



# UNIVERSITY OF CAPE TOWN

## FACULTY OF SCIENCE

### 2014

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

**Dean's & Faculty Offices:** Room 6.43, P D Hahn Building  
28 Chemistry Road  
Upper Campus

**Office Hours:** Mondays to Fridays: 08h30 - 16h30

**Fax:** (021) 650 2710  
(021) 650 4511

**Telephones:** Dean's Office (021) 650 2711  
Faculty Office (021) 650 2712/3023  
Accounts and Fees (021) 650 4076/2134  
Admissions (021) 650 2128

**Internet:** UCT's Home Page <http://www.uct.ac.za>  
Faculty Website <http://www.science.uct.ac.za>  
Faculty Office [sci-science@uct.ac.za](mailto:sci-science@uct.ac.za)  
International Academic Programmes Office [int-iapo@uct.ac.za](mailto:int-iapo@uct.ac.za)  
Information for prospective international students can be obtained at  
<http://www.uct.ac.za/about/iapo/overview/welcome/>

The Admissions Office and Student Records Office are located in the Masinge Student Administration Building, Middle Campus, and are open from 08h30 to 16h30. The Cashier's Office is located in Kramer Building, Middle Campus, and is open from 09h00 to 15h30.

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

- Book 1:** 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 and 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.

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# GUIDE TO THE USE 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 offices and staff in the Faculty with whom students may interact in the course of their studies, as well as explanatory notes on the course code system, terminology, term dates, etc.
- (b) *Degrees:* This section lists the qualifications offered by the Faculty, as well as defining the rules for each of the various degrees. These rules should be read in conjunction with the general University rules in the General Rules & 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.

The compulsory courses to be included in the curriculum of each undergraduate major offered in the Faculty are listed in this section.

The areas of study or disciplines for postgraduate studies are included in the postgraduate degrees section.

- (c) *Departments and Courses Offered:* This section contains entries for each department in the Faculty. Each lists members of staff, the research areas and units and details of the courses offered and administered by each department. The detailed course information must be read together with the curriculum and degree information as noted above in section (b).
- (d) *Schedule of Courses:* The full list of undergraduate courses offered by the Faculty is set out in this section in alpha-numeric order (i.e. based on the course code prefix) and includes lecture, practical and tutorial times together with Course entry requirements for some courses.

Another list groups courses by the semester and lecture period in which it is offered.

- (e) *Additional Information:* This section is at the back of this Handbook and includes lists of staff who are Fellows and Distinguished Teachers in the Faculty, as well as the various student prizes, class medals and scholarships awarded on academic merit and contains information on the criteria for the Dean's Merit List.

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# GENERAL INFORMATION

## Officers in the Faculty

**Dean of the Faculty of Science:**

Professor A P le Roex, BSc *Stell* BSc Hons  
PhD *Cape Town*

**Rm 6.46 P D Hahn Building**

[sci-dean@uct.ac.za](mailto:sci-dean@uct.ac.za)

**Assistant Dean:**

Associate Professor D W Gammon, PhD HDE *Cape Town*

**Rm 6.42 P D Hahn Building**

[david.gammon@uct.ac.za](mailto:david.gammon@uct.ac.za)

**Deputy Dean, Undergraduate studies:**

Professor S A Bourne, BSc Hons PhD *Cape Town*

**Rm 6.41 P D Hahn Building**

[susan.bourne@uct.ac.za](mailto:susan.bourne@uct.ac.za)

**Deputy Dean, Postgraduate studies:**

Professor M J O'Riain, BSc Hons PhD *Cape Town*

**Rm 3.20 J Day Building**

[justin.oriain@uct.ac.za](mailto:justin.oriain@uct.ac.za)

**Personal Assistant to the Dean:**

E Taladia

**Rm 6.46 P D Hahn Building**

[elhaam.taladia@uct.ac.za](mailto:elhaam.taladia@uct.ac.za)

**Faculty Manager (Academic):**

K T Wienand, MSc Adv Cert HE Management  
*Cape Town*

**Rm 6.56 P D Hahn Building**

[karen.wienand@uct.ac.za](mailto:karen.wienand@uct.ac.za)

**Deputy Faculty Manager (Academic):**

A Rooks-Smith, BA PGCE PG Dipl Educ *Cape Town*

**Rm 6.54 P D Hahn Building**

[amy.rooks@uct.ac.za](mailto:amy.rooks@uct.ac.za)

**Senior Administrative Officer, Undergraduate:**

T Mohamed, BSc BCom (Hons) *UWC*

**Rm 6.54 P D Hahn Building**

[tasneem.mohamed@uct.ac.za](mailto:tasneem.mohamed@uct.ac.za)

**Administrative Officer, Postgraduate:**

Y Hall, BSocSc *Cape Town*

**Rm 6.57 P D Hahn Building**

[yolandah.hall@uct.ac.za](mailto:yolandah.hall@uct.ac.za)

**Administrative Officer:**

S Moodley, Dipl HR Management  
*Varsity College*

**Rm 6.54 P D Hahn Building**

[shoma.moodley@uct.ac.za](mailto:shoma.moodley@uct.ac.za)

**Senior Secretaries/Receptionists:**

L Masella  
L Morgan  
C Richfield, BSocSc (Hons) *Cape Town*

**Rm 6.54 P D Hahn Building**

[leverne.masella@uct.ac.za](mailto:leverne.masella@uct.ac.za)

[lucrishia.morgan@uct.ac.za](mailto:lucrishia.morgan@uct.ac.za)

[clare.richfield@uct.ac.za](mailto:clare.richfield@uct.ac.za)

**Student Development Officer:**

B Krishna, MSocSc Psych *UKZN*

**Rm 6.53 P D Hahn Building**

[bhavani.krishna@uct.ac.za](mailto:bhavani.krishna@uct.ac.za)

**Manager: Faculty Communications,  
Development & Marketing:**

K Wilson, BA (Hons) HDE *Cape Town*

**Rm 6.51 P D Hahn Building**

[katherine.wilson@uct.ac.za](mailto:katherine.wilson@uct.ac.za)

## 2 GENERAL INFORMATION

### **Schools Liaison & Recruitment Officer:**

S Smith, BCom (Hons) *UWC*

**Rm 6.51 P D Hahn Building**

[shanaaz.smith@uct.ac.za](mailto:shanaaz.smith@uct.ac.za)

### **Faculty Manager (Finance):**

S Custers, BSc *Cape Town* BCompt BCom (Hons)  
*UNISA*

**Rm 6.47 P D Hahn Building**

[sue.custers@uct.ac.za](mailto:sue.custers@uct.ac.za)

### **Assistant Faculty Manager (Finance):**

S Champion, Nat.Dipl Fin Inf Sys *CPUT*

**Rm 6.45 P D Hahn Building**

[shaahid.champion@uct.ac.za](mailto:shaahid.champion@uct.ac.za)

### **Senior Faculty Finance Officers:**

A Hassan, Nat.Dipl Int Audit *CPUT*  
S Kriel, BCom *UCT*

**Rm 6.44 P D Hahn Building**

[aisha.hassan@uct.ac.za](mailto:aisha.hassan@uct.ac.za)  
[shuaib.kriel@uct.ac.za](mailto:shuaib.kriel@uct.ac.za)

### **Assistant Faculty Finance Officer:**

J Wyngaard, BCom (Hons) *UWC*

**Rm 6.44 P D Hahn Building**

[jody.wyngaard@uct.ac.za](mailto:jody.wyngaard@uct.ac.za)

### **Human Resource Adviser:**

N Maharaj, BCom *Natal* Dipl HR Management  
*Natal*

**Rm 6.48 P D Hahn Building**

[nalinee.maharaj@uct.ac.za](mailto:naline.maharaj@uct.ac.za)

## Senior Student Advisers in the Faculty

### **Computer Science & Statistics**

Associate Professor S Berman

Rm 317.3 Computer Science Building

[sonia.berman@uct.ac.za](mailto:sonia.berman@uct.ac.za)

### **Biology, Earth & Environmental Sciences**

Professor J J Bolton

Rm 2.14 H W Pearson Building

[john.bolton@uct.ac.za](mailto:john.bolton@uct.ac.za)

### **Chemical, Molecular & Cellular Sciences**

Associate Professor N Ravenscroft (1<sup>st</sup> semester)

Rm 6.09 P D Hahn Building

[neil.ravenscroft@uct.ac.za](mailto:neil.ravenscroft@uct.ac.za)

Dr P Meyers (2<sup>nd</sup> semester)

Rm 202 Molecular Biology Building

[paul.meyers@uct.ac.za](mailto:paul.meyers@uct.ac.za)

### **Mathematics, Physics & Astronomy**

Associate Professor C Gilmour

Rm 314 Mathematics Building

[christopher.gilmour@uct.ac.za](mailto:christopher.gilmour@uct.ac.za)

### **Extended Degree Programme (EDP)**

Associate Professor B Davidowitz

Rm 5.22 P D Hahn Building

[bette.davidowitz@uct.ac.za](mailto:bette.davidowitz@uct.ac.za)

## Student Advisers in the Faculty

### **Computer Science & Statistics**

Dr J C Nyirenda (1<sup>st</sup> semester)

Rm 6.68 P D Hahn Building

[juwa.nyirenda@uct.ac.za](mailto:juwa.nyirenda@uct.ac.za)

Ms S Silal (1<sup>st</sup> semester)

Rm 5.52 P D Hahn Building

[sheetal.silal@uct.ac.za](mailto:sheetal.silal@uct.ac.za)

Dr B Erni (2<sup>nd</sup> semester)

Rm 6.64 P D Hahn Building

[birgit.erni@uct.ac.za](mailto:birgit.erni@uct.ac.za)

Dr F Gumedze (2<sup>nd</sup> semester)

Rm 6.63 P D Hahn Building

[freedom.gumedze@uct.ac.za](mailto:freedom.gumedze@uct.ac.za)

Associate Professor M Kuttel

Rm 3.04.2 Computer Science Building  
[student-advisors@cs.uct.ac.za](mailto:student-advisors@cs.uct.ac.za)

Professor G Marsden

Rm 3.04.1 Computer Science Building  
[student-advisors@cs.uct.ac.za](mailto:student-advisors@cs.uct.ac.za)

**Biology, Earth & Environmental Sciences**

Dr P Anderson

Rm 4.03 Environmental & Geographical  
Sciences Building  
[pippin.anderson@uct.ac.za](mailto:pippin.anderson@uct.ac.za)

Dr A West

Rm 4.11 H W Pearson Building  
[adam.west@uct.ac.za](mailto:adam.west@uct.ac.za)

Dr C Reed

Rm 3.25 John Day Zoology Building  
[cecile.reed@uct.ac.za](mailto:cecile.reed@uct.ac.za)

Dr E Bordy

Room 501 Geological Sciences Building  
[emese.bordy@uct.ac.za](mailto:emese.bordy@uct.ac.za)

**Chemical, Molecular & Cellular Sciences**

Dr R Ingle

Rm 429A Molecular Biology Building  
[robert.ingle@uct.ac.za](mailto:robert.ingle@uct.ac.za)

Dr P Meyers

Rm 202 Molecular Biology Building  
[paul.meyers@uct.ac.za](mailto:paul.meyers@uct.ac.za)

Associate Professor G Smith

Rm 7.08 P D Hahn Building  
[gregory.smith@uct.ac.za](mailto:gregory.smith@uct.ac.za)

**Mathematics, Physics & Astronomy**

Dr N R C Robertson

Rm M108 Mathematics Building  
[neil.robertson@uct.ac.za](mailto:neil.robertson@uct.ac.za)

Dr S Wheaton

Rm 4T4 R W James Building  
[spencer.wheaton@uct.ac.za](mailto:spencer.wheaton@uct.ac.za)

**Extended Degree Programme (EDP)**

Mr G Stewart

Rm 3.04.3 Computer Science Building  
[gary.stewart@uct.ac.za](mailto:gary.stewart@uct.ac.za)

## 4 GENERAL INFORMATION

### Departments in the Faculty

<b>Department:</b>	<b>Location:</b>	<b>Telephone:</b>
Archaeology	Beattie Building	(021) 650 2353
Astronomy	R W James Building	(021) 650 5830
Biological Sciences (Botany)	H W Pearson Building	(021) 650 2447
Biological Sciences (Zoology)	J Day Building	(021) 650 3603
Chemistry	P D Hahn Building	(021) 650 2446
Computer Science	Computer Science Building	(021) 650 2663
Environmental & Geographical Science	Shell EGS Building	(021) 650 2874
Geological Sciences	Geological Sciences Building	(021) 650 2931
Human Biology (Faculty of Health Sciences)	Anatomy Building, Health Sciences campus	(021) 406 6235
Mathematics & Applied Mathematics	Mathematics Building	(021) 650 3191
Molecular & Cell Biology	Molecular Biology Building	(021) 650 3270
Oceanography	R W James Building	(021) 650 3277
Physics	R W James Building	(021) 650 3326
Statistical Sciences	P D Hahn Building	(021) 650 3219

### Administrative offices dealing with student matters

<b>Query:</b>	<b>Whom to approach:</b>	<b>Telephone:</b>
Academic transcripts/degree certificates, deferred examinations	Student Records Office, Student Administration Building, Middle Campus	(021) 650 3595
Admission queries, curriculum matters, registration issues	Academic Administration, Science Faculty Office, Room 6.54	(021) 650 2712/3023
Fee problems/accounts	Central Fees Office, Kramer Law Building	(021) 650 2142
Fee payments	Cashier's office, Kramer Law Building (09h30 to 15h30)	(021) 650 2207/2146
Financial assistance	Student Financial Aid Office, Kramer Law Building	(021) 650 2125
Computer laboratory queries	P D Hahn extension, Scilab D	(021) 650 4772

### Faculty Student Councils

The Science Students' Council (SSC) and the Science Postgraduate Students Council (SPGSC) form an important part of the Governance and Committee structures in the Faculty of Science (see booklet "Faculty of Science, Governance and Committees").

#### **Undergraduates:**

The Science Students' Council (SSC) is elected annually by the undergraduate students in the Faculty of Science. The SSC office is located in the PD Hahn Building, Level 4, Room 4.18 and may be contacted via email: [uct\\_ssc@uct.ac.za](mailto:uct_ssc@uct.ac.za).



**Postgraduates:**

The Science Postgraduate Students Council (SPSC) is elected by the postgraduate students in the Faculty of Science. The SPSC represents the postgraduate students on the executive committee of the University PSC. The Chairperson of the SPSC may be contacted via email: sciencepgsc@gmail.com.

The **Postgraduate Centre** is housed in the Otto Beit Building, Upper Campus. This state-of-the-art facility houses the executive committee of the Postgraduate Students Council (PSC) 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. or visited at www.pgfo.uct.ac.za.

**Term dates for 2014****1<sup>st</sup> Semester**

1 <sup>st</sup> Quarter	17 February to 04 April
Mid-term break	05 to 13 April
2 <sup>nd</sup> Quarter	14 April to 13 June
Mid-year break	14 June to 20 July

**2<sup>nd</sup> Semester**

3 <sup>rd</sup> Quarter	21 July to 29 August
Mid-term break	30 August to 07 September
4 <sup>th</sup> Quarter	08 September to 20 December

## 6 GENERAL INFORMATION

### Explanatory Notes on Course Codes

The curriculum for the bachelor degree in the Faculty of Science is based on a semester system, where a semester course is equivalent to a half-year of academic study. Courses for the bachelor degree may be completed in one semester (ie. a "half-course") or over two semesters (ie. a "full-course"). In this respect, the following codes are used:

F	1st semester half-course
S	2nd semester half-course
H	half-course taught over the whole year*
W	full-course taught over the whole year
X	special allocation
Z	any other combination

\* H courses in the EDP may be of the "intensive type" ie: half credit but full contact time over the whole year.

Summer/Winter Term courses:

P	November – December
L	June – July

<i>CEM1000W</i>	<i>Chemistry 1000</i>
CEM	designates a Chemistry course
1	designates a first-year course
000	serves to distinguish this from other first-year Chemistry courses
W	designates a full-course taught over the whole year

<i>BIO3002F</i>	<i>Marine Ecosystems</i>
BIO	designates a Biology course
3	designates a third-year course
002	serves to distinguish this from other third-year Biology courses
F	designates a first semester course.

*NOTE: second-year and third-year courses are usually regarded as 'senior courses' in terms of meeting the curriculum requirements for the bachelor degree in the Faculty of Science.*

### Essential Terminology

#### Pre-requisite courses

Most courses at UCT (except some 1<sup>st</sup> year courses) require prior knowledge either in the same discipline or in other disciplines. The courses which are required to be completed prior to taking another course are called pre-requisites. The concepts and knowledge learnt in these previous courses needs to be applied in the later course; ie a pre-requisite is the foundation upon which the later course is built. Pre-requisite rules will be applied consistently because not to do so will jeopardise your chances of success.

#### Co-requisite courses

Some courses have particular courses as co-requisites, which means that students need to register for two or more courses at the same time. Where a course has a co-requisite of another course, it implies that the courses integrate closely with each other, and it is essential to learn and apply the concepts in both courses at the same time.

**Classification of results - Refer to General Rules G25**

*DP (Duly Performed certificate) and DPR (Duly Performed certificate Refused) - Refer to General Rules GB 9*

Academic departments at UCT support continuous learning and assessment. This means that you will be required to engage with the coursework and perform consistently well from the beginning of the course. This will earn you the right to attempt the final assessment – the examination. Earning this right is called being given a DP (Duly Performed Certificate). If you have not attended lectures, practicals and tutorials, or missed a test without being excused, or do not achieve the subminimum mark (see below) for the coursework, you will be refused this Duly Performed certificate (DPR) and you will not be eligible to sit the examination. Check the DP requirements carefully in each course to make sure that you comply.

**Sub-minimum**

Many courses will require you to achieve a sub-minimum mark in your coursework and/or the final examination. This means that if you do not achieve this sub-minimum mark you will not be awarded a DP (if you fail to meet the sub-minimum in your coursework) or an F (Fail) if you do not get the sub-minimum in the final examination. Check the rules for your course in the Faculty Handbook to see whether there is a sub-minimum.

**Progression status**

At the end of every year, after the November examination period, the Faculty Examinations Committee (FEC) provides every student in the faculty with a progression status which is reflected on the student's academic transcript. The purpose of this code is to describe accurately the student's academic status in the faculty.

