 12 Site visits.

**Course outline:** Energy use patterns in the commercial, industrial, mining, transport and domestic sectors. Energy efficiency trends. Energy efficiency management and technologies used in heating and electrical equipment as well as in buildings. Analysis of energy balances, energy audits, efficiency economics and tariff structures. Local case studies and international experience of energy efficiency. Two written reports will be required, one a scan of an industrial sub-sector and the other a group project detailing an economically optimal energy efficiency plan for a given scenario.

**Assessment:** Examination and project.

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**MEC5059Z ENERGY MODELING**

20 credits.

**Course outline:** The syllabus will explore the applications of energy modelling such as energy demand projections, price projections, energy supply planning, policy planning, environmental impact assessment, climate change mitigation assessment, and integrated resource planning. Different types of models such as simulation and optimisation models will be outlined. Linkages between energy modelling, energy statistics and scenario planning will be discussed. Examples of existing energy modelling software and modelling systems will be demonstrated. Important considerations in energy modelling, such as energy-economic relationships or technology advances, will be discussed. Students will be given information on a particular energy utility or national energy situation, and energy modelling needs and approaches will be debated. After having been exposed to most energy modelling issues, students will select a project which may involve researching a particular issue in energy modelling, or involve the modelling of a particular situation.

**Assessment:** Examination.

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**MEC5060W MASTERS DISSERTATION: SUSTAINABLE ENERGY ENGINEERING**

180 credits.

**Course outline:** In exceptional cases and on the recommendation of the supervisor, and with the approval of the Head of Department, a student registered for the Masters degree may be permitted to enter a programme of individual study on a specialised topic, WITHOUT registering for additional course work. A research proposal must be agreed upon, and the supervisor will guide the project. The programme will involve the student in 1 440 hours of work, and a written report must be submitted, which will be examined by internal and external examiners.

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**MEC5061Z MASTERS DISSERTATION: SUSTAINABLE ENERGY ENGINEERING**

120 credits.

**Course outline:** The purpose of the dissertation, which complements the course work that is a requirement of the degree, is to afford the student the opportunity to demonstrate his/her ability to conduct independent research. Although the student will work under the direction of a supervisor, the quality and content of the work must be a reflection of the ability of the candidate. The subject chosen for the dissertation will be by mutual agreement between supervisor and student and should incorporate elements of the course work while also being relevant to the general field of sustainable energy. Where practical, the area of research chosen should be appropriate to the student's country of origin.

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**MEC5062Z POWER PRODUCTION SYSTEMS**

20 credits.

**Course outline:** A summary of energy conversion technologies for power generation. Simple and combined thermal cycles. Internal and external combustion engines. Steam and gas turbines. Basics of nuclear power. Coal boilers including conventional pulverised fuel, supercritical, fluidised bed and integrated gasification. Wind, solar and hydro power. Pumped storage. Efficiency of energy conversion and transmission. Practical advantages and difficulties of each technology.

**Assessment:** Examination and project.

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**MEC5063Z AN INTRODUCTION TO FINITE ELEMENTS**

12 credits, 36 lectures.

**Course outline:** Formulation of the finite element method. Finite elements available in 1-D and 2-D applications. Approach to problem solving techniques using finite elements. Topics include stress

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analysis, heat transfer, seepage flow and fluid flow.

**Assessment:** June examination.

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### MEC5064Z FINITE ELEMENT ANALYSIS

16 credits, 36 lectures.

**Prerequisites:** MEC5063Z.

**Course outline:** Advanced topics in finite element analysis. Element formulations. Introduction to nonlinear procedures and the structure of finite element programs.

**Assessment:** November examination.

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### MEC5065Z ENGINEERING SOFTWARE DESIGN & DEVELOPMENT

12 credits, 36 lectures.

**Course outline:** The objective of this course is to prepare students form the development, implementation and management of engineering software for research and/or professional purposes. Such software is characterised by reliable, efficient and user-friendly programmes. Topics covered include algorithm development, program design and implementation (including testing, debugging, validation, verification and implementation), and project management strategies. Fortran 95 will be used to demonstrate features and usage of modern structured programming languages. A substantial project component is included.

**Assessment:** June/November examination.

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### MEC5066Z CONTINUUM MECHANICS

12 credits, 36 lectures, 12 tutorials.

**Course outline:** Introduction to tensors. Kinematics of continuous media. Balance of mass, linear and angular momentum, and energy. Stress. Constitutive theory. Linear elasticity. Ideal fluids. Newtonian fluids.

**Assessment:** June/November examination.

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### MEC5067Z NONLINEAR MATERIAL BEHAVIOUR

12 credits, 36 lectures.

**Prerequisites:** MEC5066Z, MEC5063Z.

**Course outline:** Topics in nonlinear mechanics. Behaviour of elastic-plastic solids. Elastic-plastic constitutive relations. Practical aspects of computational plasticity. Viscoplasticity and creep.

**Assessment:** June/November examination.

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### MEC5068Z TOPICS IN COMPUTATIONAL AND APPLIED MECHANICS

12 credits, 36 lectures.

**Prerequisites:** MEC5063Z, MEC5066Z.

**Course outline:** The aim of this course is to provide an opportunity for students to be exposed to topics which are of relevance to current research at CERECAM, but which are not covered by the existing courses offered in the Faculty. The choice of topics will depend on the interests of the class and on the lecturer available. Subjects from which the topics for 1999 will be chosen may include: nonlinear elasticity; visco-elasticity; inelastic material behaviour, including damage and viscoplasticity; fluid mechanics; metals processing; dynamic plasticity; fracture mechanics; nondestructive testing.

**Assessment:** November examination.

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### MEC5069Z COMPUTATIONAL FLUID DYNAMICS: A FIRST COURSE

12 credits, 36 lectures.

**Prerequisites:** MEC3033F, MEC3044S and MAM2082F.



**Course outline:** The course is primarily an introduction to the Finite Volume method for problems of heat conduction, potential and convection-diffusion type flows. The latter will be extended to 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 programmes in a computer language of his/her choice. Topics include: discretisation, interpolation, boundary conditions, solution procedures, complex geometries.

**Assessment:** Examination and Project.

### **MEC5070W** MASTERS DISSERTATION: MATERIALS ENGINEERING

180 credits.

### **MEC5071Z** MASTERS DISSERTATION: MATERIALS ENGINEERING

120 credits.

### **MEC5073Z** PHASE TRANSFORMATIONS IN MATERIALS

8 credits, 24 lectures.

**Prerequisites:** MEC3060F, MEC3067F or MEC3065F or MEC3064F or MEC3063S.

**Course outline:** Thermodynamics and kinetics of phase equilibria and phase transformations in metals, alloys and ceramic materials.

**Assessment:** Examination 70% Year Mark 30%.

### **MEC5074Z** BOUNDARY LAYER FLOWS

12 credits, 36 lectures.

**Prerequisites:** MEC3060F, MEC3067F or MEC3065F or MEC3064F or MEC3063S.

**Course outline:** The course aims to provide the student with the necessary knowledge and skills to make informed decisions when selecting the different modeling strategies to resolve boundary layer flows numerically.

**Assessment:** Examination and project.

### **MEC5075Z** NEW AND RENEWABLE ENERGY TECHNOLOGIES

20 credits.

**Course outline:** Renewable energy resources, solar radiation and wind meteorology, water and biomass resource base; solar thermal, heat transfer essentials, solar water heating, passive and active solar building design; solar thermal electric, thermodynamic essentials, engine cycles; photovoltaics; wind, fluid mechanics essentials; small hydro-electric systems; alternative liquid fuels; wave, tidal, OTEC, geothermal; fuel cells, hydrogen; storage, environmental issues.

**Assessment:** Examination.

### **MEC5076Z** MANUFACTURE AND PROPERTIES OF POLYMERS

12 credits, 36 lectures, 2 tutorials, 2 practicals, 1 site visit.

**Prerequisites:** MEC2042F.

**Course outline:** Polymer nomenclature; morphology; bonding; molecular weight, polymerization, crystallization; polymer types; rheology; manufacturing methods; applications; polymer identification; polymer modification, additives; analytical techniques; biodegradability; selection and design.