*One of the following descriptions will appear on the transcript:*

- Academically eligible to continue - may return the next year
- Concession (FEC) to continue - may return the next year, but with specific conditions
- Concession (FEC) to change field/specialisation/degree within Faculty - may return the next year but in a different field of study
- Status pending FEC decision - status dependent on further information and final decision
- Academically not eligible to continue - may not return the next year
- Status pending: continue if SUPP/DE exams passed - may return conditional on passing SUPP/DE
- Qualifies for award of degree/diploma - have met all the requirements for the award of degree
- Qualification depends on supp/DE results - award of degree conditional on passing SUPP/DE

**Supplementary examinations**

*Refer to this Handbook Rule FB 4.1-4.2 and General Rules G 22*

**Deferred examinations**

*Refer to General Rules G 26 & 27*

## DEGREES OFFERED IN THE FACULTY

All qualifications offered in the Faculty are HEQS-F (Higher Education Qualifications Sub-Framework) aligned but SAQA (South African Qualifications Authority) registration numbers are still awaited for some qualifications.

- |      |   |                 |
|------|---|-----------------|
| .i)  | Bachelor of Science (BSc) degree              | [SAQA ID 35954] |
| ii)  | Bachelor of Science Honours (BSc Hons) degree |                 |
| iii) | Master of Science (MSc) degree                |                 |
| iv)  | Master of Philosophy (MPhil) degree           |                 |
| v)   | Doctor of Philosophy (PhD) degree             |                 |
| vi)  | Doctor of Science (DSc) degree                | [SAQA ID 19751] |

### Rules for Degrees in the Faculty

The following rules are specific to the Faculty of Science. They must be read in conjunction with the general University rules (G and GB) for degrees and diplomas in Book 3 of this series.

### General rules for Bachelor of Science (BSc) degree

- FB1 Except by permission of Senate, all students registered in the Faculty of Science will be subject to the general rules of either the BSc degree or the BSc Extended Degree Programme, and the associated curricular rules for majors.

### Duration of the Bachelor of Science degree

- FB2.1 The curriculum for the Bachelor of Science degree shall extend over not less than three academic years of study.
- FB2.2 The curriculum which includes the Extended Degree Programme for Science (EDP) will usually extend over four academic years of study.
- FB2.3 Continuation on the three year BSc degree curriculum, or placement on the EDP, will be based on level of performance in a set of tests at the end of the first quarter, together with other information such as the NBT and NSC results, and one-on-one consultations with Student Academic Advisors.

NOTE: At the discretion of the Dean, the Faculty may admit candidates for the BSc degree who, due to special circumstances, are unable to study on a full-time basis. Students would complete the degree over an extended period of time by taking a reduced number of courses each year, but would attend normal lectures and practicals as scheduled in the University timetable. All enquiries should be directed to the Faculty Manager (Academic).

### Restriction on registration and examination

- FB3 A student shall not register for more than:
- the equivalent of four half-courses in each semester in the first academic year of study;
  - the equivalent of three half-courses in each semester in any other year of study.
- This restriction also applies to the number of courses for which a student may be examined.

#### *Policy*

Permission of Senate to waive these restrictions will only be considered under the following circumstances:

- (a) where a student registering for the first time for the first year of a BSc degree has achieved outstanding results in all NSC subjects;
- (b) where a student who has been registered for the BSc degree for at least one semester has obtained an average of 50% or more in all courses written in the most recent set of ordinary examinations and/or tests, (ie. in June or November);

Waivers to students who satisfy either of the above will depend on an assessment by a Student Adviser or Deputy Dean, on the merits of each individual case.

## Supplementary examinations

### First-year students

FB4.1 The Senate may permit a first-year student who has registered for a bachelor degree in the Faculty of Science, and who has failed the ordinary examination in one or more courses, to write supplementary examinations in a maximum of three full-year courses or the equivalent.

*Policy and guidelines:*

- (a) A supplementary examination may (not will) be awarded to a student who has obtained marks from 45% to 49% in a first-year course in any Science Faculty department.
- (b) A supplementary examination may be awarded to a student who has obtained marks from 40% to 49% in first-year courses in Mathematics, except for MAM1000W, MAM1019H, MAM1043H and MAM1044H, where the conditions in (a) above apply.
- (c) A department (other than Mathematics - see (b)) may recommend the award of a supplementary examination to a student who has obtained marks from 40% to 44% in a first-year course provided that the Head of the Department submits a written recommendation and motivation to reach the Dean before the meeting of the Faculty Examinations Committee.
- (d) Where a student is awarded supplementary examinations in more than three full-year courses or the equivalent, he/she must choose which supplementary examinations to write in terms of the restriction detailed in FB4.1 above.

### Students other than first-year students

FB4.2 The Senate may permit a student other than a first-year student to write supplementary examinations in a maximum of two full-year courses or the equivalent, only one of which may be a third-year course.

*Policy and guidelines:*

- (a) Departments will act according to guidelines (a), (b) and (c) listed under FB4.1 in respect of first-year courses.
- (b) A supplementary examination in a senior course may be awarded if the mark obtained is at least 45% and if the department concerned recommends it.
- (c) A finalist who has obtained marks from 40% to 44% in any course, which is the only credit outstanding for the award of the degree, may be awarded a supplementary examination if the department concerned recommends it.
- (d) Where a student is awarded supplementary examinations in more than two full-year courses or the equivalent, or more than one full-year third-year course or the equivalent, he/she must choose which supplementary examinations to write in terms of the restriction detailed in FB4.2 above.

## 10 RULES FOR DEGREES

FB4.3 The decision on whether or not to award a supplementary examination, in accordance with the policies outlined above, shall be taken by the Senate on the recommendation of the Head of the Department concerned and be based on the student's academic performance in the course concerned, except that the Senate may decide to award, or refuse to award, a supplementary examination in a course or courses taking account of the student's overall academic record.

### **Refusal of readmission to the Faculty and related matters**

#### **Bachelor of Science degree (excluding EDP)**

- FB5.1 Except by permission of Senate, a student who has registered for the Bachelor of Science degree, shall not be permitted to reregister in the Faculty unless he or she has completed:
- one and a half courses or the equivalent, including one and a half courses specific to a major, by the end of the first year;
  - three and a half courses or the equivalent, including all first-year courses required for a major, by the end of the second year;
  - five and a half courses or equivalent, including one and a half senior courses, by the end of the third year;
  - seven and a half courses, including three senior courses, by the end of the fourth year.
  - Students are expected to complete all the requirements of the degree by the end of the fifth year.
- FB5.2 In addition to the readmission requirements listed in FB5.1 above, the fulfilment of other specific requirements may be required by individual majors. These requirements will be communicated to students.

#### **Extended Degree Programme (EDP)**

- FB5.3 Except by permission of Senate, a student who is registered on the EDP shall not be permitted to reregister in the Faculty unless he or she has completed:
- one and a half courses or the equivalent, including one course specific to a major, by the end of the first year;
  - three full-year courses or the equivalent, including two and a half courses specific to a major, by the end of the second year;
  - five full-year courses or the equivalent, of which at least one shall be a senior course, by the end of the third year;
  - seven full-year courses, of which at least two and a half shall be senior courses, by the end of the fourth year.

#### **General**

- FB5.4 Except by permission of Senate, where the academic circumstances of a student do not permit the application of Rules FB5.1-FB5.3, a student shall be required to complete the equivalent of two full-year courses per year of study.
- FB5.5 In special cases, or in the case of undergraduates transferring from other faculties or other universities, the Senate may impose probationary academic requirements which must be fulfilled before the student shall be permitted to renew his or her registration in the Faculty in the following year.
- FB5.6 A student who fails to complete the University examination in a course after two years of study may, at the discretion of Senate, be excluded from further attendance of such a course.

- FB5.7 Except by permission of Senate, a student who has been refused permission to reregister in another faculty may not register in the Faculty of Science.
- FB5.8 Re-registration in the Faculty does not imply a right to register for senior courses in subjects for which the student has completed prerequisite courses.

## Transfer from other faculties into the Faculty of Science

- FB6 Except by permission of Senate, a student who, after a year or more in another faculty, wishes to register in the Faculty of Science, shall, as a minimum:
- (a) satisfy the normal school-leaving subject entry requirements for admission to the BSc degree, and
  - (b) have complied with the provisions of Rule FB5.1-FB5.3 as appropriate, as applicable *mutatis mutandis*.

## Curricula rules for the Bachelor of Science (BSc) degree

All bachelor degree curricula in the Faculty of Science include courses carefully selected to provide adequate foundation for and depth in the major disciplines, as well as providing generic skills to function as a graduate. All curricula therefore require students to achieve skills in numeracy, computer literacy, problem solving and communication in the context of their majors.

Students must choose one or more majors, with curricula including compulsory courses as outlined under rules FB7.6 and FB7.7 below. The general rules governing BSc curricula are rules FB7.1 to FB7.5 which stipulate the minimum number of courses required, and the range of choices possible.

All curricula can lead to postgraduate study.

### Total number of courses

- FB7.1 The curriculum shall include the equivalent of at least nine full-year courses of which at least six full-year courses must be Science courses. A maximum of three full-year courses or the equivalent may be counted from other faculties.

### Number of senior courses

- FB7.2 The curriculum shall include the equivalent of at least four full-year senior courses or the equivalent, of which at least three shall be Science courses.

### Mathematics

- FB7.3 The curriculum shall include at least a half Science course in Mathematics (18 HEQS-F credits, level 5) plus a half Science course in Statistics (18 HEQS-F credits, level 5), or a full Science course in Mathematics (36 HEQS-F credits, level 5).

### Elective courses

- FB7.4 Any course in the Faculty of Science may be taken as an elective. Courses from other Faculties may also be taken as electives, but subject to the following constraints and approval by a Student Adviser or Deputy Dean:

- Only courses with an HEQS-F credit value of 18 or more will be counted (a first year half course in the Science Faculty has an HEQS-F credit value of 18).
- If the equivalent of two or less full Science courses are replaced by courses from another Faculty, any courses not specifically excluded by Science Faculty rules can be chosen (Refer to “Non-Science electives in the Bachelor of Science (BSc) degree” at the back of this book).

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- If more than two full year Science courses are replaced with electives from another Faculty, then the further electives must form part of a hierarchical sequence linked to those already completed.
- Courses taught by the Faculty of Science for other Faculties are not available for students registered in Science. However, students transferring into Science from other Faculties may be able to count such courses towards their Science curriculum, with the credit weighting, equivalence and conditions established by the Departments concerned.

NOTE: Refer to “Non-Science electives in the Bachelor of Science (BSc) degree” at the back of this book for details on non-Science courses that do or do not carry credit in the Science curriculum.

FB7.5 In order to satisfy the requirement of competencies including numeracy, computer literacy, problem solving and communication or as a measure of integrated assessment, a Student Adviser may add one or more compulsory courses to a curriculum.

### Major(s)

FB7.6 The curriculum shall include at least one major from the following list:

Applied Biology	Environmental & Geographical Science
Applied Mathematics	Genetics
Archaeology	Geology
Astrophysics	Human Physiology
Biochemistry	Marine Biology
Business Computing*	Mathematical Statistics
Chemistry	Mathematics
Computer Science	Microbiology**
Computer Engineering*	Ocean & Atmosphere Science
Computer Games Development*	Physics
Ecology & Evolution	

\* These majors may only be taken in conjunction with a major in Computer Science.

\*\* Not available to students entering first year post-2012.

*NOTE: Acceptance into the Science Faculty does not guarantee acceptance into your chosen major. Formal acceptance for specific majors only takes place at the start of the second year on registration for the second year level courses. A number of majors (currently Biochemistry, Genetics, Geology and Human Physiology) have limits on the number of students accepted into second year level courses. Selection criteria, based on academic performance in first year courses, are outlined to students during the first year of study. Students will be advised in their first year to take courses which could lead to several majors. Students are encouraged to consult timeously with the relevant Department or Student Adviser regarding possible restrictions.*

### NQF credit requirements for the Bachelor of Science (BSc) degree

FB7.7 All courses have been assigned a credit value and level, according to the Higher Education Qualifications Sub-Framework (NQF).

The standard BSc degree requires:

- (a) two majors\*
- (b) a total of 420 NQF credits (nine full-year courses). A minimum of 396 NQF credits will be accepted where the second major or suite of hierarchical courses includes at least one senior full course from another Faculty
- (c) a minimum of 276 NQF credits from Science courses (the equivalent of six full-year courses)
- (d) a minimum of 120 NQF credits at level 7



*\*NOTE: A curriculum leading to only one major but including at least 120 NQF credits at level 7 will be acceptable.*

Read in conjunction with rule FB7.1-FB7.6.

FB7.8 A third-year half course may be counted toward more than one major. However, the curriculum must contain at least two distinct third-year semester courses recognised by the Faculty for each major.

**Compulsory courses to be completed for each Science major:**

NOTE 1: The compulsory courses listed below are the minimum which a student must complete for the major, in addition to those listed in FB7.3. Courses deemed by the Faculty as equivalent can be substituted as appropriate, for example:

MAM1005H+MAM1006H is deemed equivalent to MAM1000W;

CEM1009H+CEM1010H is deemed equivalent to CEM1000W, etc.

NOTE 2: All courses taught in other Faculties that are required/compulsory for a major in the Science Faculty will be counted as Science courses for the purpose of rules FB7.1 and FB7.2. For example, the specific EEE courses listed as compulsory for the major in Computer Engineering, the specific HUB courses listed as compulsory for the major in Human Physiology, the specific INF courses listed as compulsory for the major in Business Computing.

<b>Major in APPLIED BIOLOGY (BIO01)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F	5	18
	BIO1004S	5	18
	CEM1000W	5	36
	MAM1004F+STA1007S (or MAM1000W)	5	18+18 (or 36)
		5	
Year 2	BIO2010F	6	24
	Two of BIO2011S, BIO2012S, BIO2013F/S	6	24+24
Year 3	BIO3013F	7	36
	BIO3014S	7	36
			<b>Total 252</b>

<b>Major in APPLIED MATHEMATICS (MAM01)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	MAM1000W	5	36
	MAM1043H	5	18
	MAM1044H	5	18
Year 2	MAM2000W	6	48
	MAM2046W	6	48
Year 3	MAM3040W	7	72
			<b>Total 240</b>

<b>Major in ARCHAEOLOGY (AGE01)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	GEO1009F (or EGS1004S)	5	18
	AGE1002S	5	18
	MAM1004F+STA1000S (or MAM1000W)	5	18+18 (or 36)
		5	
Year 2	AGE2011S	6	24
	AGE2012F	6	24

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Year 3	AGE3013H	7	36
	At least one of AGE3011F and AGE3012S	7	36(or 72)

**Total 192 (or 228)**

<b>Major in ASTROPHYSICS (AST02)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	MAM1000W	5	36
	PHY1004W	5	36
	AST1000F highly recommended	5	18
Year 2	AST2002H	6	24
	AST2003H	6	24
	MAM2000W (or MAM2004H+MAM2047H)	6	(or 24+24)
	PHY2014F	6	24
	PHY2015S	6	24
Year 3	AST3002F	7	36
	AST3003S	7	36

**Total 288**

<b>Major in BIOCHEMISTRY (MCB01)</b>			
<i>(This major has limits on the number of students accepted into second year level courses; courses marked with an asterisk (*) will not be offered in 2014.</i>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F and BIO1004S	5	18
	CEM1000W	5	36
	MAM1004F (or MAM1000W)	5	18
	STA1007S	5	(or 36)
	(or STA1000F/S)	5	18
Year 2	<i>MCB2014F*</i>	6	24*
	<i>MCB2015S*</i>	6	24*
	<i>OR</i>		
	MCB2020F	6	24
	MCB2021F	6	24
MCB2022S	6	24	
Year 3	MCB3020F	7	36
	MCB3024S	7	36
	MCB3012Z	7	0

**Total 234 (or 252)**

<b>Major in BUSINESS COMPUTING (CSC02)</b>			
<b>(Must be taken concurrently with a Computer Science major)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	CSC1015F	5	18
	CSC1016S	5	18
	MAM1000W	5	36
Year 2	INF2009F+INF2006F	6	24
	INF2011S	6	18
Year 3	INF3011F	7	18
	INF3012S	7	18
	INF3014F	7	18

**Total 168**

<b>Major in CHEMISTRY (CEM01)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	CEM1000W	5	36
	MAM1000W	5	36
	PHY1031F	5	18
	PHY1032S	5	18
Year 2	CEM2007F	6	24
	CEM2008S	6	24
Year 3	CEM3005W	7	72

**Total 192**

<b>Major in COMPUTER ENGINEERING (CSC03)</b> <b>(Must be taken concurrently with a Computer Science major)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	CSC1015F	5	18
	CSC1016S	5	18
	MAM1000W	5	36
Year 2	EEE2040F	6	24
	EEE2026S	6	20
Year 3	EEE3078W	7	44

**Total 160**

<b>Major in COMPUTER GAMES DEVELOPMENT (CSC07)</b> <b>(Must be taken concurrently with a Computer Science major)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	CSC1015F	5	18
	CSC1016S	5	18
	MAM1000W	5	36
Year 2	CSC2003S	6	24
	INF2009F+INF2006F	6	24
Year 3	CSC3020H	7	36
	CSC3022H	7	36

**Total 192**

<b>Major in COMPUTER SCIENCE (CSC05)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	CSC1015F or CSC1018F	5	18
	CSC1016S	5	18
	MAM1000W	5	36
Year 2	CSC2001F	6	24
	CSC2002S	6	24
	INF2009F+INF2006F	6	24
Year 3	CSC3002F	7	36
	CSC3003S	7	36

**Total 216**

<b>Major in ECOLOGY &amp; EVOLUTION (BI004)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F	5	18
	BIO1004S	5	18
	CEM1000W	5	36
	MAM1004F+STA1007S (or MAM1000W)	5	18+18 (or 36)
		5	
Year 2	BIO2010F	6	24
	Two of BIO2011S, BIO2012S, BIO2013F/S	6	24+24

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Year 3	BIO3015F	7	36
	BIO3016S	7	36

**Total 252**

<b>Major in ENVIRONMENTAL &amp; GEOGRAPHICAL SCIENCE (EGS02)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	EGS1003S	5	18
	GEO1009F (or EGS1004S)	5	18
	MAM1004F (or MAM1000W)	5	18 (or 36)
	STA1007S or STA1000S	5	18
Year 2	EGS2013F	6	24
	EGS2014S	6	24
Year 3	Two of EGS3012S, EGS3020F, EGS3021F, EGS3022S	7	36+36

**Total 192 (or 210)**

<b>Major in GENETICS (MCB04)</b>			
(This major has limits on the number of students accepted into second year level courses; <i>courses marked with an asterisk (*) will not be offered from 2014.</i> )			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F	5	18
	BIO1004S	5	18
	CEM1000W	5	36
	MAM1004F (or MAM1000W)	5	18 (or 36)
	STA1007S (or STA1000F/S)	5	18
Year 2	MCB2018F*	6	24*
	MCB2019S*	6	24*
	OR		
	MCB2020F	6	24
	MCB2021F	6	24
Year 3	MCB2023S	6	24
	MCB3019F	7	36
	MCB3023S	7	36
	MCB3012Z	7	0

**Total 252 (or 270)**

<b>Major in GEOLOGY (GEO02)</b>			
(This major has limits on the number of students accepted into second year level courses)			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	GEO1009F (or EGS1004S)	5	18
	GEO1006S	5	18
	CEM1000W	5	36
	MAM1004F+STA1000S (or MAM1000W)	5	18+18 (or 36)
	PHY1031F	5	18
Year 2	GEO2001F	6	24
	GEO2004S	6	24
	GEO2005X*	6	

Year 3	GEO3005F	7	36
	GEO3001S	7	36
	GEO2005X*	6	24

\*field work half-course to be taken over second and third years of study

**Total 270**

<b>Major in HUMAN PHYSIOLOGY (HUB17)</b> (This major has limits on the number of students accepted into second year level courses)			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F	5	18
	BIO1004S	5	18
	CEM1000W	5	36
	MAM1004F+STA1007S (or MAM1000W)	5	18+18 (or 36)
	1000-level Physics highly recommended	5	
Year 2	HUB2019F	6	24
	HUB2021S	6	24
	One full senior Science course	6	48
Year 3	HUB3006F	7	36
	HUB3007S	7	36

**Total 276**

<b>Major in MARINE BIOLOGY (BIO05)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F	5	18
	BIO1004S	5	18
	CEM1000W	5	36
	MAM1004F	5	18
	STA1007S	5	18
Year 2	BIO2013F/S	6	24
	BIO2010F highly recommended	6	24
	SEA2004F	6	24
Year 3	BIO3002F/S	7	36
	BIO3017S	7	36

**Total 228 (or 252)**

<b>Major in MATHEMATICAL STATISTICS (STA02)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	MAM1000W	5	36
	STA1006S	5	18
Year 2	STA2004F	6	24
	STA2005S	6	24
Year 3	STA3041F	7	36
	STA3043S	7	36

**Total 174**

<b>Major in MATHEMATICS (MAM02)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	MAM1000W	5	36
	MAM1019H	5	18
Year 2	MAM2000W	6	48
Year 3	MAM3000W	7	72

**Total 174**

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<b>Major in MICROBIOLOGY (MCB05)</b>			
(This major is not available to students entering Year 1 post-2012. Courses marked with an asterisk will not be offered from 2014).			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	BIO1000F	5	18
	CEM1000W	5	36
	MAM1004F (or	5	18
	MAM1000W)	5	(or 36)
	STA1007S (or	5	18
	STA1000F/S)		
Year 2	MCB2016F*	6	24
	MCB2017S*	6	24
Year 3	MCB3021F	7	36
	MCB3022S or MCB3024S	7	36
	MCB3012Z	7	0
<b>Total 210 (or 228)</b>			

<b>Major in OCEAN &amp; ATMOSPHERE SCIENCE (SEA03)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	GEO1009F	5	18
	MAM1004F	5	
	+STA1007S/1000S (or	5	18+18
	MAM1000W)	5	(or 36)
	PHY1031F or equivalent	5	18
Year 2	SEA2004F	6	24
	SEA2005S	6	24
Year 3	SEA3004F	7	36
	EGS3012S	7	36
<b>Total 192</b>			

<b>Major in PHYSICS (PHY01)</b>			
		<b>HEQS-F course level</b>	<b>NQF credits</b>
Year 1	MAM1000W	5	36
	MAM1043H+MAM1044H		
	highly recommended	5	
	PHY1004W	5	36
Year 2	MAM2000W (or	6	48
	MAM2047H+MAM2004H)	6	(or 24+24)
	PHY2014F	6	24
	PHY2015S	6	24
Year 3	PHY3021F	7	36
	PHY3022S	7	36
<b>Total 240</b>			

*NOTE: The Faculty of Science reserves the right to change the details of the curricula for all majors and reserves the right to change or add to majors or to discontinue any major offered in the Faculty of Science, depending on circumstances and demand.*

## Distinction

The Bachelor of Science (BSc) degree may be awarded with distinction, and with distinction in one or more majors. See Rules FB8.1 and FB8.2 for distinctions in specialisations.

### FB8.1 Rules for distinction in a major

- (a) In order to obtain a distinction in a major, a student will be required to obtain first class passes in the courses listed below, except as specified in (b) and (c):

Applied Biology:	BIO2010F; any one of BIO2011S, BIO2012S, BIO2013F/S, plus BIO3013F, BIO3014S
Applied Mathematics:	MAM2046W (or two of MAM2047H, MAM2048H and MAM2043S) and MAM3040W
Archaeology:	Four senior half-courses in Archaeology
Astrophysics:	AST2002H, AST2003H, AST3002F, AST3003S
Biochemistry:	MCB2014F, MCB2015S, MCB3020F, MCB3024S
Business Computing:	INF3011F, INF3012S, INF3014F
Ecology & Evolution:	BIO2010F; any one of BIO2011S, BIO2012S, BIO2013F/S, plus BIO3015F, BIO3016S
Chemistry:	CEM2007F, CEM2008S, CEM3005W
Computer Engineering:	EEE2040F, EEE2026S, EEE3078W
Computer Games Development:	CSC2003S, CSC3020H and CSC3022H
Computer Science:	CSC2001F, CSC2002S, CSC3002F, CSC3003S
Environmental & Geographical Science:	EGS2013F and EGS2014S; any two of EGS3012S, EGS3020F, EGS3021F, EGS3022S
Genetics:	MCB2018F, MCB2019S, MCB3019F, MCB3023S
Geology:	GEO2001F, GEO2004S, GEO3005F, GEO3001S
Human Physiology:	HUB2019F, HUB2021S, HUB3006F, HUB3007S
Marine Biology:	SEA2004F, BIO2013F/S, BIO3002F, BIO3017S
Mathematics:	MAM2000W, MAM3000W
Mathematical Statistics:	STA2004F, STA2005S, STA3041F, STA3043S
Microbiology:	MCB2016F, MCB2017S, MCB3021F, MCB3022S or MCB3024S
Ocean & Atmosphere Science:	SEA2004F, SEA2005S, SEA3004F, EGS3012S
Physics:	PHY2014F, PHY2015S, PHY3021F, PHY3022S

- (b) If a student obtains a first and an upper second class in two half-courses at second-year level listed in (a) above, the marks obtained in these half-courses shall be averaged. If this average is 75% or more the student will be regarded, for this purpose only, as having obtained first class passes in both these half-courses. The same applies at the third-year level.
- (c) In special cases the Board of the Faculty may replace a first class in one of the courses listed above by a first class pass in a cognate course (which has not been used for distinction in that cognate subject).

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### FB8.2 Rules for distinction in the BSc degree as a whole

To obtain a distinction in the degree as a whole, a student must

- (a) obtain a distinction in at least one major (rule FB8.1); and
- (b) obtain first class passes in at least six courses (or the equivalent in half-courses), including at least four senior courses or obtain an aggregate of at least 75% for each of four first-year courses, three second-year courses and two third-year courses obtained in a minimum period. (The minimum period will usually be three years).

In applying the rules above, only passes at the first attempt are taken into account, i.e. ordinary examinations in June or December and/or deferred examinations will be taken into account, but not any supplementary examinations.

### **Curriculum rules for SB006, SB012, SB013 and SB014 (Degree Programmes) (for students who registered for the first time before 2010)**

Please refer to the Faculty of Science Student Handbook of 2012 for the rules and curriculum requirements which relate to the Bachelor of Science Programmes, which are no longer offered.

### **Curriculum rules for the General Entry Programme for Science (GEPS)**

This programme is no longer offered. The curriculum rules for GEPS are to be found in the Faculty of Science Student Handbook of 2012.



## Rules for the degree of Bachelor of Science Honours (BSc Hons)

(To be read with General Rules on Honours Degrees (G and GH) in Book 3 of this series).

### Admission

- FH1 A person shall not be admitted as a candidate for the degree unless he or she
- is a graduate of the Faculty of Science who has been awarded a bachelors degree in the discipline in which he or she proposes to proceed to Honours, or has subsequently met the conditions which would have enabled him or her to be awarded the degree in the Faculty with that subject as a discipline; or
  - is a graduate of any other faculty in the University who has completed courses and fulfilled conditions accepted by Senate as equivalent to those required under (a) above; or
  - is a graduate of any other university recognised by Senate for such purposes who has completed courses and has fulfilled conditions accepted by Senate as equivalent to those required under (a) above.

### Duration

FH2.1 Subject to the provisions of rule GH3 the BSc Hons is offered over a period of not less than one academic year. Normally, candidates are required to complete the programme within one academic year.

FH2.2 In exceptional circumstances, where an application for the BSc Hons degree does not have an adequate undergraduate academic background, he/she may, with permission of the Head of Department, register as an occasional student to complete preparatory courses. On satisfactory completion of such courses, he/she may be permitted to enrol on the Honours course.

*NOTE: Students following rule FH2.2 are required to apply for admission to the Honours programme for the following year.*

FH2.3 In exceptional circumstances, the Senate may admit a suitably qualified student as a part-time candidate for the Honours degree. Any such candidate shall be required to complete the programme within two academic years.

### Subjects

Qualification	Degree and Plan Code	Specialisations
BSc Hons	SH001MAM01	Applied Mathematics
BSc Hons	SH001AGE01	Archaeology
BSc Hons	SH001AGE02	Archaeology & Environmental Science
BSc Hons	SH001AST03	Astrophysics & Space Science
BSc Hons	SH001SEA02	Atmospheric Science
BSc Hons	SH001BIO07	Biological Sciences
BSc Hons	SH001CEM01	Chemistry
BSc Hons	SH001CSC05	Computer Science
BSc Hons	SH001EGS02	Environmental & Geographical Science
BSc Hons	SH001GEO01	Geochemistry
BSc Hons	SH001GEO02	Geology
BSc Hons	SH001CSC05	Information Technology
BSc Hons	SH001BIO05	Marine Biology
BSc Hons	SH001STA02	Mathematical Statistics
BSc Hons	SH001MAM02	Mathematics
BSc Hons	SH001MAM04	Mathematics of Computer Science
BSc Hons	SH001MCB02	Molecular & Cell Biology

## 22 RULES FOR DEGREES

BSc Hons	SH001SEA03	Ocean & Atmosphere Science
BSc Hons	SH001PHY01	Physics
BSc Hons	SH001BUS01	Statistical Sciences for Actuaries

### Restriction on registration

FH4 A student may not take any course(s) other than those prescribed by the Honours programme for which he or she is registered.

### Award of the degree

- FH5 The degree of BSc Hons may be conferred
- after the successful completion of a programme of formal training and supervised research, the latter comprising a minimum of 30 NQF credits out of a total of 160 credits; and
  - subject to the research project being passed with a minimum of 50%.

## Rules for the degree of Master of Philosophy/Science

(To be read with General Rules on Master Degrees (G and GM) in Book 3 of this series).

### Master of Philosophy (MPhil)

The degree will normally be awarded for work on inter-faculty topics or where a student holds an undergraduate or honours degree other than in Science.

#### Admission

- FM1 A person shall not be admitted as a candidate for the degree unless he or she
- is the holder of an honours degree or four year equivalent of the University or of any other university recognised by Senate for the purpose; or
  - is a graduate of the University or of any other university recognised by Senate for the purpose who has shown by examination or publication or a record of appropriate training that he or she has reached the current level in the subject or discipline equivalent to an honours degree; or
  - has in any other manner attained a level of competence which in the opinion of Senate is adequate for the purpose of admission to the degree.

### Master of Science (MSc)

#### Admission

- FM2 A person shall not be admitted as a candidate for the degree unless he or she is
- an honours graduate in the Faculty of Science, or a graduate of another faculty or another university who holds a degree recognized by the Senate as being equivalent to an honours degree in the Faculty of Science; or
  - a graduate of the University, or of any other institution recognised by the Senate for the purpose, who has shown by examination or publication or a record of appropriate training, that he or she has reached a level in the subject or cognate subject equivalent to an honours degree in Science.

#### *Guidelines for applicants*

Prospective candidates should contact a member of the academic staff under whose supervision they would like to pursue a dissertation. Alternatively applicants could approach the Head of Department that best suits their research interests and request contact with prospective supervisors. Only upon acceptance by a prospective supervisor should the candidate then submit their application to the Head of the Department for approval. The Dean (through the Head) is responsible for the final

acceptance of the candidate, and appointment or approval of the supervisor(s). The candidate will then be required to complete a memorandum of understanding, between them and their supervisor(s) for approval by the Dean (through the Head). Candidates may be required, after consultation with the prospective supervisor(s), to draw up a project proposal. This may then be inspected by a departmental board or panel appointed by the Head, before the candidate may proceed with their research.

### Subjects

FM3 The degree may be conferred in any one of the following specialisations:

Qualification	Degree and Plan Code	Specialisations
MSc/MPhil	SM004/5 SEA01	Applied Marine Science
MSc/MPhil	SM001/2 MAM01	Applied Mathematics
MSc/MPhil	SM001/2 AGE02	Archaeology
MSc/MPhil	SM001/2 AST01	Astronomy
MSc/MPhil	SM004/5 AST03	Astrophysics & Space Science
MSc/MPhil	SM001/2 BIO07	Biological Sciences
MSc/MPhil	SM001/2 CEM01	Chemistry
MSc/MPhil	SM004/5 EGS06	Climate Change & Sustainable Development
MSc/MPhil	SM001/2/4/5 CSC05	Computer Science
MSc/MPhil	SM001/2/4/5 BIO09	Conservation Biology
MSc/MPhil	SM001/2/4/5 EGS02	Environmental & Geographical Science
MPhil	SM005 EGS05	Environment, Society & Sustainability
MSc/MPhil	SM001/2 GEO01	Geochemistry
MSc/MPhil	SM001/2 GEO02	Geology
MSc/MPhil	SM004/5 CSC06	Information Technology
MSc/MPhil	SM001/2 STA02	Mathematical Statistics
MSc/MPhil	SM001/2 MAM02	Mathematics
MSc/MPhil	SM001/2 MCB02	Molecular & Cell Biology
MSc/MPhil	SM001/2 SEA03	Ocean & Atmosphere Science
MSc/MPhil	SM004/5 SEA06	Ocean & Climate Dynamics
MSc/MPhil	SM001/2 STA03	Operational Research
MSc/MPhil	SM001/2 SEA05	Physical Oceanography
MSc/MPhil	SM001/2 PHY01	Physics
MSc/MPhil	SM004/5 STA04	Statistical Sciences
MSc/MPhil	SM001/2 PHY02	Theoretical Physics
MSc/MPhil	SM001/2 CEM02	Tertiary Chemistry Education
MSc/MPhil	SM001/2 PHY03	Tertiary Physics Education

NOTE: SM001/SM002 refers to MSc/MPhil by full dissertation

SM004/SM005 refers to MSc/MPhil by coursework and minor dissertation

### Award of the degree

FM4.1 The degree of MSc/MPhil may be conferred

- (a) after acceptance by Faculty of a dissertation constituting a detailed report on a research project performed under the guidance of an approved supervisor (Master's by dissertation only); or
- (b) after a programme of advanced formal training and supervised research, for which a minor dissertation would be a partial requirement (Master's by coursework and minor dissertation).

FM4.2 Supplementary examinations are not awarded to candidates for the degree of Master.

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FM4.3 The degree may be awarded with distinction. In the case of a Master's by coursework and dissertation, a distinction must be obtained in both components.

### Registration and candidacy

FM5 Subject to the provisions of Rule FM7, a candidate for the degree shall register for not less than one academic year. Except by permission of Senate, full-time students are required to complete the requirements for the degree within two years. In exercising its discretion, Senate may take into account the nature of the research project undertaken.

#### *Guidelines for candidates*

After registration the candidate is expected to consult regularly with the supervisor(s). Prior to re-registration, both the candidate and the supervisor(s) are expected to present brief written progress reports to the Head of Department. These may be considered before the Head recommends re-registration for the degree. In appropriate cases, the supervisor(s) and Head may propose to Faculty that the candidate's registration be converted to a PhD. This should take place during the second year of MSc registration.

### The dissertation

FM6.1 The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research project and an appropriate acquaintance with the relevant literature. It shall be clearly presented and conform to the standards laid down from time to time by the department and the Faculty (refer also to Faculty Postgraduate Information Handbook).

FM6.2 (a) The dissertation shall be accompanied by a written undertaking by the candidate, empowering the University to reproduce for the purpose of research the whole or any part of the dissertation.  
(b) A publication may not, without the prior permission of the Senate, contain a statement that the published material was, or is to be, submitted in fulfilment or part fulfilment of a Master's degree.

FM6.3 A candidate required to submit a dissertation shall  
(a) inform the Head of Department in writing of his or her intention to submit the dissertation for examination within two weeks of the intended submission date.  
(b) submit two hard copies in temporary binding and a CD containing a PDF version, to the Dean by 17 February for graduation in June or 15 August for graduation in December. A further one unbound copy plus an electronic copy on a CD must be submitted once all necessary corrections and revisions to the dissertation have been made.

*NOTE: (1) The letter of intention to submit should include the name of the supervisor(s) and the title of the dissertation. (2) Depending on the date of submission, certain fee rebates may apply. See Book 12, Student Fees, for details.*

#### *Guidelines for candidates*

The dissertation will usually consist of a detailed report on the conduct of, and analysis of the results of, a research project performed under the close guidance of a suitably qualified supervisor(s). It is not essential for the Master's degree that the dissertation constitute a distinct contribution to knowledge in the subject, nor that the research project(s) undertaken necessarily be original. The degree is usually regarded as a training course to equip the candidate with the skills necessary either for employment in a given field, or for further, independent research for the degree of PhD in the same or related subject area. The course of training provided, and the research project(s) undertaken, will usually be less rigorous, and require less independent thought, than would study for a PhD.

### **Length of Master's dissertation**

A Master's dissertation, submitted in fulfilment of the degree, should not exceed 50 000 words (appendices excluded). Any request to deviate from these limits must be discussed with the supervisor and forwarded with the supervisor's comments to the Dean for consideration and possible approval. For further details, refer to the "Master's and PhD student's handbook", section 12, *Submission of a dissertation/thesis*.

A candidate who contemplates including published papers in his/her dissertation must accept that approval to do so is not automatic. For further information, refer to the *Guidelines for the inclusion of publications in the PhD thesis*, available from the Faculty Office. The rules for publishing papers in a PhD thesis will also apply to all Master's dissertations.

### **Part-time programme**

FM7 On the recommendation of the Head of Department, the Senate may permit a candidate who is unable to complete the programme within the minimum period, to complete the programme part time over a period of at least two years or more.  
*NOTE: No reduction in fees is made for part-time Master's degree students.*

### **Recognition of attendance at another institution**

FM8 The Senate may accept, in lieu of, part or all of the required periods of attendance, periods of attendance at other approved laboratories or institutions with facilities for the purpose of the proposed study, provided that supervision of the candidate by an approved officer of the University is assured.