**Assessment:** Examination 70%, year mark 30%.

### **MEC5077Z** MANUFACTURE AND PROPERTIES OF COMPOSITES

12 credits, 36 lectures, 3 tutorials, 2 practicals, 1 site visit.

**Prerequisites:** MEC2042F.

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**Course outline:** History of composites; carbon, glass and aramid fibres; functions of the reinforcement and matrix, polymer-, metal- and ceramic-matrix composites; manufacture of composites; elastic properties of fibre composites; fracture and toughness, the fibre/matrix interface; geometric aspects; laminate theory and the strength of laminates; testing of composites and environmental effects; selection, modification and design of composites.

**Assessment:** Examination 3 hours 70%, year mark 30%.

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### MEC5078Z MANUFACTURE AND PROPERTIES OF CERAMICS

8 credits, 24 lectures, 2 tutorials, 2 practicals, 1 site visit.

**Prerequisites:** MEC2042F.

**Course outline:** History of ceramics; traditional ceramics; glasses and glass ceramics; advanced ceramics; chemical bonding in ceramics; physical, mechanical and chemical properties of ceramics, nucleation and growth phenomena; production and properties of engineering ceramics, refractories; fracture and reliability of ceramics; powder technologies; selection and design of ceramic components.

**Assessment:** Examination 2 hours 70%, year mark 30%.

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### MEC5079Z PROPERTIES AND MANUFACTURE OF METALLIC MATERIALS

16 credits, 48 lectures, 4 practicals.

**Prerequisites:** MEC2042F.

**Course outline:** The course is divided into four modules (12 lectures each). The principal themes for the respective modules are as follows:

- Phase transformations in metals and alloys.
- Metallurgy and properties of ferrous alloys.
- Metallurgy and properties of non-ferrous alloys.
- Introduction to metallic corrosion.

**Assessment:** Examination 3 hours 70%, year mark 30%.

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### MEC5080Z MANAGING NEW VENTURE PROJECTS

20 credits.

**Course outline:** In this course students will learn how to prepare a business plan for launching a high potential new business. Students will work in teams which will be given the opportunity to pool their skills and experience and apply them to a very practical hands-on project focused on developing a comprehensive plan for a new business.

**Assessment:** Project, presentations, case study.

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### MEC5082Z ENERGY FOR TRANSPORTATION

12 credits.

**Prerequisites:** BSc (Mech Eng) or equivalent.

**Course outline:** Vehicles have become one of the most vital components in the world economy equation. The aim of this course is to provide a partial overview of the dynamics that operate on the fuel supply side of this equation, ie the oil industry. This subject cannot be studied in isolation and the perspectives of the three other main stakeholders in the transport industry need to be also considered, ie, the motorist, the motor manufacturers and the government.

**Assessment:** Examination and projects.

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### MEC5083Z ENGINE DESIGN

16 credits.

**Prerequisites:** BSc (Mech Eng) or equivalent.

**Course outline:** The modern motor vehicle represents a sophisticated example of technology and engineering. The aim of this course is to show how a systems approach can be used to establish the basic relationships between the engine and vehicle in terms of various performance indicators and fuel consumption. The various building blocks for such an analysis were laid in the Mechanical Engineering undergraduate programme and this course represents an integration of this foundation by means of a high-level synthesis for a specific application.

**Assessment:** Examination and projects.

### **MEC5084Z ENGINE THERMODYNAMICS AND COMBUSTION**

16 credits.

**Prerequisites:** BSc (Mech Eng) or equivalent.

**Course outline:** Fuel and engine form a complementary pair. Combustion research cannot be divorced from either the engine or the fuel and it is the goal of this course to show how these two are integrated by the combustion event. The course will focus strongly on combustion and engine modelling.

**Assessment:** Examination and projects.

### **MEC5087Z ENERGY MARKETS AND GOVERNANCE**

20 credits.

**Course outline:** National and international energy markets (oil, gas, electricity), their structure, dynamics and implications for national planning. Energy governance, the role of the state and management of the energy sector: market failure; regulatory theory; monopolies; institutional reform. Energy pricing theory and methods. Demand Side Management. Environmental governance in the energy sector; key issues; mechanisms and policy.

**Assessment:** Examination.

### **MEC5088Z ENERGY, POVERTY AND DEVELOPMENT**

20 credits.

**Course outline:** Availability, consumption, and characteristics of energy use in developing areas; assessing consumption patterns and problems. Introduction to social research techniques. Relationships between energy, poverty, education, health, water access, and development. Gender perspectives on energy procurement and uses. Urban and rural energy technologies and strategies as applied to households, community facilities and small scale enterprises, (including electrification, biomass and renewable energy). Related energy efficiency and environment issues.

**Assessment:** Examination.

### **MEC5089Z ENERGY PROJECT**

20 credits.

**Course outline:** On the recommendation of the supervisor, and with the approval of the Director of the Energy Research Centre, a student registered for a Masters degree may be permitted to enter a programme of individual study on a specialised topic. A research proposal must be agreed upon, and the project will be guided by the supervisor. The programme will involve the student in 180 hours of work, and a written report must be submitted which will be examined by an internal and external examiner.

**Assessment:** Project(s).

### **MEC5090Z ENERGY AND CLIMATE CHANGE**

20 credits.

**Course outline:** Causes of climate change: greenhouse effects, carbon cycle, current status and climate variability. Future changes and impacts of climate change: emissions and concentrations, stabilisation prospects, temperature effects, ecological and socio-economic impacts. Energy

## 270 COURSES OFFERED

development and use and climate change: GHG emissions from energy supply and use, non-GHG emissions from energy supply and use. Climate change debate and Assessment: Agenda 21, UNFCCC, Kyoto Protocol, obligations and commitments of countries, IPCC reports. Energy options for mitigation of climate change: supply, building, transport, industry erosion, waste management, and human health. Energy technology transfer: transfer trends, transfer strategies. Sustainable policies and measures: domestic, international, UNFCCC and KP instruments.

**Assessment:** Examination.

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### **MEC5091Z** INTRODUCTION TO ENERGY POLICY & SUSTAINABLE ENERGY ENGINEERING

20 credits, 32 lectures, 3 visits, 24 seminars.

**Course outline:** Introduction to energy concepts and terminology. Energy resources and reserves, extraction methods and conversion techniques, including coal, gas, liquid fuels, hydro, nuclear, renewable energy and new energy technologies. An overview of the current world-wide energy situation. Energy demand and energy balances. Energy issues related to development, sustainability and conservation with environmental and economic linkages. Integrated resource planning and integrated energy planning. Introduction to policy science and theory. South African and international energy policy issues.

**Assessment:** Examination 70%, year mark 30%.

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### **MEC5092Z** MASTERS DISSERTATION: ENERGY AND DEVELOPMENT STUDIES

120 credits.

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### **MEC5093W** MASTERS DISSERTATION: ENERGY AND DEVELOPMENT STUDIES

180 credits.

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### **MEC5094Z** CLEANER FUELS AND CLEANER ENGINES

16 credits, 36 lectures over six weeks and 1 tutorial per week.

**Prerequisites:** BSc(Mech Eng) or equivalent.

**Course outline:** Air quality and emission legislation; life-cycle analysis; emission and pollution formation processes; in-cylinder & after-treatment control and electronic engine management; fuel and lubricant effects; emission measurements.

**Assessment:** Examination 50%, year mark 50%.

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### **MEC5095Z** ENGINEERING MANAGEMENT RESEARCH REPORT

60 credits.

**Prerequisites:** Registration for a postgraduate degree or diploma.

**Course outline:** In agreement with a suitable supervisor, a research topic will be selected, a research proposal agreed, research will be undertaken and a research report prepared. This will represent at least 600 hours of work.

**Assessment:** The written report will be examined, and a further oral examination may be held.

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### **MEC5096Z** ATMOSPHERIC FLIGHT MECHANICS

12 credits.