## **Rules for the degree of Doctor of Philosophy (PhD)**

(Rules for the PhD degree may be found in Book 3, General Rules and Policies.)

### **Admission**

The entrance requirement to the PhD is a Master's degree or equivalent. Prospective candidates wishing to register for a PhD should have a discussion with a prospective supervisor and Head of Department in the appropriate field of study prior to applying formally to the University. It is sometimes possible to upgrade to a PhD after completing the first year of Master's research.

### **The thesis**

Where a candidate intends to submit his or her thesis for examination in the hope of the award of the degree at either the June or December graduation ceremonies, he or she must inform the Doctoral Degrees Board Office in writing of his or her intention to do so by not later than 5 January or 21 June respectively; the final dates for receipt of theses by the Doctoral Degrees Board Office are 17 February or 15 August. The University does not, however, undertake to reach a decision on the award of the degree by any specific date.

### **Length of the PhD thesis**

The Senate has approved a recommendation from the Doctoral Degrees Board that a doctoral thesis should not exceed 80 000 words (rule GP6.8; this excludes appendices and illustrations). Any request to deviate from these limits must be discussed with the supervisor and forwarded with the supervisor's comments via the Dean to the Doctoral Degrees Board for approval. For further details, refer to the "Master's and PhD student's handbook", section 12, *Submission of a dissertation/thesis*.

A candidate who contemplates including published papers in his/her thesis must accept that approval to do so is not automatic. For further information, refer to the *Guidelines for the inclusion of publications in the PhD thesis*, available from the Doctoral Degrees Board or Faculty Office.

## Rules for the degree of Doctor of Science

- FD1 The degree of Doctor of Science is a senior degree, and is awarded for substantial and original contributions to knowledge in a field of scientific endeavour. Such contribution will normally be the result of work carried out and published over a period of years, and will be such as to have established the candidate's position as a leading authority in the field(s) in which he or she has worked. Candidates will ordinarily be senior scientists with a PhD, post-doctoral experience, and a track record of at least ten years as a leading researcher.
- FD2 A Candidate for the degree must be a graduate of:  
 (a) the University (only in exceptional cases will candidates who do not have a PhD be considered); or  
 (b) a university recognised by the Senate for the purpose (only in exceptional cases will candidates who do not have a PhD be considered) who has or has had established research or teaching associations with the University.
- FD3 A candidate for the degree of Doctor of Science  
 (a) must submit published work, which must constitute a substantial, original and important contribution to learning in some branch of science;  
 (b) may submit other published or unpublished work as collateral testimony of his or her fitness for the degree;  
 (c) must be registered for the degree for a minimum of two academic years and during the period of examination, whichever is the longer.
- FD4 (a) The examination will consist primarily of an assessment of the work submitted by the candidate, but a candidate shall, if required by Senate, present him/herself for an oral examination on the subject of the work presented.  
 (b) No work will be accepted which has already been accepted by another university for the purpose of obtaining a degree.
- FD5 A candidate must submit three copies of all publications he or she wishes to be assessed for examination or as collateral testimony. 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 waive the right so granted if the candidate subsequently makes arrangements for publication in a manner satisfactory to the University.

### NOTES:

1. *The DSc is the highest and most prestigious degree awarded in the Faculty of Science; it is of higher status than the Doctor of Philosophy (PhD) degree and is awarded very rarely. In these respects the DSc at UCT is based on the DSc tradition followed by many universities in the United Kingdom. (Some universities confer the DSc degree for a thesis on research done under supervision; such a DSc is the equivalent of a PhD. UCT does not.)*
2. *The DSc at UCT is awarded on the basis of published research work in a specific scientific field in which the supplicant has been active and productive for at least ten years.*
3. *Examiners for the DSc will be asked to consider whether the work submitted for the DSc to constitute a substantial, original and important contribution to learning in some branch of science in the sense that*
4. (a) *it is likely to be regarded as 'benchmark' research in the relevant field now and in years to come, and*  
 (b) *it demonstrates that the candidate has achieved a leadership role (internationally) in that field of scientific research, and will be reminded that the emphasis in assessing the work of a DSc candidate must be on originality, substance and excellence.*

## DEPARTMENT OF ARCHAEOLOGY

The Department is housed in the Beattie Building, 5 University Avenue  
 Telephone (021) 650-2353 Fax (021) 650-2352  
 The Departmental abbreviation for Archaeology is AGE.

**Professor and Head of Department:**

J E Parkington, MA PhD *Cantab*

**Professor and South African Research Chair in Stable Isotopes in Archaeology and Paleo-environments:**

J C Sealy, MSc PhD *Cape Town*

**Associate Professor:**

R R Ackermann, MA *Arizona* PhD *Washington*

S L Hall, MA *Wits* DPhil *Stell*

**Senior Lecturers:**

D R Braun, MA PhD *Rutgers*

S Chirikure, MA PhD *UCL*

**Lecturers:**

R Sithaldeen, BSc Hons PhD *Cape Town* (CHED)

D D Stynder, MA PhD *Cape Town*

A Sumner, PhD *Toronto*

**Senior Scholar:**

J E Parkington, MA PhD *Cantab*

**Emeritus Professor:**

N J van der Merwe, MA PhD *Yale*

**Emeritus Associate Professor:**

A B Smith, PhD *Berkeley*

**Principal Scientific Officer:**

J L Lanham, BA (Hons) *Cape Town*

**Senior Scientific Officer:**

L Hutten, BSc Hons MSc *Pretoria*

**Administrative Officer:**

L J Cable

**Laboratory Assistant:**

D H Jacobs

**Departmental Assistant:**

O Noëls

### RESEARCH IN ARCHAEOLOGY

Research in Archaeology embraces a wide variety of topics, some of which are listed below. More detailed information can be obtained by writing to the Department of Archaeology. Some research programmes lie mainly in the areas of arts and humanities; others have closer affiliations with the natural sciences. Archaeological sites contain a rich record of the long-term history of peoples' interaction with the environment, and palaeoenvironmental research is one focus of activity within the department. Particular research interests include issues related to human evolution, the emergence of modern humans, and the history of hunter-gatherer, pastoralist and farming communities in southern Africa, as well as the archaeology of more recent colonial settlement. The department houses and manages the University's light isotope mass spectrometers, and has a strong research programme in the area of light stable isotopes as environmental and dietary tracers. Short courses on the theory and practice of light isotope mass spectrometry are offered from time to time. The Archaeometry Laboratory is also equipped with a range of smaller items of equipment used in analytical studies of archaeological remains. Most, but not all, work in this area is focused on archaeological questions; other activities include surveys of selected modern environments to

provide comparative data for studies of the past, and wildlife forensics.

There is also a laboratory for the study of archaeomaterials, with facilities for the preparation and study of metallographic and other specimens. Identification and interpretation of biological residues from archaeological sites is routine, and the department houses comparative material for this purpose, including mammal, reptile and fish skeletons, marine mollusc shells, and botanical specimens. Larger reference collections are readily available in related University departments and allied institutions. Further information may be found in the Department's website at <http://www.uct.ac.za/depts/age>.

## Undergraduate Courses

*NOTE: Lectures are usually given four times a week, but the fifth day may also be used and should therefore be kept free.*

### First-Year Courses

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#### AGE1002S AFRICA & WORLD ARCHAEOLOGY

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr D Stynder

**Course entry requirements:** None

**Course outline:**

This course will provide an overview of the human past from the perspective of Africa, including an introduction to human origins and the origin of the archaeological record in Africa, the expansion of the human population from Africa, a comparative perspective on hunter-gatherers, the development of farming and the origins of complex societies, and the contact between Africa, Asia and Europe in the colonial period.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5

**Tutorials:** One tutorial/practical per week, Friday, 5th period or as arranged.

**DP requirements:** Attendance and participation in lectures and tutorials; submission of written work.

**Assessment:** Essays and tests count 50%; one 3-hour examination in November counts 50%. A sub-minimum of 40% is required for the examination.

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#### GEO1009F INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES

See course details under the Department of Geological Sciences.

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#### AGE1004H INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr R Sithaldeen

**Course entry requirements:** None, but the permission of the Dean or Head of Department is required prior to registration for this course.

**Course outline:**

*This course only begins in week 7 and is intended for students who have been advised to transfer to this course after initially registering for GEO1009F (see entry for GEO1009F). It places an emphasis on the strengthening of foundational concepts and skills, the carefully-paced introduction of new material, and the development of sound approaches to effective learning.*



This course will introduce students to the structure and geological history of Earth as well as the interactions between the abiotic and biotic systems that shape the surface of the world. Human interactions with the environment are also discussed. Topics covered are solar system evolution, plate tectonics, the structure of the earth, climate-land interactions, the evolution of landscapes, biogeography, human adaptation and interaction with the natural environment.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Practicals:** One practical per week, Friday, 14h00-17h00.

**DP requirements:** A class record of at least 45%; attendance at 80% each of practicals, tutorials and lectures.

**Assessment:** Class project, tests, practicals and field report count 50%; one 2-hour paper written in November counts 50%. A sub-minimum of 40% is required for the final exam.

## Second-Year Courses

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### AGE2011S HUMAN EVOLUTION

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr D Stynder

**Course entry requirements:** Any first-year Science course, or any first-year Humanities course from a related discipline such as Social Anthropology, Historical Studies, Sociology, etc or by permission of the Head of Department.

**Course outline:**

In AGE2011S we examine the record of primate and hominid evolution, showing how the traces of fossil skeletons and artefacts are interpreted in terms of human behaviour and evolutionary processes. We answer such questions as Why in Africa? Why a larger brain? Why bipedalism? Why make tools? and situate the study of human origins in its evolutionary context. The syllabus for AGE2011S includes practical sessions for the study of primate and human, fossil and recent skeletal material and the artefacts associated with early hominids.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2

**Practicals:** One 2-hour practical per week at times to be arranged.

**DP requirements:** Attendance at lectures and practicals and completion of assignments.

**Assessment:** Essays and tests count 50%; one 3-hour examination in October/November counts 50%. A sub-minimum of 40% is required for the examination.

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### AGE2012F SOUTHERN AFRICAN HUNTERS & HERDERS

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr A Sumner

**Course entry requirements:** Any first year Science course, or any first-year Humanities course from a related discipline such as Social Anthropology, Historical Studies, Sociology, etc or by permission of the Head of Department.

**Course outline:**

Humans have been hunter-gatherers for 99% of their evolutionary history, which means that our physical, psychological and social selves have been shaped by this way of life. Southern African Khoesan hunter-gatherers and herders have contributed significantly to our understanding of such societies. In this course, we focus on hunting and gathering as a way of life in Southern Africa from some 20 000 years ago to the twentieth century, concluding by considering the contemporary socio-political environment, in which many South Africans are (re-) connecting to a Khoesan identity. The course will include coverage of rock art and its significance, as well as other material culture,

## 30 DEPARTMENT OF ARCHAEOLOGY

biology, linguistics and economic and environmental issues.

### Period

Mon Tue Wed Thu Fri

**Lectures:** 2 2 2 2

**Practicals:** One 2-hour practical per week, at times to be arranged.

**DP requirements:** Attendance at lectures and practicals, completion of assignments and participation in one-day field trip.

**Assessment:** Practical hand-ins, essays and tests count 50%; one 3-hour examination in June counts 50%. A sub-minimum of 40% is required for the examination.

## Third-Year Courses

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### AGE3006H DIRECTED READING & RESEARCH

**NQF credits:** 36 HEQS-F at level 7

**Course entry requirements:** For students specialising in Archaeology, with permission of the Head of Department.

#### Course outline:

A flexible intensive study course in a specific area customised to the needs of individual students.

**Lectures:** By arrangement

**DP requirements:** Completion of assignments.

**Assessment:** Essays and tests count 20%; a long paper count 40%; one 3-hour examination in November counts 40%.

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### AGE3011F ROOTS OF BLACK IDENTITY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr S Chirikure

**Course entry requirements:** AGE2011S or AGE2012F, or by permission of the Head of Department.

#### Course outline:

In AGE3011F we explore the history of southern Africa's people over the past 2000 years. Why are southern African populations so diverse? What lies behind the linguistic map of modern South Africa? What are the links between human biology, culture and language? We use the archaeological record of artefacts, settlement systems, food waste, environmental contexts and human skeletons to look at population movement, assimilation, conflict, co-operation and domination. We explain the origins of current demographic patterns, problematise the notion of 'settler' and explore the rich and diverse heritage of the making of South Africa.

### Period

Mon Tue Wed Thu Fri

**Lectures:** 4 4 4 4

**Practicals:** One 2-hour practical per week, at times to be arranged.

**DP requirements:** Attendance at lectures and practicals and completion of assignments.

**Assessment:** Essays and tests count 50%; one 3-hour examination in June counts 50%. A sub-minimum of 40% is required for the examination.

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### AGE3012S GLOBAL INTERACTION & THE TRANSFORMATION OF SOUTH AFRICAN SOCIETY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor S Hall

**Course entry requirements:** AGE2011S or AGE2012F, or by permission of the Head of Department.

**Course outline:**

Over the last thousand years, trade, population movements and exploratory settlement led to massive impacts on indigenous economies in southern Africa. In AGE3012S we look at these transformations from both foreign and local viewpoints. The archaeological record of Indian and Atlantic Ocean expansions record events of great significance and drama, including the process of colonization, slavery, genocide and eventually apartheid. Material culture, historic written records and excavated artefacts all inform our understanding of these events, many of them the major determinants of current conflicts and differences. We trace the history of interactions, the roots of inequalities and the course of differentiation through the archaeological record.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	4	4	4	4	

**Practicals:** One 2-hour practical per week, at times to be arranged.

**DP requirements:** Attendance at lectures and practicals and completion of assignments.

**Assessment:** Essays and tests count 50%; one 3-hour examination in November counts 50%. A sub-minimum of 40% is required for the examination.

**AGE3013H ARCHAEOLOGY IN PRACTICE**

**NQF credits:** 36 HEQS-F at level 7

*NOTE: This course is a three and a half week residential field-school during the January/February vacation.*

**Convener:** Associate Professor S Hall

**Course entry requirements:** AGE2011S and AGE2012F, or by permission of the Head of Department.

**Course outline:**

The curriculum covers field training in site location, excavation, field note taking, stratigraphic observation, site survey, use of GPS and total station, photography, rock art recording, processing of field observations, spreadsheet use, and preliminary conservation and accessioning of materials. The daily programme consists of lectures, followed by fieldwork and a short period of laboratory processing.

**DP requirements:** Attendance at field-school and completion of assignments.

**Assessment:** Essays and tests count 30%; projects count 20%; examinations count 50%.

## Postgraduate Courses

**AGE4000W BSc HONOURS IN ARCHAEOLOGY**

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 48 credits)

**Convener:** Dr D Stynder

**Course entry requirements:** A BSc degree majoring in Archaeology and an acceptable academic record. Students applying for admission to the Honours programme in Archaeology must satisfy the Head of Department that they have adequate field work experience.

**Course outline:**

The purpose of the Honours programme in Archaeology is to look in depth at current issues in the discipline, both internationally and in southern Africa. Those taking part are expected to become fully involved in the academic life of the Department, attending such seminars as may be given by staff members, research students and visitors. In addition, they must participate in the structured programme of lectures and tutorials, and write a research dissertation. The dissertation is a central part of the Honours programme. Each student must prepare a project proposal, worked out with a supervisor and approved by the Head of Department. In addition, students must take part in one open seminar, where they present their project to the Department. All students are required to attend

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a one-week field trip held during the year.

**Assessment:** On average examinations count 50% of the final mark, coursework counts 20% and the research project counts 30%. A sub-minimum of 50% is required for the research project.

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### **AGE4001W** BSc HONOURS IN ARCHAEOLOGY & ENVIRONMENTAL SCIENCE

**NQF credits:** 160 HEQS-F at level 8  
(includes research project of 48 credits)

**Convener:** Dr D Stynder

**Course entry requirements:** A BSc degree with majors in both Archaeology and Environmental & Geographical Science. Acceptance will be at the discretion of the Head of Department.

**Course outline:**

Using the resources of both the Departments of Archaeology and Environmental & Geographical Science, this honours programme focuses on the paleoenvironmental context in which humans lived during the long course of the Quaternary. Course requirements include modules from both Archaeology and from Environmental & Geographical Science and a research project (48 credits).

**Assessment:** On average examinations count 50% of the final mark, coursework counts 20% and the research project counts 30%. A sub-minimum of 50% is required for the research project.

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### **AGE5000W** MASTERS IN ARCHAEOLOGY

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

See also AGE5006W, Faculty of Humanities Handbook.

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material.

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### **AGE6000W** PhD IN ARCHAEOLOGY

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies

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## DEPARTMENT OF ASTRONOMY

The Department is housed in the RW James Building, 9 University Avenue  
 Telephone (021) 650-5830 Fax (021) 650-4547; website <http://www.ast.uct.ac.za>  
 The Departmental abbreviation for Astronomy is AST.