**Prerequisites:** BSc(Eng)

**Course outline:** Kinematics and dynamics of particles, particle systems and rigid bodies in three-dimensions: Vector transformations, vector derivatives in rotating frames, Newton's Laws, linear and angular impulse and momentum, the inertia tensor, Euler angles, quaternions and equations of

motion. Introduction to applied aerodynamics: Nature of subsonic, transonic and supersonic flow, shockwaves and boundary layers, laminar and turbulent flow, vortex flow, Buckingham's pi theorem and aerodynamic coefficients, Reynolds and Mach numbers, compressible flow, wind tunnel testing, the atmosphere, air speed measurement. Approximate analysis of propulsive devices: the gas turbine and its components, ramjets, rocket motors and propellers. Aircraft performance: power required and available, take-off, rate of climb, time to climb, ceiling, range, endurance, flight envelopes, excess specific power, velocity-load-factor diagrams. Static stability and trim: static stability, control power, g-capability, elevator trim position, hinge moments, stick force, stick-free stability, mass centre limits. Small perturbation stability and response of aircraft: linearized equations of motion, estimation of stability derivatives, lateral and longitudinal equations of motion, frequency response, transient response, mode roots and mode shapes.

**Assessment:** Examination 50%, year mark 50%.

**DP requirements:** Completion of assignments and tests.

**MEC6000W** PHD THESIS: MECHANICAL ENGINEERING

**MEC6002W** PHD IN ENGINEERING MANAGEMENT

**MEC6003W** PHD THESIS: SUSTAINABLE ENERGY ENGINEERING

**MEC6004W** PHD THESIS: MATERIALS ENGINEERING

**MEC6005W** PHD THESIS IN ENERGY & DEVELOPMENT STUDIES

**PHY1010W** PHYSICS 110

32 credits, 96 lectures, 24 Exercise sessions, 24 tutorials/practicals.

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

**Assessment:** Class record 25%, November examination 3 hours 50%, Laboratory work 25%.

**PHY1011W** PHYSICS 111

For ASPECT students only. Details as for PHY1010W above.

**Assessment:** Class record 25%, November examination 3 hours 50%, Laboratory work 25%.

**PHY1023H** FOUNDATIONS AND PRINCIPLES OF PHYSICS

18 credits, , 120 lectures, 24 tutorials/practicals.

**Course outline:** The first half of this course provides students with the essential tools and skills that are required for dealing successfully with physics at first-year university level. The three broad areas that are covered are (a) mathematical techniques and their relationship with physical phenomena, (b) experimental procedures and (c) communication skills, in particular report writing. The second half of the course has a similar content to PHY1031F, but at a calculus level.

**Assessment:** Class record 25%, November examination 3 hours 50%, Laboratory work 25%.

**PHY1024F** PHYSICS OF RADIATION AND MATTER

For students registered in the Engineering Foundation Programme.

18 credits, 60 lectures, 12 tutorials/practicals.

## 272 COURSES OFFERED

**Prerequisites:** PHY1023H.

**Course outline:** Similar content to PHY1032SF, but at a calculus level.

**Assessment:** Class record 25%, June examination 3 hours 50%, Laboratory work 25%.

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### PHY1031F PHYSICS OF NATURAL SYSTEMS 1

18 credits, 60 lectures, 12 tutorials/practicals.

**Course outline:** Mechanics: vectors, kinematics, dynamics, work, energy, power, conservative and non-conservative forces, friction impulse, momentum, collisions, rotation, rotational dynamics, torque, rotational inertia, rotational energy, angular momentum, static equilibrium, gravitation. Properties of matter: elasticity, elastic moduli, hydrostatics, hydrodynamics. Thermal physics: Temperature, heat, kinetic theory of gases, thermodynamics.

**Assessment:** Class record 25%, June examination 3 hours 50%, Laboratory work 25%.

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### PHY1032S PHYSICS OF NATURAL SYSTEMS 2

18 credits, 60 lectures, 12 tutorials/practicals.

**Prerequisites:** PHY1031F.

**Course outline:** Electricity and magnetism: electric charge, electric field, Gauss's law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, magnetic field, Bio-Savart law, Ampere's law, electromagnetic induction, inductance, alternating currents. Vibrations and Waves: simple harmonic motion, damped oscillations, forced oscillations, resonance, traveling waves, phase velocity, superposition, standing waves, sound waves, sound intensity, Doppler effect. Atomic physics: the electron, quantum physical phenomena, atomic structure, wave-particle duality, X-rays, elementary nuclear physics, radioactivity.