**Professor and Head of Department:**

R C Kraan-Korteweg, Diplom (MSc) *Basle* PhD Phil II *Basle* FRSSAf, MASSAf

**South African Research Chair in Astrophysics and Space Science:**

T H Jarrett, PhD *Amherst*

**SKA South African Research Chair in Multi-wavelength Extragalactic Astronomy:**

C Carignan, MSc *Montréal* PhD *Canberra*

**UCT-UWC-SKA Chair in Radio Astronomy:**

R Taylor, MSc PhD *Vancouver*

**Associate Professor:**

P A Woudt, MSc *Groningen* PhD *Cape Town*

**Senior Lecturer:**

K J van der Heyden, BSc Hons MSc *Cape Town* PhD *Utrecht*

**Lecturer:**

S-L Blyth, MSc PhD *Cape Town*

V A McBride, BSc Hons MSc *Cape Town* PhD *Southampton*

**Honorary Academic Member:**

P K S Dunsby, BSc PhD *London*

**Senior Scholar:**

B Warner, BSc Hons PhD DSc *London* MA DSc *Oxon* DSc (h.c) *Cape Town* Hon FRSSAf Hon  
 Fell *UCL*

**Honorary Professors:**

W J G de Blok, MSc PhD *Groningen*

P A Charles, BSc Hons PhD *London* FRAS

M W Feast, BSc Hons PhD *London* DSc (h.c) *Cape Town* ARCS DIC Assoc.RAS FRSSAf  
 MASSAf FSAIP

T B Williams, BSc *Purdue* PhD *Caltech*

**SKA Visiting Professor:**

R Fender, PhD *OU Milton Keynes*

**Adjunct Professor:**

P A Whitelock, DIC PhD *London* Assoc RAS FRSSAf MASSAf

**Computer System Managers:**

S Funani

B Kuck

**Administrative Officer:**

C Marsh

**NASSP Administrator:**

N Walker

**Senior Secretary:**

R Daniels

**RESEARCH CENTRE IN ASTROPHYSICS, COSMOLOGY AND GRAVITATION**

The core of the Centre consists of the members of the Astronomy Department (AST) and of the Cosmology Group and the Laboratory for Quantum Gravity and Strings of the Department of Mathematics and Applied Mathematics (MAM):

**Directors:**

P K S Dunsby (MAM), BSc PhD *London*

R C Kraan-Korteweg (AST), Diplom (MSc) *Basle* PhD Phil II *Basle* FRSSAf, MASSAf

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### Deputy Directors:

T H Jarrett, PhD *Amherst*

J Murugan (MAM), MSc PhD *Cape Town*

### Core Members:

S-L Blyth (AST), MSc PhD *Cape Town*

C Carignan (AST), MSc *Montréal* PhD *Canberra*

C A Clarkson (MAM), BSc Hons *Edinburgh* PhD *Glasgow*

G F R Ellis (MAM), BSc Hons BCom (Hons) *Cape Town* PhD *Cantab* DSc (h.c) *Natal, Haverford*

M W Feast (AST), BSc Hons PhD *London* DSc (h.c) *Cape Town* ARCS DIC Assoc.RAS FRSSAf MASSAf FSAIP

R Fender (AST), PhD *OU(Milton Keynes)*

C W Hellaby (MAM), BSc Hons *St Andrews* MSc PhD *Queen's (Ontario)*

V A McBride (AST; UCT/SAAO), BSc Hons MSc *Cape Town* PhD *Southampton*

B Osano (MAM), MSc PhD *Cape Town*

J P Shock (MAM), MPhys *Bristol* PhD *Southampton*

D Solomons (MAM), MSc PhD *Cape Town*

R Taylor (AST), MSc PhD *Vancouver*

K J van der Heyden (AST), BSc Hons MSc *Cape Town* PhD *Utrecht*

B Warner (AST), BSc Hons PhD DSc *London* MA DSc *Oxon* DSc (h.c) *Cape Town* Hon FRAS Hon FRSSAf Hon Fell *UCL*

A Weltman (MAM), BSc Hons *Cape Town* PhD *Columbia*

P A Whitelock (AST; UCT/SAAO), DIC PhD *London* Assoc RAS FRSSAf MASSf

P A Woudt (AST), MSc *Groningen* PhD *Cape Town*

It also incorporates numerous postdoctoral fellows: Drs Armstrong, Bartlett, Bilicki, Cluver, Coriat, Deane, Elson, Hess, Joseph, Lucero, Maddox, Magoulas, Perrete, Ribeiro, Schurch, Townsend (AST) and Drs Abbott, de la Cruz, Bioullot, Busti, Kanno, Lilley, Poltis, Roy, Seikel, Sundin, Sung, (MAM)

Affiliated members from other departments and faculties at UCT, the SAAO, the KAT Project Office, UWC and the National Institute for Theoretical Physics are welcome.

## RESEARCH IN ASTRONOMY

Research at the Astronomy Department covers a number of distinct themes, ranging from *Galactic Composition and Stellar Evolution* (Professors Feast and Whitelock) and *Accretion Physics in Compact Stellar Binaries* (Associate Professor Woudt, Dr McBride, Professors Warner, Fender and Charles) to *Neutral Hydrogen and Dark Matter Content of Nearby Galaxies* (Professors Carignan, Jarrett, de Blok and Williams), *Star Formation and Galaxy Evolution* (Professor Kraan-Korteweg, Drs Blyth and van der Heyden) and *Large-Scale Structures of Galaxies and the Zone of Avoidance* (Professors Kraan-Korteweg and Jarrett, Associate Professor Woudt, Dr. Blyth). A new research theme in the Astronomy Department is *Cosmic Magnetism* (Professor Taylor).

In each of these thematic areas, expertise exists in the department across a range of ground- and space-based observational techniques in X-ray, optical, infrared and radio astronomy, with the additional expertise in developing optical astronomical instrumentation (e.g. electron-multiplying CCDs). Besides leading many research projects on SALT, members of the Astronomy Department lead four of the ten MeerKAT Large Survey Projects.

The Research Centre in Astrophysics, Cosmology and Gravitation (<http://www.acgc.uct.ac.za>) was established in 2009. Its primary goal is to form a major research hub in astrophysics, cosmology and gravitation in Southern Africa, with particular emphasis on projects involving the new facilities SALT and MeerKAT that will require the expertise from both observers and theorists. The Centre provides a natural home for the students and staff of NASSP, the National Astrophysics and Space Science Programme (<http://www.star.ac.za>).

## Undergraduate Courses

### First-Year Courses

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#### AST1000F INTRODUCTION TO ASTRONOMY

**NQF credits:** 18 HEQSF at level 5

**Convener:** Dr S-L Blyth

**Course entry requirements:** None

**Course outline:**

The course introduces students to the subject of Astronomy and our place in the universe from the small scales of the Earth-Sun-Moon system to the large scales of distant galaxies. It aims to provide insight into how we study astrophysical objects via EM radiation and telescopes (theory) as well as providing a high-level overview of objects in the universe, moving outwards from our solar system, to stars and stellar remnants, our galaxy and others, dark matter and cosmology, and the study of the universe at the largest scales. The course is open to all interested students as well as providing a solid introduction to those wishing to continue in astrophysics.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Practicals:** One compulsory tutorial/practical session per week, Wednesday, 14h00-17h00 (two sessions are held in the Planetarium of Iziko Museums of Cape Town plus five tutorial sessions and five practical sessions, including a tour of the SAAO in Observatory).

**DP requirements:** Satisfactory attendance at lectures and compulsory attendance at Wednesday afternoon sessions and submission of bi-weekly problem sets; class record of at least 35%.

**Assessment:** Class record 50%; one 2-hour final examination 50%; subminimum requirement of 40% for final examination.

### Second-Year Courses

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#### AST2002H ASTROPHYSICS

**NQF credits:** 24 HEQSF at level 6

**Convener:** Dr V A McBride

**Course entry requirements:** PHY1004W, MAM1000W

**Course outline:**

This course presents an introduction to the theoretical aspects of modern astrophysics. The key objective is to illustrate the application of physical laws in an astronomical context and to explain how we know what we do about the universe and its constituents. Subject matter broached includes: Celestial mechanics; radiation laws; blackbody radiation, Planck function and approximations; magnitudes; the hydrogen atom; stellar spectroscopy; stellar evolution and remnants; special relativity; the Earth-Moon system; the Solar system; extrasolar planets; stellar motions; the Milky Way and other galaxies; the extragalactic distance scale; large scale structure; Newtonian cosmology.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 (no Friday lecture in second semester)

**Tutorials:** 10 Compulsory tutorial/practical sessions over the year, Wednesday, 14h00-17h00

**Practicals:** One virtual observatory project, by arrangement; one essay and one presentation. One field trip to the South African Astronomical Observatory, Sutherland.

**DP requirements:** Satisfactory attendance at lectures and tutorials/practicals; class record of at least 35%.

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**Assessment:** Three class tests count 25%; 10 compulsory tutorials/practicals including a virtual observatory project, an essay and one presentation count 25%. One 2-hour final examination in November counts for 50%; subminimum requirement of 40% for final examination.

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### AST2003H ASTRONOMICAL TECHNIQUES

**NQF credits:** 24 HEQSF at level 6

**Convener:** Dr K van der Heyden

**Course entry requirements:** PHY1004W and MAM1000W (pre-requisites), or PHY1023H and MAM1005H (pre-requisites) and PHY1004W and MAM1006H (co-requisites)

**Course outline:**

This course combines a large practical component (radio and optical astronomy practicals) with theoretical background in astronomical techniques, instrumentation and data analysis. The techniques, instrumentation and data analysis section includes: Positional astronomy: time systems, spherical astronomy, coordinate systems and conversions, astrometry; Detection systems: interaction of radiation and matter, ultraviolet and optical detectors; Optics and telescope design; Multi-wavelength astronomy: infrared, ultraviolet, x-ray and gamma-ray astronomy, fundamentals of radio astronomy; Observational techniques: photometry and spectroscopy; Orthodox statistics: probability distributions, Chi-squared distribution, propagation of errors; Stochastic processes and noise: photon noise.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 (no Thursday lectures in second semester)

**Tutorials:** Five tutorials over the year, Wednesday, 14h00-16h30, by arrangement

**Fieldwork:** One observational radio astronomy project and one observational optical astronomy project, by arrangement. One field trip to South African Astronomical Observatory, Sutherland

**DP requirements:** Satisfactory attendance at lectures and tutorials. Attendance at all fieldwork practicals. Class record of at least 35%.

**Assessment:** Two class tests 15%; 5 tutorials over the year in which students will learn astronomical data analysis and statistical techniques count 10%. One two-hour theoretical examination counts 25%; two projects count 40% and presentation counts 10%

### Third-Year Courses

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### AST3002F STELLAR ASTROPHYSICS

**NQF credits:** 36 HEQSF at level 7

**Convener:** Associate Professor P A Woudt

**Course entry requirements:** AST2002H and AST2003H (or AST2002S), PHY2014F, PHY2015S, MAM2000W (or MAM2004H and MAM2047H).

**Course outline:**

This course introduces fundamental concepts such as radiative transfer and opacity to explain the observed spectroscopic and photometric signatures of stars. Students will interpret the observed intrinsic properties of stars through a theoretical understanding of the energy production inside stars and the propagation of the electromagnetic radiation from the stellar core through its interior to the stellar surface, from where the radiation escapes unhindered. The life cycle of stars is considered in great detail, from the collapse of an interstellar gas cloud to the end products of stellar evolution: white dwarfs, neutron stars and black holes. This course includes an observational component in which the students use the modern teaching observatory on campus to derive fundamental properties of stars and stellar systems.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Practicals:** One practical or tutorial per week. Wednesdays, 14h00-16h00. Two evening observing



sessions at the UCT teaching observatory, by prior arrangement.

**DP requirements:** Satisfactory attendance at lectures and tutorials; class record of at least 35%.

**Assessment:** Class record 50% (this includes two class tests, tutorials, and practicals); one 2-hour final examination 50%; subminimum requirement of 40% for final examination.

### AST3003S GALACTIC & EXTRAGALACTIC ASTROPHYSICS

**NQF credits:** 36 HEQSF at level 7

**Convener:** Professor R C Kraan-Korteweg

**Course entry requirements:** AST2002H and AST2003H (or AST2002S), PHY2014F, PHY2015S, MAM2000W (or MAM2004H and MAM2047H).

**Course outline:**

The aim of this course is to provide a broad introduction to galactic & extragalactic astrophysics and cosmology. Topics will include the Milky Way and normal galaxies, supermassive black holes, active galaxies, clusters of galaxies, and cosmology and the origin of structure in the universe. Current hot topics in the area are also discussed in lectures from time to time and students are encouraged to keep abreast of the latest developments. A further aim is to develop observing data reduction skills. Students will therefore participate in a field trip to the South African Astronomical Observatory in Sutherland, where they will obtain their own spectroscopic data and will be taught how to do the data reduction and analysis.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Practicals:** One practical or tutorial per week, Wednesday, 14h00-16h30. One observing trip to Sutherland in the semester break is compulsory.

**DP requirements:** Satisfactory attendance at lectures and tutorials; class record of at least 35%.

**Assessment:** Class record 50% (this includes two class tests, tutorials, and practicals); one 2-hour final examination 50%; subminimum requirement of 40% for final examination.

## Postgraduate Courses

### AST4007W BSc HONOURS IN ASTROPHYSICS & SPACE SCIENCE

(National Astrophysics and Space Science Programme (NASSP))

**NQF credits:** 160 HEQSF at level 8

(includes research project of 32 credits)

**Convener:** Dr K van der Heyden

**Course entry requirements:** AST3002F and AST3003S or PHY3021F and PHY3022S or MAM3040W or equivalent. Candidates with an Engineering background will also be considered. Enrollments are limited to 20 students. Candidates must satisfy the Steering Committee that they have sufficient background in Mathematics. Admission is subject to the approval of the Steering Committee and an application must be made before 30th September of the preceding year. Late applications will also be considered.

**Course outline:**

The Honours course in Astrophysics and Space Science consists of courses presented by distinguished South African researchers from research institutions participating in NASSP. There is a theory component which includes courses in spectroscopy, electrodynamics, general relativity, general astrophysics, galaxies, computational physics, astrophysical fluid dynamics and computational methods, as well as an observational techniques component which includes optical and infrared astronomy and radio astronomy. In addition students will complete a mini research project as well as a main research project and go on a number of field trips to the national facilities.

**Assessment:** The assessment of the coursework is based on the class records and examinations for each of the modules. In general they are made up from tests, oral presentations, projects and a final

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examination. Examinations count 40%, class record 40% and research project 20% of the final result. The project component must be passed at 50%.

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#### **AST5003F TAUGHT COMPONENT OF THE MASTERS IN ASTROPHYSICS & SPACE SCIENCE**

(National Astrophysics and Space Science Programme (NASSP))

**NQF credits:** 90 HEQSF at level 9

**Convener:** Dr K van der Heyden

**Course entry requirements:** This programme is open to Honours graduates in Astronomy and Space Science (AST4007W), Physics (PHY4000W, PHY4001W, PHY4002W) or equivalent, and Engineering. Entrance is subject to a minimum pass mark of 60% in the Honours degree.

**Course outline:**

A selection of advanced topics presented by distinguished South African researchers from research institutions participating in NASSP. The courses vary from year to year but usually include cataclysmic variables, extragalactic astronomy, space technology, hot topics in cosmology, advanced general relativity, high energy astrophysics, observational cosmology, geomagnetism and aeronomy, plasma physics and magnetohydrodynamics.

**Assessment:** On average, examinations of individual modules count 60% of the final result, and marked practical work counts 40%.

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#### **AST5001W DISSERTATION COMPONENT OF THE MASTERS IN ASTROPHYSICS & SPACE SCIENCE**

**NQF credits:** 90 HEQSF at level 9

**Course entry requirements:** AST5003F

**Minor dissertation:** Students will work on an approved research topic on which a minor dissertation must be presented for formal assessment. The minor dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature.

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#### **AST5000W MASTERS IN ASTRONOMY**

**NQF credits:** 180 HEQSF at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of the handbook.

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#### **AST6000W PhD IN ASTRONOMY**

**NQF credits:** 360 HEQSF at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis

must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF BIOLOGICAL SCIENCES

The Department is housed in the John Day Building, 20 University Avenue

Telephone (021) 650-3603/4 Fax (021) 650-3301

and the H W Pearson Building, 8 University Avenue,

Telephone (021) 650-2447 Fax (021) 650-4041

The Animal Demography Unit may be reached on telephone (021) 650-2423

The Percy Fitzpatrick Institute for African Ornithology may be reached on telephone (021) 650-3291

The Plant Conservation Unit may be reached on telephone (021) 650-2440

The Departmental abbreviation for Biological Sciences is BIO.

### **Professor and Head of Department:**

A Chinsamy-Turan, BSc Hons PhD *Wits*

### **Leslie Hill Professor of Plant Conservation:**

M T Hoffman, BSc Hons PhD *Cape Town*

### **Pola Pazvolsky Chair of Conservation Biology:**

G Cumming, BSc Hons *Rhodes* DPhil *Oxon*

### **H W Pearson Honorary Professor of Botany:**

J S Donaldson MSc *Rhodes* PhD *Cape Town*

### **Professors:**

J J Bolton, BSc Hons PhD *Liverpool*

T A Hedderson, MSc *Memorial* PhD *Reading*

J J Midgley, BSc Hons PhD *Cape Town*

M J O'Riain, BSc Hons PhD *Cape Town*

### **Associate Professors:**

C Attwood, BSc Hons PhD *Cape Town*

E C February, BA (Hons) PhD *Cape Town*

M D Cramer, MSc *Wits* PhD *Cape Town*

L Gillson, BA *Oxon* MSc *Imperial* DPhil *Oxon*

J H Hoffmann, MSc PhD *Rhodes*

M I Lucas, BSc Hons PhD *Wales*

C L Moloney, BSc Hons PhD *Cape Town*

A M Muasya, MPhil *Moi* PhD *Reading*

M D Picker, BSc Hons PhD *Wits*

P G Ryan, MSc PhD *Cape Town*

G A Verboom, BSc Hons PhD *Cape Town*

### **South African Research Chair in Animal Evolution and Systematics:**

D S Jacobs, BSc Hons *Cape Town* PhD *Hawaii*

### **South African Research Chair in Marine Ecology & Fisheries:**

A Jarre, MSc *Kiel* PhD *Bremen*

### **Senior Lecturers:**

A D Amar, BSc Hons *Newcastle* PhD *Aberdeen*

G N Bronner, MSc PhD *Natal*

H Marco, BSc Hons PhD *Cape Town*

A G West, MSc *Cape Town* PhD *Utah*

### **Lecturers:**

S B M Chimphango, MSc *Malawi* PhD *Cape Town*

J Bishop, BSc Hons *King's College London* PhD *Cape Town*

L Khomo, BSc Hons PhD *Wits*

D Pillay, BSc Hons PhD *UKZN*

C C Reed, MSc PhD *UFS*

### **Senior Scholars:**

G M Branch, BSc Hons PhD *Cape Town* FRSSAf

G Gäde, MS PhD *Munster*

C L Griffiths, BSc Hons *Soton* PhD *Cape Town*

L G Underhill, MSc PhD *Cape Town*

**Emeritus Professors:**

W J Bond, BSc Hons *Exeter* MSc *Cape Town*

**Emeritus Associate Professors:**

B R Davies, BSc Hons *Newcastle* PhD *CNAA MSAIE & ES*

J A Day, BSc Hons PhD *Cape Town* MSAIE & ES

J U M Jarvis, MSc *Cape Town* PhD *East Africa* FRSSAf

**Honorary Professors:**

R M Cowling, BSc Hons PhD *Cape Town*

L Hutchings, BSc Hons PhD *Cape Town*

H P Linder, BSc Hons PhD *Cape Town*

**Honorary Associate Professor:**

R J Anderson, BSc Hons *Wits* PhD *Cape Town*

**Honorary Research Associates:**

L Atkinson, MSc PhD *Cape Town*

R Barlow, MSc *Natal* PhD *Cape Town*

G A Balme, BSc Hons *Cape Town* PhD *UKZN*

N Bergh, BSc Hons PhD *Cape Town*

J Carrick, BSc Hons *Cape Town* PhD *Cambridge*

P A Cockcroft, MSc PhD *UPE*

M S De Villiers, BSc Hons *Cape Town* PhD *UPE*

M D Durholtz, BSc Hons PhD *Cape Town*

J A Huggett, MSc PhD *Cape Town*

P B Hulley, PhD *Cape Town*

L Hutchings, PhD *Cape Town*

K Hutchings, BSc Hons PhD *Cape Town*

S Kerwath, MSc *Erlangen* PhD *Rhodes*

C Klak, BSc Hons PhD *Cape Town*

F Kruger, BSc Hons *Stellenbosch* PhD *Wits*

R W Leslie, BSc *Stellenbosch* PhD *Wits*

H L Malan, BSc Hons *UPE* PhD *Cape Town*

Q E Martins, PhD *Bristol*

B Paterson, MA *Aachen* PhD *Cape Town*

G Pitcher, BSc Hons *Natal* PhD *Cape Town*

T Samaai, BSc Hons *IC London* PhD *UWC*

C Savage, BSc Hons *Cape Town* PhD *Stockholm*

G Scott, MSc PhD *Cape Town*

A H W Seydack, BSc Hons PhD *Stellenbosch*

J A Slingsby, BSc Hons PhD *Cape Town*

C H Stirton, PhD *Cape Town*

S W Todd, BSc Hons *Pietermaritzburg* MSc *Cape Town*

C van der Lingen, BSc Hons *Rhodes* PhD *Cape Town*

H Verheye, MSc *Ghent* PhD *Cape Town*

A J Williams, BSc Hons *Sheffield* PhD *Cape Town*

D Yemane, MSc *Asmara* PhD *Cape Town*

**Principal Technical Officers:**

G A Aguilar, MSc *Chile*

A Plos, BSc *Cape Town*

## 42 DEPARTMENT OF BIOLOGICAL SCIENCES

### **Chief Technical Officers:**

G du Plessis

P Müller

### **Chief Scientific Officer:**

D Hattas, B Tech (*Cape Tech*) MSc *UWC*

L V Phigeland, BSc *Cape Town*

### **Technical Officer:**

D I Barnes

### **Departmental Administrative Manager:**

S Pillay

### **Senior Secretaries:**

S Abrahams

T Nozewu

### **Administrative Assistants:**

N Jodamus

A Stain

### **Departmental Assistants:**

N Davids

G Faulmann

G Ginindza

Z Jikumlambo

## **BOLUS HERBARIUM**

### **Director:**

A Chinsamy-Turan, BSc Hons PhD *Wits*

### **Keeper:**

J J Midgley, BSc Hons PhD *Cape Town*

### **Curator/Principal Technical Officer:**

T H Trinder-Smith, BSc Hons MSc *Cape Town*

### **Chief Scientific Officer (part-time):**

C Klak, BSc Hons PhD *Cape Town*

### **Librarian:**

A Gebregziabher

### **Departmental Assistant:**

C J Christians

## **THE PERCY FITZPATRICK INSTITUTE OF AFRICAN ORNITHOLOGY**

### **Associate Professor and Acting Director:**

P G Ryan, MSc PhD *Cape Town*

### **Pola Pazvolsky Chair of Conservation Biology:**

G Cumming, BSc Hons *Rhodes* DPhil *Oxon*

### **Emeritus Professor:**

W R Siegfried, PhD *Cape Town*

### **Honorary Professors:**

D Cumming, BSc Hons PhD *Rhodes*

### **Senior Lecturer:**

A D Amar, BSc Hons *Newcastle* PhD *Aberdeen*

### **Manager, Centre of Excellence:**

R M Little, PhD *Cape Town*

### **Honorary Research Associates:**

P Barnard, MSc *Wits* PhD *Upsala*

D Grémillet PhD *Kiel*

L Pichegru, PhD *Strasbourg*

A R Ridley, BSc Hons *Lincoln* PhD *Cantab*

R Simmons, MSc *Acadia* PhD *Wits*

R M Wanless, MSc PhD *Cape Town*

**Research Affiliates:**

P Bloomer, PhD *Virginia*

R C K Bowie, MSc PhD *Cape Town*

R Covas, MSc *Lisbon* PhD *Cape Town*

W R J Dean, MSc *Natal* PhD *Cape Town*

A Jenkins, PhD *Cape Town*

G Joseph, PhD *Cape Town*

A McKechnie, PhD *Natal*

A Milewski, MSc *Cape Town* PhD *Murdoch*

M S L Mills, MSc *Cape Town*

S J Milton, PhD *Cape Town*

M Pinheiro de Melo, MSc *Cape Town* PhD *Edinburgh*

P Pistorius, PhD *NMMU*

L Roxburgh, BSc Hons *Pietermaritzburg* PhD *Ben Gurion*

C Spottiswoode, BSc Hons *Cape Town* PhD *Cantab*

**Postdoctoral Fellows:**

R S Boyes, PhD *UKZN*

S Cunningham, PhD *Massey*

A de Vos, PhD *Cape Town*

T Flower, PhD *Cantab*

E Hallard, PhD *Lyon*

A T Lee, PhD *Manchester*

K Maciejewski, PhD *NMMU*

R Mullers, PhD *Groningen*

M Nelson-Flower, PhD *Cape Town*

**Principal Technical Officer:**

C J Tobler

**Librarian:**

M M Sandwith Koopman, BA *Unisa* HDipLib Info Sci MSc *Natal*

**Administrative Assistant:**

H Buchanan, BA H Dip Lib *Cape Town*

**Senior Secretary:**

T Jansen

**Departmental/Accounts Assistant:**

A Links

**PLANT CONSERVATION UNIT**

**Director:**

M T Hoffman, BSc Hons PhD *Cape Town*

**Deputy Director:**

L Gillson, BA *Oxon* MSc *Imperial* DPhil *Oxon*

**ANIMAL DEMOGRAPHY UNIT**

**Director:**

L G Underhill, MSc PhD *Cape Town*

**Honorary Associate Professor:**

R Altwegg, PhD *Zurich*

R J M Crawford, MSc PhD *Cape Town*

**Honorary Research Associates:**

P Barham, MSc PhD *Bristol*

D L Borchers, MSc PhD *Cape Town*

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M de Villiers, MSc PhD *Pretoria*

A Jenkins, PhD *Cape Town*

S P Kirkman, MSc *Pretoria* PhD *Cape Town*

Q Martins PhD *Bristol*

J P Roux, MSc PhD *Montpellier*

L J Waller MSc PhD *Cape Town*

I Wiesel, MSc PhD *Hamburg*

A J Williams, MSc PhD *Cape Town*

**Senior Scientific Officer:**

R A Navarro, MSc *Austral de Chile* PhD *Cape Town*

**Research Assistants:**

M Brooks, Nat Dipl in Conservation

H D Oschadleus, MSc PhD *Cape Town*

**Administrative Assistant:**

S Kuyper, BA *Natal HDLS Unisa*

**Postdoctoral Fellows:**

Y Barshep, PhD *Cape Town*

F Gebreselassie, PhD *Bern*

T Hoffman, PhD *Cape Town*

S Kohler, PhD *Reunion*

K Ludynia, PhD *Kiel*

R B Sherley, PhD *Bristol*

A Steinfurth, PhD *Kiel*

**SEAWEED RESEARCH UNIT**

**DEPARTMENT OF AGRICULTURE, FORESTRY & FISHERIES (DAFF)**

**Head:**

R J Anderson, BSc Hons *Wits* PhD *Cape Town*

**Oceanographic Researcher:**

M D Rothman, BSc Hons *UWC* MSc *Cape Town*

**Principal Oceanographic Research Assistants:**

C J T Boothroyd

F A Kemp

**WEED BIOLOGICAL CONTROL UNIT**

**Chief Research Officer:**

J H Hoffmann, MSc PhD *Rhodes*

**Scientific Officers:**

F A C Impson, BSc Hons *Rhodes* MSc *Cape Town*

C A Kleinjan, MSc *Cape Town*

V C Moran, MSc PhD *Rhodes* FRES FLS FRSSAf

**RESEARCH IN THE BIOLOGICAL SCIENCES**

The mission of the Biological Sciences Department is to conduct high quality teaching and research in the biodiversity, conservation, ecology, ecophysiology, evolution, and systematics of terrestrial and aquatic life. Courses offered are designed to reflect these research interests and train students in the major areas of ecology and evolution, applied biology and marine biology.

**Ecophysiology:** Dr SBM Chimphango (nitrogen fixation and agriculture), Associate Professor MD Cramer (carbon-nitrogen interactions, nutritional physiology), Associate Professor EC February (plant water relations, anthropogenic impacts), Dr HG Marco (crustacean neuroendocrinology) Dr AG West (impacts of climate change, drought), Emeritus Professor G Gäde (invertebrates, neuropeptides).

**Evolution and Systematics:** Dr J Bishop (evolutionary genetics, phylogeography), Dr G Bronner (micromammal systematics, conservation biology), Professor A Chinsamy-Turan (palaeobiology,



vertebrate bone & teeth histology), Associate Professor D Jacobs ( SARChI Chair, animal evolution and systematics, biology & behaviour of bats), Professor TA Hedderson (molecular ecology, bryophytes), Associate Professors AM Muasya (wetlands and Cyperaceae) and GA Verboom (speciation, Cape flora).

**Ecology and Behaviour:** Emeritus Associate Professor JA Day (fresh water ecology & conservation), Associate Professor EC February (savannas, Cape flora), Associate Professor L Gillson (long-term ecology, conservation), Associate Professor JH Hoffmann (bio-control, plant-insect interactions), Professor MT Hoffman (historical ecology, rangelands), Dr L Khomo (soils and landscapes), Professor JJ Midgley (ecosystem dynamics, plant-animal interactions), Professor MJ O’Riain (behavioural ecology, human-wildlife conflict solutions), Associate Professor MD Picker (insect ecology & biodiversity), Emeritus Professor LG Underhill (applications of statistics in the biological sciences, particularly ornithology and ecology), Emeritus Associate Professor JUM Jarvis (small mammal biology, mole-rats).

**Marine Biology:** Associate Professor C Attwood (marine protected areas, line fish population biology), Professor JJ Bolton (seaweed biology, marine aquaculture), Emeritus Professor CL Griffiths (coastal ecology, taxonomy), Associate Professor A Jarre (SARChI Chair; ecosystem modelling, ecosystem approach to fisheries management), Associate Professor MI Lucas (biological oceanography, biogeochemical cycling), Associate Professor C Moloney (ecological modelling, fisheries), Dr D Pillay (estuarine and intertidal ecology), Dr CC Reed (parasitology, aquatic ecology), Emeritus Professor GM Branch (rocky shore & coastal ecology).

**Ornithology:** Dr A Amar (conservation and raptor biology), Professor G Cumming (Pola Pasvolsky Chair of Conservation Biology), Associate Professor PG Ryan (seabirds, marine mammals).

The department is also home to the following research entities:

The Animal Demography Unit: Animal population dynamics, distributions and conservation with a focus on long-term monitoring and statistical modelling (Director: Emeritus Professor L Underhill)

The Bolus Herbarium: Taxonomy of the Cape Flora (Curator: Mr T Trinder-Smith)

The Percy FitzPatrick Institute of African Ornithology: Avian Conservation Biology and Evolutionary Ecology

The Plant Conservation Unit: Plant ecology and conservation with an emphasis on long-term ecology and the Cape Flora (Director: Professor MT Hoffman, Leslie Hill Chair of Plant Conservation)

The Seaweed Research Unit of the Department of Agriculture, Forestry & Fisheries (Head: Associate Professor RJ Anderson)

## Undergraduate Courses

**DP Requirements:** In all undergraduate courses the class record comprises marks from essays, tests and practical write-ups (as well as seminars and projects in some senior courses).

### First-Year Courses

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#### BIO1000F CELL BIOLOGY

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Associate Professor M Cramer

**Course entry requirements:** Admission will be restricted to students who have passed either NSC Physical Science or Life Science with at least 60%.

*NOTE: Preference will be given to students registered in the Science Faculty.*

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to BIO1000H from week 7.*

#### **Course outline:**

Basic biological principles and processes at a cellular level provide an essential grounding for future study in the life sciences. Chemistry concepts necessary for understanding biological processes are

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introduced, as well as the structure and function of cell components. Cellular respiration and the energetic relationships of photosynthesis, and cellular processes associated with nitrogen assimilation, animal physiology and animal behaviour follow. Sections dealing with genetics and cell division provide an introduction to biological diversity.

### Period

Mon Tue Wed Thu Fri

**Lectures:** 5 5 5 5 5

**Tutorials:** One tutorial per week, by arrangement.

**Practicals:** One afternoon per week, Monday or Tuesday or Wednesday or Thursday, 14h00-17h00.

**DP requirements:** Attendance at 70% of the practicals and a minimum of 35% for the class record.

**Assessment:** Class record counts 45% (three class tests count 27% and a practical book mark of 18%); one practical paper counts 15%; one 2-hour examination paper written in June counts 40%. A subminimum of 40% is required in the June examination.

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### BIO1000H CELL BIOLOGY

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr R Kelly

**Course entry requirements:** Admission will be restricted to students who have passed either NSC Physical Science or Life Science with at least 60%. The permission of the Dean or Head of Department is required prior to registration for this course.

*NOTE: Preference will be given to students registered in the Science Faculty.*

#### **Course outline:**

*This course only begins in week 7 and is intended for students who have been advised to transfer to this course after initially registering for BIO1000F (see entry for BIO1000F). It places an emphasis on the strengthening of foundational concepts and skills, the carefully-paced introduction of new material, and the development of sound approaches to effective learning. Note that BIO1000H is equivalent to BIO1000F in level, credit value and as prerequisite for certain other courses.*

The content includes basic biological principles and processes at a cellular level that provide an essential grounding for future study in life sciences. Chemistry concepts necessary for understanding biological processes are introduced, as well as the structure and function of cell components. Cellular respiration and the energetic relationships of photosynthesis, and cellular processes associated with nitrogen assimilation, animal physiology and animal behaviour follow. Sections dealing with genetics and cell division provide an introduction to biological diversity.

### Period

Mon Tue Wed Thu Fri

**Lectures:** 5 5 5 5 5

**Tutorials:** One tutorial per week, by arrangement.

**Practicals:** One afternoon per week, Monday or Tuesday or Wednesday or Thursday, 14h00-17h00.

**DP requirements:** Attendance at 90% of the practicals, completing the project and a minimum of 35% for the class record.

**Assessment:** Class record counts 45% (three class tests count 27% and a practical book mark of 18%); one practical paper counts 15%; one 2-hour examination paper written in June counts 40%. A subminimum of 40% is required in the June examination.

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### BIO1004F BIOLOGICAL DIVERSITY

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr L Khomo

**Course entry requirements:** BIO1000F or BIO1000H, or a pass at 60% in NSC Life Sciences or by permission of the Head of Department.

*NOTE: Preference will be given to students registered in the Science Faculty.*

#### **Course outline:**

This course investigates a range of plants and animals to illustrate the diversity and complexity of

living things. Topics covered include: historical evidence and evolution as a means of interpreting change with time; modern theories on the mechanism of evolution; the origin of species, including humans; interdependence of organisms in South African biomes; plant/animal symbiosis, mutualism and parasitism. This course includes a strong practical component which further examines animal and plant diversity.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Tutorials:** One tutorial per week, by arrangement.

**Practicals:** One practical per week, Monday, Tuesday, Wednesday, Thursday or Friday, 14h00-17h00.

**Fieldwork:** A compulsory one-day excursion will be held over a weekend.

**DP requirements:** Attendance at practicals and an average of 50% for the practical record.

**Assessment:** Class record counts 40%; one 2-hour theory paper written in November counts 40% (subminimum of 40% applies); one 1.5-hour practical examination written in November counts 20%.

**BIO1004S BIOLOGICAL DIVERSITY**

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr H Marco

**Course entry requirements:** BIO1000F or BIO1000H, or a pass at 60% in NSC Life Sciences or by permission of the Head of Department.

*NOTE: Preference will be given to students registered in the Science Faculty.*

**Course outline:**

This course investigates a range of plants and animals to illustrate the diversity and complexity of living things. Topics covered include: historical evidence and evolution as a means of interpreting change with time; modern theories on the mechanism of evolution; the origin of species, including humans; interdependence of organisms in South African biomes; plant/animal symbiosis, mutualism and parasitism. This course includes a strong practical component which further examines animal and plant diversity.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Tutorials:** One tutorial per week, by arrangement.

**Practicals:** One practical per week, Monday, Tuesday, Wednesday, Thursday or Friday, 14h00-17h00.

**Fieldwork:** A compulsory one-day excursion will be held over a weekend.

**DP requirements:** Attendance at practicals and an average of 50% for the practical record.

**Assessment:** Class record counts 40%; one 2-hour theory paper written in November counts 40% (subminimum of 40% applies); one 1.5-hour practical examination written in November counts 20%.

**Second-Year Courses**

**BIO2010F PRINCIPLES OF ECOLOGY & EVOLUTION**

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr C C Reed

**Course entry requirements:** BIO1000F or BIO1000H, BIO1004F/S.

**Course outline:**

This course explains how species have evolved and are adapted to the environments in which they live. Topics include: an introduction to evolution, natural selection, inheritance and genetics; ecology at the community, population and individual levels; animal and plant life histories and interactions. The formal lectures and practicals will be supported by a 5-day compulsory field camp.

**Period****Mon Tue Wed Thu Fri****Lectures:** 1 1 1 1 1**Tutorials:** One per week, Friday 1st period (if required)**Practicals:** One practical per week, Monday, 14h00-17h00.**Fieldwork:** One 5 day field trip during April vacation.**DP requirements:** 50% for class record; submission of assignments on schedule and attendance at field camp held during the Easter vacation.**Assessment:** A 2-hour theory examination will count for 50% of the course with a sub-minimum of 40%. Coursework marks will be allocated as follows: Practical classes (assessed weekly) count 15%; project based on field camp data collection counts 20%; one class test counts 15%.**BIO2011S LIFE ON LAND: ANIMALS****NQF credits:** 24 HEQS-F at level 6*NOTE: This course replaced BIO3012F & BIO2002S***Convener:** Dr G Bronner**Course entry requirements:** BIO1000F or BIO1000H, BIO1004F/S.**Course outline:**

This course will familiarise students with the evolution, functional biology and physiology of invertebrates and vertebrate animals living in terrestrial environments. It covers the diversity and life styles of land animals (particularly myriapods, arachnids, insects and tetrapod vertebrates), paying special attention to the major adaptations required for life on land.