**Assessment:** Class record 25%, November examination 3 hours 50%, Laboratory work 25%.

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### PHY2006H CLASSICAL AND QUANTUM MECHANICS

24 credits, 60 lectures, 12 practicals.

**Prerequisites:** PHY1004W or PHY2009S or 60% pass in both PHY1010W and MAM1003W. First full year course in Mathematics.

**Course outline:** Classical and quantum mechanics: Review of Newton's laws. Constraints. D'Alembert principle. Lagrangian formulation of mechanics. Conservation laws. Applications. Central forces. Planetary motion. Non-inertial frames of reference. Small oscillations. Normal coordinates. The basic assumptions of quantum mechanics. Solutions of Schrodinger's equation. Properties of wave functions and operators. One-dimensional applications. Angular momentum in quantum mechanics. Three-dimensional applications. The hydrogen atom. Approximate methods.

**Assessment:** Class work 25%, November examination 3 hours 50%, Laboratory work 25%.

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### PHY2009S THE PHYSICS OF FLUIDS AND FIELDS

24 credits, 60 lectures, 12 practicals.

**Prerequisites:** A half course in mathematics, PHY1024F.

**Co-requisites:** A full course in mathematics.

**Course outline:** Liquids and Gases: Interatomic forces and potentials. Perfect and real gases, Boltzmann distribution, Maxwell velocity distribution, transport properties of gases. Thermodynamics, entropy, free energy. Latent heat and phase transitions. Ideal and real fluids. Vectors and Fields: introductory vector analysis; div, grad, curl; flux and circulation, hydrostatics, fluid dynamics, Navier-Stokes equation, drag.

**Assessment:** Class work 25%, November examination 3 hours 50%, Laboratory work 25%.

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### PHY2010S ELECTROMAGNETISM FOR ENGINEERS

16 credits, 6 practicals, 36 lectures.

**Prerequisites:** PHY1010W.

**Co-requisites:** MAM2080W.

**Course outline:** 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. Geometrical optics. Propagation in optical fibres.

**Assessment:** Class work 25%, November examination 3 hours 50%, Laboratory work 25%.

### **PHY2013H ELECTROMAGNETISM AND PROPERTIES OF MATTER**

24 credits, 60 lectures, 12 practicals.

**Prerequisites:** PHY1004W or PHY2009S or 60% pass in both PHY1010W and MAM1003W. First full year course in Mathematics.

**Course outline:** Vector calculus (div, grad, curl); Electrostatics; special techniques for potentials; electric fields in matter; magnetostatics; magnetic fields in matter; current, Ohm's law, circuits, electromagnetic induction, electrodynamics, states of matter, Kinetic theory of gases, thermodynamics, inter-atomic potentials, properties of solids and liquids.

**Assessment:** Class record 25%, November examination 3 hours 50%, Laboratory work 25%.

### **PHY3021F ADVANCED PHYSICS 1**

24 credits, 60 lectures, 12 practicals.

**Prerequisites:** PHY2006H and PHY2013H. A full second year course in mathematics or applied mathematics.

**Course outline:** ELECTROMAGNETISM: Maxwell's equations, conservation laws; electromagnetic waves; the Fresnel relations; absorption and dispersion; wave guides; gauge transformations; dipole radiation; power radiation by a point charge; special relativity; four vectors; relativistic kinematics, relativistic electrodynamics.

THERMAL PHYSICS: Ensembles and entropy; Boltzmann distribution and Helmholtz free energy; thermal radiation; chemical potential and Gibbs distribution; Fermi-Dirac and Bose-Einstein statistics, with applications to classical and quantum systems.

COMPUTATIONAL PHYSICS: Introduction to computing; numerical methods; motion in classical mechanics; problems in quantum mechanics; Monte Carlo techniques.

**Assessment:** Class work 25%, June examination 3 hours 50%, Laboratory work 25%.

### **PHY3022S ADVANCED PHYSICS 2**

24 credits, 60 lectures, 12 practicals.