**Period****Mon Tue Wed Thu Fri****Lectures:** 4 4 4 4 4**Tutorials:** One per week, Friday, 4th period.**Practicals:** One practical per week, Monday, 14h00-17h00.**Fieldwork:** One 5 day field trip during September vacation.**DP requirements:** 50% for class record; submission of assignments on schedule and attendance at a 5 day field camp held during the September vacation.**Assessment:** A 2-hour theory examination and 2-hour practical examination will each count 25% of the course with a sub-minimum of 40% for the combined mark (theory & practical). Coursework marks will be allocated as follows: Practical classes (assessed weekly) count 10%; project based on field camp data collection counts 20%; two class tests count 20%**BIO2012S LIFE ON LAND: PLANTS****NQF credits:** 24 HEQS-F at level 6**Convener:** Associate Professor E February**Course entry requirements:** BIO1000F or BIO1000H, BIO1004F/S**Course outline:**

Terrestrial plants inhabit a broad range of environments, that are distinguished by their abiotic (e.g. light, temperature, water, nutrients) and biotic (e.g. animals, plants, microbes) features. Adaptation to contrasting habitats has generated a diversity of form in plants, as well as a fascinating array of ecophysiological and ecological strategies. Starting with roots, stems and leaves, and finishing with reproductive structures (flowers and seeds) and life-histories, this course explores plant structure and function, and the manner in which this has changed through the course of evolutionary history. This is followed by an introduction to the diversity of vascular plants, with an emphasis on flowering plants, particularly those that typify the Cape flora. Finally, the biology of bryophytes (mosses and relatives) is considered, highlighting the very different solutions they employ for a life on land.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	2	2	2	2	2

**Practicals:** One practical per week, Thursday, 14h00-17h00, and a compulsory field excursion.

**DP requirements:** Minimum of 40% for class record and attendance at practicals and five day field camp.

**Assessment:** Class record counts 50% (tests count 15%; practicals (assessed weekly) count 15%; project counts 20%); two 2-hour written examinations in November each count 25%. A subminimum of 40% is required for examinations.

**BIO2013F LIFE IN THE SEA**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: This course replaced BIO2009S.*

**Convener:** Dr D Pillay

**Course entry requirements:** BIO1000F or BIO1000H, BIO1004F/S.

**Course outline:**

The Life in the Sea course is intended to introduce students to the diversity of life present in oceans, including the invertebrates, vertebrates and plants. It will focus on adaptations of form to function (locomotion, reproduction, feeding) and to habitat (rocky shore, open ocean, sedimentary). The course is also intended to familiarise students with biophysical processes that influence life in the oceans.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	3	3	3	3	3

**Tutorials:** One per week, Friday, 3rd period.

**Practicals:** One practical per week, Wednesday, 14h00-17h00.

**Fieldwork:** One 4-day field trip during April vacation

**DP requirements:** 50% for class record; submission of assignments on schedule; attendance at field camp.

**Assessment:** A 2-hour theory examination will count for 50% of the course with a sub-minimum of 40%. Coursework marks will be allocated as follows: Practical classes (assessed weekly) count 15%; project counts 20%; class tests count 15%.

**Third-Year Courses****BIO3002F MARINE ECOSYSTEMS**

**NQF credits:** 36 HEQS-F at level 7

*NOTE: This course replaced BIO3002S.*

**Convener:** Associate Professor M I Lucas

**Course entry requirements:** SEA2004F, BIO2013F

**Course outline:**

The course aims to develop and promote skills in the marine sciences in South Africa, making students familiar with global marine ecosystem structure and functioning, but with an emphasis on South African systems. Lectures, tutorials and practicals will be aimed at developing interpretative and integrative skills built during previous courses (eg. SEA2004F; BIO1004S; BIO1000F) which cover large amounts of more basic information. A further important aim will be to develop numerical and written skills, as well as introducing students to modern research techniques and approaches.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	1	1	1	1	1

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**Tutorials:** By arrangement

**Practicals:** One practical per week, Wednesday, 14h00-17h00.

**Fieldwork:** A compulsory 5 day field camp during February.

**DP requirements:** 50% for class record; submission of assignments on schedule and attendance at field camp.

**Assessment:** A 2-hour theory exam written in June will count for 50% of the course with a sub-minimum of 40%. Course work marks will be allocated as follows: project based on field camp data collection counts 20%; two class tests count 15% each; essay counts 15%.

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### BIO3013F GLOBAL CHANGE ECOLOGY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr A West

**Course entry requirements:** BIO1000F or BIO1000H, BIO1004F/S

**Course outline:**

How are organisms and ecosystems affected by the drivers of global environmental change? This course begins with a brief overview of key drivers of global environmental change, including both natural (e.g. Milankovich cycles) and anthropogenic "forcings" (e.g. greenhouse gas emissions, nitrogen deposition and pollution, land-use change). It then examines how these drivers influence (and are influenced by) primary productivity, nutrient cycling, water relations and vegetation-climate feedbacks. Biological responses to global change are examined in the context of marine, freshwater and terrestrial ecosystems. The course provides an integrated knowledge of contemporary environmental issues related to global change (e.g. carbon sequestration, climate change mitigation, and dynamic global vegetation models).

#### Period

Mon	Tue	Wed	Thu	Fri
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Lectures:	2	2	2	2	2
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**Practicals:** One practical per week, Monday, 14h00-17h00.

**DP requirements:** Minimum of 40% for class record.

**Assessment:** Class record counts 50% (practicals 15%, tests 15% and projects 20%); two 2-hour written examinations in June count 25% each. A subminimum of 40% is required in examinations.

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### BIO3014S CONSERVATION: GENES, POPULATIONS & BIODIVERSITY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr J Bishop

**Course entry requirements:** BIO2010F

**Course outline:**

This course introduces students to the science and practice of conservation biology, beginning with an overview of conservation issues, the value of biodiversity, extinction risks and the history and philosophy of conservation. The conservation of biodiversity at the level of genes, species, populations and ecosystems, starting with the understanding of conservation at the genetic level as well as the management of genetic diversity are explored. At the species and population levels, the life history, behaviour and the management of populations in the real world is covered. The conservation and management of ecosystems is considered in terms of important processes, such as disturbance, and threats by alien plants and animals. This course concludes by considering conservation and society. Issues to be considered here include: incentives, access, who benefits from conservation, legal aspects and management policies.

#### Period

Mon	Tue	Wed	Thu	Fri
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Lectures:	2	2	2	2	2
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**Tutorials:** By arrangement

**Practicals:** One practical per week, Monday, 14h00-17h00.

**Fieldwork:** A compulsory 2-day field trip during the September vacation.

**DP requirements:** Submission of assignments by due date and 50% subminimum.

**Assessment:** A single 2-hour theory examination will count 50% of the course marks, with a subminimum of 40%. Coursework counts 50% with marks allocated to tests (15%), practicals (15%), and project (20%).

### **BIO3015F ECOSYSTEM ECOLOGY**

**NQF credits:** 36 HEQS-F at level 7

*This course is a residential two week field course, occurring before term starts. During term time further lectures and various assignments need to be completed.*

**Convener:** Professor J J Midgley

**Course entry requirements:** BIO2010F

**Course outline:**

This course focuses on terrestrial and freshwater ecosystems, especially of Africa. Lectures take place mainly on a field camp where there is ample opportunity for practicals and individual projects. Typical practicals concern the distribution and impact of small mammals and large herbivores, succession between fynbos and forest, the role of soil water on ecosystem attributes and freshwater vlei and river dynamics. The course begins with an introduction to ecosystem ecology and the role of abiotic factors (such as nutrients, fire and water) and biotic factors (such as predation). The issue of scale, both spatial (from metres to kilometres) and temporal (for days to millennia) is considered as is the issue of scaling and scaling-up in ecosystem ecology. Trophic ecology, the causes and consequences of the elimination of predators is discussed, with examples from Africa. Besides developing field work skills in ecosystem ecology, students will also develop modelling skills including simple demographic and succession models. Finally, the dynamics, management and conservation of Africa's terrestrial and freshwater resources are studied.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Tutorials:** By arrangement.

**Practicals:** By arrangement.

**DP requirements:** A minimum of 40% for class record, attendance of two week field camp.

**Assessment:** Class record counts 50% (practicals 30%, project based on field camp data collection 10%, class test 10%), one 2-hour theory examination and one 2-hour practical examination written in March/April each count 25%. A subminimum of 40% is required in examinations.

### **BIO3016S SYSTEMATICS & MACROEVOLUTION**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor A M Muasya

**Course entry requirements:** BIO2010F

**Course outline:**

This course deals with the description and analysis of biodiversity and evolution at the species level and above. The course begins by considering the nature and definition of "species," the processes by which new species arise in nature (speciation), and the data and procedures employed in the practical discovery, naming and description of previously-undescribed species. Thereafter, the focus shifts to the inference of phylogenetic (evolutionary) relationships amongst species, with an emphasis on the data (morphological, molecular) and analytical methods (parsimony, likelihood, Bayesian) employed in phylogeny reconstruction. Following on from this, the utility of phylogenetic data in the study of macroevolution is explored, specifically in relation to the study of adaptation, key innovation, evolutionary radiation and molecular dating. Students will also be introduced to several key biodiversity initiatives including the Tree of Life Project and The Consortium for the Barcode of Life.

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### Period

Mon Tue Wed Thu Fri

**Lectures:** 5 5 5 5 5

**Practicals:** One practical per week, Tuesday, 14h00-17h00.

**DP requirements:** Minimum of 40% for class record and attendance at weekend field camp.

**Assessment:** Class record counts 50% (practicals and tutorials 20%, class tests 15%; project 15%, two 2-hour written examinations in November each count 25%. A subminimum of 40% is required in examinations.

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### BIO3017S MARINE RESOURCES

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor C Attwood

**Course entry requirements:** BIO1000F or BIO1000H, BIO1004F/S, BIO2013F

**Course outline:**

Topics include the diversity and life-history strategies of living marine resources, the diversity of fishing methods and fisheries, surplus production and responses of exploited populations, monitoring and assessment techniques, regulatory strategies, non-consumptive industries, diversity and principles of marine aquaculture, and marine conservation theory and practise.

### Period

Mon Tue Wed Thu Fri

**Lectures:** 3 3 3 3 3

**Practicals:** One practical per week, Friday, 14h00-17h00.

**Fieldwork:** A compulsory 2-day field trip.

**DP requirements:** 50% for class record; submission of assignments on schedule.

**Assessment:** A 2-hour theory examination will count for 50% of the course marks, with a subminimum of 40%. Coursework marks will be allocated as follows: Practical classes count 12%; two class tests count 20% and project 18%.

## Postgraduate Courses

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### BIO4000W BSc HONOURS IN BIOLOGICAL SCIENCES

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 72 credits)

**Convener:** Associate Professor G A Verboom

**Course entry requirements:** A BSc degree in Biology. Enrolments are limited to 32, and acceptance will be at the discretion of the Head of Department who will consider quality of final year results, material covered in the undergraduate curriculum, and also possibly referees' reports.

**Course outline:**

The Honours course is designed to enrich the student's appreciation of theory through advanced coursework, essay writing, seminars, discussion groups and compulsory field work. In addition to a compulsory coursework module, students are required to choose 8 elective modules. Students are also expected to conduct research project/s.

**Assessment:** Two written examinations count 16%; two projects count 45%; theory and research seminars (one of each) count 5% each; compulsory coursework counts 9%; and elective module coursework counts 20%. The non-project component of the course carries a sub-minimum of 45%. The project component must be passed at 50%.

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### BIO4001W BSc HONOURS IN MARINE BIOLOGY

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 72 credits)

**Convener:** Associate Professor C Attwood



**Course entry requirements:** BSc degree in Marine Biology. Enrolments are limited to 10, and acceptance will be at the discretion of the Head of Department who will consider quality of final year results, material covered in the undergrad curriculum, and also possibly referees' reports.

**Course outline:**

The Honours course is designed to enrich the student's appreciation of theory through advanced coursework, essay writing, seminars, and discussion groups and a compulsory fieldtrip. In addition to a compulsory coursework module, students are required to choose 8 elective modules. Students are also expected to conduct research project/s. The projects, theory seminar and project seminar have to be on marine topics, and at least four marine electives must be selected.

**Assessment:** Two written examinations count 16%; Project/s count 45%; theory and research seminars (one of each) count 5% each; compulsory coursework counts 9%; and elective module coursework counts 20%. The non-project component of the course carries a sub-minimum of 45%. The project component must be passed at 50%.

### **BIO5010W MASTERS IN BIOLOGICAL SCIENCES**

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of the handbook.

### **BIO5005H and BIO5006W MASTERS IN APPLIED MARINE SCIENCE**

(by coursework and minor dissertation)

Coursework (BIO5005H): **NQF credits:** 90 HEQS-F at level 9

Minor Dissertation (BIO5006W): **NQF credits:** 90 HEQS-F at level 9

**Convener:** Associate Professor C L Moloney

**Course outline:**

The objective of this Masters by coursework and dissertation is to provide skills and specialised knowledge appropriate for a broad range of disciplines in marine science. The course is intended for professional scientists interested in applied aspects of marine science, where broadly-based, practical skills are required, often in a management context. The course has two components.

The coursework component (BIO5005H) runs for approximately 7-8 months, and consists of a series of modules. Students are engaged full-time with activities relating to the modules. Topics include coastal and shelf oceanography, marine ecology, numerical skills(Matlab), statistics, marine environmental law, mariculture, remote sensing, multivariate analysis, marine conservation, marine project management, ecosystem approach to fisheries management, decision analysis, ecosystem modelling and marine global change.. The modules are conducted in a classroom setting involving lectures and tutorials, and field and laboratory practicals.

Each student is assessed on each module, with formal marks for essays, presentations and mini-projects, and in some cases for class tests. Two formal examinations are used to assess progress, and to consolidate the material covered in the completed modules.

The research component (BIO5006W) must be submitted as a minor dissertation for formal examination. The expected duration of the research component is 5-6 months.

**DP requirements:** Satisfactory completion of each module, and a pass in the first examination; **we**

**reserve the right to ask students to leave part way through the course** if their progress is deemed unsatisfactory.

**Assessment:** Both coursework and minor dissertation components must be passed separately for the degree to be awarded. Of the coursework component, class assessments will count 60% and two formal examinations will count 40%.

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### **BIO5007H and BIO5008W MASTERS IN CONSERVATION BIOLOGY**

(by coursework and minor dissertation)

Coursework (BIO5007H): **NQF credits:** 90 HEQS-F at level 9

Minor Dissertation (BIO5008W): **NQF credits:** 90 HEQS-F at level 9

**Convener:** Professor G S Cumming and Associate Professor P G Ryan

#### **Course outline:**

A one-year intensive programme deals with the conservation and biologically sustainable and economically viable use of biodiversity. It provides the education and training necessary to identify threatened species, ecosystems and ecological processes, and to develop appropriate measures to mitigate against, or reduce the effects of, particular threats to biodiversity. From a utilisation perspective, it focuses on biological and socio-economic criteria necessary to select species and areas of utilisation and the development of appropriate management and monitoring strategies. This programme is intended for students concerned with both the theory and practise of conservation and consists of two components.

The coursework component (BIO5007H) is a series of modules covering a range of fields of conservation biology: philosophy of science and conservation ethics; community ecology, population ecology, biodiversity basics, ecosystem/aquatic ecology, disturbance and restoration ecology, invasive species, complex systems concepts, landscape ecology, GIS and conservation planning, climate change and conservation, resource economics, conservation genetics, societies and natural resources. Each student receives a mark for each of the modules, and the modules are examined in groups during 'open-book' examinations.

The research component (BIO5008W) must be submitted as a minor dissertation for formal examination. A pass in both components is required for the degree. It should be completed by mid-February following first registration. Those students already in possession of a Masters degree, or in exceptional cases those who wish to upgrade to a PhD, may expand a project in accord with the normal pursuit of that degree at UCT (see below). A handbook for the programme is available from the Percy Fitzpatrick Institute's website: [www.fitzpatrick.uct.ac.za](http://www.fitzpatrick.uct.ac.za).

**Assessment:** Coursework and minor dissertation components each constitute 50% to the final grade; both must be passed separately for the degree to be awarded.

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### **BIO5009W MASTERS IN CONSERVATION BIOLOGY**

**NQF credits:** 180 HEQS-F at level 9

#### **Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of this handbook.

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**BIO6003W** PhD IN BIOLOGICAL SCIENCES**NQF credits:** 360 HEQS-F at level 10**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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**BIO6002W** PhD IN CONSERVATION BIOLOGY**NQF credits:** 360 HEQS-F at level 10**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF CHEMISTRY

The Department is housed in the P D Hahn Building, 28 Chemistry Mall  
Telephone (021) 650-2324 Fax (021) 650-5195  
The Departmental abbreviation for Chemistry is CEM.