**Prerequisites:** PHY2006H and PHY2013H. A full second year course in mathematics or applied mathematics.

**Course outline:** The hydrogen atom. Transitions and selection rules. Fine structure. The helium atom. The hydrogen molecular ion. The hydrogen molecule. Basic properties of nuclei. Nuclear binding energy and the semi-empirical mass formula. Bound state of the deuteron and the nuclear force. Nuclear shell model. Radioactivity and the radioactive decay series. Alpha, beta and gamma radioactivity. Interaction of nuclear radiation with matter. Radiation dosimetry. Nucleosynthesis in stars Cosmic radiation, crystal structure, lattice vibrations, electron states in solids, energy band theory, semiconductor physics and devices.

**Assessment:** Class work 25%, November examination 3 hours 50%, Laboratory work 25%.

### **STA1000F/S STATISTICS 1000**

18 credits, 60 lectures.

**Prerequisites:** MAM1004F/H or MAM1005H or MAM1006H or MAM1000W or MAM0102W or MAM1012F or a pass or concurrent registration in any of MAM1003W or STA1001F/H.

**Course outline:** Explanatory data analysis and summary statistics. Probability theory. Random variables. Probability mass and density function. Binomial, Poisson, exponential, normal and uniform distributions. Sampling distributions. Confidence intervals. Introduction to hypothesis

## 274 COURSES OFFERED

testing. Tests on means, variances and proportions. Determining sample size. Simple linear regression and measures of correlation.

**Assessment:** June/November examination 3 hours.

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### STA1001F/S/H STATISTICS 1001

18 credits, 60 lectures.

**Note:** No student will be permitted simultaneous credit for STA1001F/H and any equivalent or subsisting first year Mathematics course.

**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.

---

### STA2020F BUSINESS STATISTICS

18 credits, 48 lectures, 12 tutorials.

**Prerequisites:** (MAM1000W or MAM1002W or MAM1005S or MAM1004F/H or MAM1005H or MAM1006H or MAM1012 or STA1001F/H) plus (STA1000F/S or STA1006S).

**Course outline:** Analysis of variance (ANOVA) and experimental design; Revision and extension of simple linear regression; Multiple regression; Econometric models; Time series analysis; Non-parametric statistics; Index numbers.

**Assessment:** Class record 40%, June/November examination 3 hours 60%.

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### STA3022F RESEARCH AND SURVEY STATISTICS

18 credits, 48 lectures, 12 tutorials.

**Prerequisites:** STA2020F or STA2004F.

**Course outline:** Applied multivariate analysis; includes correspondence analysis; factor analysis; cluster analysis; discriminant analysis, other methods will also be reviewed.

**Assessment:** Class work 40%, November examination 3 hours 60%.

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### STA5081Z INTRODUCTION TO APPLIED STATISTICS

4 credits.

**Prerequisites:** Knowledge of Excel.

**Course outline:** *Data presentation:* Identifying an appropriate population; drawing a sample from the population; organising data; discrete and continuous data types; graphical presentation of data. *Descriptive statistics:* Exploratory data analysis and summary statistics. *Applied mathematics:* Simple interest; equivalence; compound interest; present value; annuities; general annuities; sinking funds; amortization.

**Assessment:** Examination.

---

### STA5082Z APPLIED STATISTICS

4 credits.

**Prerequisites:** STA5081Z.

**Course outline:** *Design of a questionnaire:* Defining the "target" population, drawing a sample from the population, organising the data into an appropriate format for further analysis.

*Presenting the results:* Summarizing the data, and interpreting the results.

*Statistical methods:* Contingency tables; (Chi Square tests); multiple regression; t-test and Anova; confidence interval equivalence.

**Assessment:** Continuous Assessment.

**DP requirements:** Class attendance and submission of all worksheets, projects and assignments.



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**STA5083Z INTRODUCTION TO STATISTICAL METHODS FOR PLANNERS**

8 credits.

**Course outline:** Scales of measurement; descriptive statistical methods; data summaries; introduction to statistical inference; tests of association; measures of correlation; simple linear regression.

**Assessment:** 2 hour computer based examination.

**DP requirements:** Class attendance and submission of all assignments.

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