### **Professor and Head of Department:**

S A Bourne, BSc Hons PhD *Cape Town* CChem MRSC MSACI

### **Mally Professor of Organic Chemistry:**

R Hunter, BSc Hons PhD *London* DIC

### **Jamison Professor of Inorganic Chemistry:**

T J Egan, BSc Hons PhD *Wits* MSACI

### **Professor of Physical Chemistry:**

M R Cairn, MSc PhD *Cape Town* Dr Hon Causa Univ Med Pharm 'Iuliu Hatieganu' *Romania*

### **South African Research Chair in Drug Discovery:**

K Chibale, BScEd *Zambia* PhD *Cantab*

### **South African Research Chair in Scientific Computing:**

K J Naidoo, MSc *Cape Town* PhD *Michigan*

### **Professors:**

G E Jackson, BSc Hons PhD *Cape Town* CChem FRSC MSACI

### **Associate Professors:**

B Davidowitz, MSc PhD *Cape Town* MSACI

D W Gammon, BSc Hons PhD HDE *Cape Town* MSACI

A T Hutton, MSc PhD *Cape Town* CChem MRSC MSACI

N Ravenscroft, BSc Hons PhD *Cape Town* MSACI

G S Smith, BSc *Natal* BSc Hons MSc PhD *UWC* MSACI

### **Senior Lecturers:**

M A Jardine, MSc PhD *Cape Town*

S Wilson, BSc Hons PhD *Cape Town*

### **Lecturers:**

C Kaschula, BSc Hons PhD *Cape Town*

C L Oliver, BSc Hons PhD *Cape Town*

G A Venter, MSc PhD *Stell* MSACI

### **Senior Scholars:**

L R Nassimbeni, MSc *Rhodes* PhD *Cape Town* CChem FRSC FRSSAf MSACI

A L Rodgers, MSc PhD *Cape Town*

### **Emeritus Professors:**

J R Bull, MSc *Natal* DPhil *Oxon* CChem FRSC FRSSAf Hon MSACI

P W Linder, MSc *Natal* PhD *Cantab* CChem MRSC MSACI

A M Stephen, MSc PhD *Cape Town* DPhil *Oxon* CChem MRSC MSACI

### **Honorary Research Associates:**

S Churms, BSc Hons PhD *Cape Town*

R J Haines, MSc *Natal* PhD *London* FRSSAf

### **Principal Scientific Officer:**

A Nchinda, MSc *Yaounde I* PhD *Rhodes*

### **Principal Research Officer:**

L Street, BSc Hons PhD *Leeds* UK

### **Senior Research Officer:**

C Musonda, BSc *Zambia* PhD *Cape Town*

### **Research Officers:**

C Barnett, MSc PhD *Cape Town*

Y Y Adam, BSc *Khartoum* PhD *Cape Town*

T Paquet, MSc *Cape Town* PhD *Cambridge*

S Winks, BSc Hons *Cape Town* PhD *Wits*

R van der Westhuysen, MSc *Stell*

**Chemical Safety Officer:**

M Muller, MBA *UFS*

**Chief Scientific Officers:**

D Jappie, BSc Hons *Cape Town* MSACI

C Lawrence-Naidoo, BSc Hons MSc *Cape Town*

E Murray, BSc Med (Hons) *Stell* PhD *Cape Town*

**Senior Scientific Officers:**

N N Barnes, NDipl Anal Chem *CPUT* MSc *Stell*

A Gamielidien, BSc Hons HDE *UWC*

N Lawrence, BSc Hons *Cape Town* MSc *Stell*

H Su, MSc PhD *Cape Town*

T Theka, MSc *Venda* PhD *Cape Town*

**Scientific Officer:**

V Reid, BSc Hons Food Science *UFS* MSc Wine Biotechnology *Stell*

**Principal Technical Officers:**

P D de Kock, BEng MEng *Stell*

A de Jager

**Chief Technical Officers:**

A D Joseph

G Hesselink

**Senior Technical Officers:**

G Benincasa, BSc Hons *Natal*

P Roberts

**Technical Officer:**

K Willis

**Assistant Technical Officer:**

F Majola, NDipl Elect Eng *CPUT*

**Departmental Administrative Manager:**

S Manie, Dipl Acc & Fin Dipl HRM *Damelin*

**Administrative Officer:**

K Badenhorst

**Administrative Assistants:**

L M Bezuidenhout

D C Brooks

S D Naicker

E Rutherford-Jones, BSocSc *Cape Town*

P Smit

**Senior Secretaries:**

L Lalbahadur, BPaed *UDW* BEd (Hons) *UNISA*

**Departmental Assistants:**

S Y Dyule-Nozewu

F Esau

E Jooste

A M Khoapa

G M Mlungu

N Ngamani

J Paulse

K M Sigam

C M Stanley

**Workshop Assistant:**

Y Ely

## RESEARCH IN CHEMISTRY

The Department of Chemistry is equipped for many and varied research activities. In addition to a microanalytical service, gas-liquid chromatography, high-speed liquid chromatography and other routine facilities, major items of modern physical equipment include NMR (Varian VXR 200, Mercury 300 multi-nuclear and solid-state spectrometers) and atomic absorption spectrometers (flame and graphite furnace), an inductively-coupled plasma spectrometer, mid-IR spectrophotometers, UV-visible spectrophotometers, X-ray generators and single-crystal diffractometers (four-circle and CCD detector) for crystallographic studies, a spectropolarimeter, and workstations for both thermal and electrochemical analysis. The Department is also fortunate in having the opportunity of utilising facilities in other departments within the University. In terms of computing the Department has several research and teaching microlabs, several workstations for molecular modelling, workstations for the processing of NMR data, and full access to the local area network.

In its Strategic Plan the Department has affirmed the central importance of the sub-disciplines of Inorganic, Organic and Physical Chemistry, and their applications in synthesis and analysis. These three themes constitute the essential pillars of the discipline of Chemistry. The Department wishes to consolidate and strengthen four main focus areas for its research activities:

*Synthetic and medicinal chemistry* - the discovery, design, synthesis and activity of bio-active molecules (M R Caira, K Chibale, T J Egan, D W Gammon, R Hunter, G E Jackson, M A Jardine, N Ravenscroft).

*Supramolecular chemistry* - the application of X-ray diffraction and other physical methods to the understanding of inclusion phenomena and other molecular associations (S A Bourne, M R Caira, L R Nassimbeni, C L Oliver).

*Transition metal chemistry* - the discovery, design, synthesis and properties of new coordination and organometallic compounds of the transition metals with potential applications as materials or catalysts (A T Hutton, G S Smith).

*Biophysical and structural chemistry* - the application of spectroscopic, diffraction and computational methods to the understanding of molecular and macromolecular phenomena (T J Egan, G E Jackson, K J Naidoo, N Ravenscroft, A L Rodgers, G A Venter).

Research is also carried out on aspects of *chemistry education* - curriculum design, writing and communication within the discipline (B Davidowitz).

Further information may be found on the Department's website at <http://www.uct.ac.za/depts/cem>

## Undergraduate Courses

### Supplementary examinations:

For all undergraduate Chemistry courses, borderline candidates may not necessarily be awarded a supplementary examination to be written in January/February of the following year. As an alternative, the Department reserves the right to apply rule G19.6 which implies that a further test, which may be oral or written, may take place before the date of the Faculty Examinations Committee. Students are accordingly warned that they may be expected to make themselves available for such further testing.

### Textbooks:

The lecturers in charge of each course will advise students at the commencement of the course on the textbooks required and recommended.

## First-Year Courses

CEM1000W is the first-year full qualifying course for entrance to second-year courses in the Faculty of Science and in Chemical Engineering in the Faculty of Engineering and the Built Environment. CEM1009H and CEM1010H are half courses taken by students who are placed on the Extended Degree Programme, and completion of both courses is equivalent to the full course CEM1000W. The Department also offers CEM1008F: Chemistry for Engineers and CEM1011F: Chemistry for Medical Students, which is repeated as CEM1111S and CEM1011X as part of the

Faculty of Health Sciences Intervention Programme. Details of these courses can be found in the relevant faculty student handbooks.

The practical courses are designed to test and apply the principles discussed in the lectures, and include titrimetric analysis, introductory instrumental techniques and the preparation and reactions of organic compounds.

### **CEM1000W CHEMISTRY 1000**

**NQF credits:** 36 HEQS-F at level 5

**Convener:** Associate Professor G S Smith

**Course entry requirements:** Students wishing to register for CEM1000W will normally be expected to have passed NSC Physical Science with at least 60% and NSC Mathematics with at least 70%. In exceptional circumstances, a student who has passed a full suite of 1<sup>st</sup> year courses may register for CEM1000W without meeting the NSC Physical Science requirement. Such registration requires the permission of the Head of Department.

*NOTE: Preference will be given to students registered in the Science Faculty.*

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to CEM1009H from week 7.*

#### **Course outline:**

This course lays the foundation of chemistry in its context as a central science for scientists and engineers working in the chemical, biological or earth sciences or in chemical engineering. Fundamental concepts in chemistry are covered to illustrate their application to understanding the molecular nature of the world around us. Topics include microscopic and macroscopic concepts, atomic structure, chemical bonding and molecular structure, the chemistry of the elements and inorganic chemistry, chemical equilibrium, acids and bases, solubility, phases of matter, thermochemistry and thermodynamics, colligative properties, oxidation and reduction, electrochemistry and chemical kinetics. The course continues with an introduction to the language of organic chemistry, including structure and reactivity in organic chemistry, describing and predicting organic reactivity and the properties and reactivity of biologically important molecules. Practicals aim to develop essential manipulative and technical laboratory skills, as well as to draw links to interpreting the physical world in terms of its molecular nature.

**Lectures:** Four lectures per week, Monday to Wednesday and Friday, 2nd or 4th period.

**Tutorials:** One tutorial per week, Thursday, 2nd or 4th period.

**Practicals:** One practical per week, Tuesday, Thursday or Friday, 14h00-17h00.

**DP requirements:** Attendance and completion of practicals, tests and tutorial exercises and at least 35% for the class record.

**Assessment:** Class record (comprising tests and practicals) counts 50%; one 3-hour paper written in November counts 50%. It is necessary to pass the theory examination and the whole course in order to secure an overall pass.

### **CEM1009H CHEMISTRY 1009**

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Associate Professor B Davidowitz

The permission of the Dean or Head of Department is required prior to registration for this course.

#### **Course outline:**

*This course only begins in week 7 and is intended for students who have been advised to transfer to this course after initially registering for CEM1000W (see entry for CEM1000W). It places an emphasis on the strengthening of foundational concepts and skills, the carefully-paced introduction of new material, and the development of sound approaches to effective learning. Note that the combination of CEM1009H and CEM1010H is equivalent to CEM1000W in level, credit value and*

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*as prerequisite for certain other courses.*

This course lays the foundation of chemistry in its context as a central science for scientists working in the chemical, biological or earth sciences and is one of the courses specially designed for the Extended Degree Programme. Fundamental concepts in chemistry are covered to illustrate their application to understanding the molecular nature of the world around us. Topics include microscopic and macroscopic concepts, atomic structure, chemical bonding and molecular structure, chemical equilibrium, acids and bases, solubility, phases of matter, thermochemistry, osmosis and chemical kinetics. The course continues with an introduction to the language of organic chemistry, including naming of compounds, identification of functional groups and isomers. Practicals are designed to develop essential manipulative and technical laboratory skills, to take measurements and handle data, as well as to draw links to interpreting the physical world in terms of its molecular nature.

### Period

Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	4	4	4	
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**Tutorials:** Two tutorials per week, Monday and Tuesday, 4th period.

**Practicals:** One practical per week, Wednesday, 14h00-17h00.

**DP requirements:** Attendance and completion of practicals, tests and tutorial exercises and at least 35% for the class record.

**Assessment:** Class record (comprising tests and practicals) counts 50%; one 2-hour paper written in November counts 50%. It is necessary to pass the theory examination and the whole course in order to secure an overall pass.

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## CEM1010H CHEMISTRY 1010

**NQF credits:** 18 HEQS-F at level 5

This half course is taken by students who have completed CEM1009H during the previous academic year. The half courses CEM1009H and CEM1010H together are equivalent to the first-year full course CEM1000W.

**Convener:** Associate Professor A T Hutton

**Course entry requirements:** CEM1009H

**Course outline:**

This course builds on the foundation laid in the CEM1009H course and several of the topics are covered at a more advanced level. Topics include microscopic and macroscopic concepts, atomic structure, chemical bonding and molecular structure, the chemistry of the elements and inorganic chemistry, chemical equilibrium, acids and bases, solubility, vapour pressure and phase diagrams, thermodynamics, colligative properties, oxidation and reduction, electrochemistry and chemical kinetics. The course includes an introduction to the language of organic chemistry, structure and reactivity in organic chemistry, describing and predicting organic reactivity and the properties and reactivity of biologically important molecules. Practicals aim to develop essential manipulative and technical laboratory skills, as well as to draw links to interpreting the physical world in terms of its molecular nature.

### Period

Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	4	4	4	- 4
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**Tutorials:** One tutorial per week, Thursday, 4<sup>th</sup> period

**Practicals:** One practical or workshop per week, Thursday, 14h00-17h00.

**DP requirements:** Attendance and completion of practicals, tests and tutorial exercises and at least 35% for the class record.

**Assessment:** Class record (comprising tests, tutorials and practicals) counts 50%; one 2-hour paper written in November counts 50%. It is necessary to pass the theory examination and the whole course in order to secure an overall pass.



## Second-Year Courses

CEM2007F and CEM2008S are required courses for students proceeding to a major in Chemistry.

### CEM2007F PHYSICAL CHEMISTRY & SPECTROSCOPY

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr G A Venter

**Course entry requirements:** CEM1000W (or equivalent), 1000-level full course in Physics, 1000-level full or semester course in Mathematics; concurrent registration for STA1000F/S is highly recommended.

**Course outline:**

In this course, the principles of physics are applied to the study of the macroscopic and atomic behaviour of chemical systems. The course begins with the application of thermodynamics to chemical systems, including consideration of phase equilibria and the thermodynamics of solutions and transport properties. Further topics covered include chemical kinetics, quantum chemistry and the fundamentals of rotational and vibrational spectroscopy. The final quarter of the course introduces students to analytical chemical techniques including ultraviolet, infrared and mass spectroscopy, nuclear magnetic resonance spectrometry and X-ray diffraction. The practical course covers the same material as that in the lectures.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Tutorials:** Six tutorials per semester, by arrangement

**Practicals:** One practical per week, Thursday, 13h30-17h00.

**DP requirements:** Attendance and completion of practicals, tests and tutorial exercises and at least 50% for the class record.

**Assessment:** Class record (comprising tests and practicals) counts 50%; one 2-hour paper written in June counts 50%. It is necessary to pass the theory examination and the whole course in order to secure an overall pass.

### CEM2008S ORGANIC & INORGANIC CHEMISTRY

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr A Jardine

**Course entry requirements:** CEM1000W (or equivalent), 1000-level full course in Physics, 1000-level full or semester course in Mathematics, DP for CEM2007F

**Course outline:**

This course aims to develop skills and understanding of chemical reactivity and synthesis, across the entire periodic table. Lectures and tutorials develop interpretive and synthetic skills built during CEM1000W (or equivalent). Topics covered include main-group chemistry and trends in the periodic table, the chemistry of the transition metals, coordination chemistry, structure elucidation of organic molecules, organic reactivity, reaction mechanisms and stereochemistry, elimination reactions and carbonyl group reactivity, substitution and addition reactions and chemical biology. The practical course covers the same topics and aims to develop manipulative and technical laboratory skills.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Tutorials:** One tutorial per week, by arrangement.

**Practicals:** One practical per week, Thursday, 13h30-17h00.

**DP requirements:** Attendance and completion of practicals, tests and tutorial exercises and at least 50% for the class record.

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**Assessment:** Class record (comprising tests and practicals) counts 50%; one 2-hour paper written in November counts 50%. It is necessary to pass the theory examination and the whole course in order to secure an overall pass.

### Third-Year Courses

CEM3005W is the required course for students completing a major in Chemistry.

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#### CEM3005W CHEMISTRY 3005

**NQF credits:** 72 HEQS-F at level 7

**Convener:** Professor M R Cairn

**Course entry requirements:** CEM2007F and CEM2008S, 1000-level full course in Mathematics; completion of or concurrent registration for STA1000F/S is highly recommended.

**Course outline:**

This final course for the Chemistry major aims to develop understanding and integrated knowledge of the core disciplines in Chemistry. Lecture material includes topics in wave mechanics and spectroscopy, adsorption and heterogenous catalysis, solid state chemistry and X-ray crystallography, dynamics, inorganic reaction mechanisms, organometallic chemistry, further topics in organic structure and reactivity, organic synthesis and organic dynamic stereochemistry. The practical course covers the same topics and aims to develop integrative and interpretive skills. A further aim is to develop skills on writing within the discipline, as well as introducing students to modern research methods.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Practicals:** Two practicals per week, Wednesday and Friday, 14h00-17h00.

**DP requirements:** Attendance and completion of practicals, tests and tutorial exercises and at least 50% for the class record.

**Assessment:** Class record (comprising tests, writing project and practicals) counts 50% and two 3-hour papers written in November count 50% towards the final mark. It is necessary to pass the theory examination and the whole course to secure an overall pass.

### Postgraduate Courses

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#### CEM4000W BSc HONOURS IN CHEMISTRY

**NQF credits:** 160 HEQS-F at level 8

(includes a research project of 66 credits)

*NOTE: Entrance is limited to 16 students*

**Convener:** Professor T J Egan

**Course entry requirements:** A BSc degree (or equivalent) with a major in Chemistry at a sufficiently high standard to satisfy the Head of Department. Entrance to the Honours course is competitive and applications are considered individually, taking into consideration the entire academic record. Priority will be given to UCT graduates, who require 60% or higher in CEM3005W as the normal minimum prerequisite for admission. Applicants from other universities must satisfy the Honours steering committee that they have covered the same topics at the equivalent level.

**Course outline:**

The Honours course is designed to enrich understanding of chemical theory, while developing skills in the modern research techniques and approaches required of the professional Chemist. The course has several components:

*Modern instrumental methods and group theory* are taught through experiential workshops and lectures covering topics in NMR spectroscopy, X-ray methods of analysis, separation methods, electrochemical techniques, group theory and molecular modelling methods.

The *core lecture course* provides the conceptual tools required in modern inorganic, organic and physical chemistry. Topics covered include aqueous coordination chemistry, organometallic

chemistry, bioinorganic chemistry and catalysis (inorganic chemistry), organic synthesis, the third dimension in organic reactions, asymmetric synthesis and advanced reagents (organic chemistry), as well as statistical thermodynamics, quantum chemistry, solid state chemistry and the chemistry of liquids (physical chemistry).

A 14-week *research project* caps the course. Each student chooses a research project of personal interest. After presentation of a full research proposal, the student engages in 10 weeks of full-time research work which culminates in the presentation of a short dissertation, a research poster and an oral presentation to the Department. Training in oral communication is provided during this period.

**Lectures:** By arrangement. Lectures, tutorials and practicals start at the end of January. Lectures and tutorials are daily in the first three periods and at other times arranged. Practical work and other activities occupy three afternoons per week during the first semester and all day all week during the second semester.

**Assessment:** Examinations count 33%, coursework 26% and the Honours research project 41%. To pass the Honours course candidates must obtain an overall average of 50%, an average of 45% for the Core Course written examinations with a subminimum of 33% on each individual paper of the Core Course examinations. In addition, candidates must attain at least 50% for the research project, complete the Modern Instrumental Methods and Group Theory module, all practical work, tutorial assignments, generic skills course and any other compulsory activities.

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### CEM500W MASTERS IN CHEMISTRY

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of the handbook.

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### CEM504W MASTERS IN TERTIARY CHEMISTRY EDUCATION

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of the handbook.

**CEM6000W** PhD IN CHEMISTRY

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates for the PhD degree must submit a thesis on an approved research topic, and are referred to Book 3, General Rules and Policies, in which the rules for the degree are set out.

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**CEM6001W** PhD IN TERTIARY CHEMISTRY EDUCATION

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates for the PhD degree must submit a thesis on an approved research topic, and are referred to Book 3, General Rules and Policies, in which the rules for the degree are set out.

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## DEPARTMENT OF COMPUTER SCIENCE

The Department is housed in the Computer Science Building, 18 University Avenue  
Telephone (021) 650-2663 Fax (021) 689-3551  
The Departmental abbreviation for Computer Science is CSC.

**Associate Professor and Head of Department:**

S Berman, BSc *Rhodes* MSc PhD *Cape Town*

**Professors:**

E H Blake, BSc Hons *Wits* PhD *London*

G Marsden, BSc Hons PhD *Stirling*

**Associate Professor:**

J E Gain, MSc *Rhodes* PhD *Cantab*

M Kuttel, MSc PhD *Cape Town*

P C Marais, MSc *Cape Town* DPhil *Oxon*

H Suleman, MSc *UDW* PhD *Virginia Tech*

**Senior Lecturers:**

A Kayem, MSc *Yaoundé* PhD *Queens*

A Mbogho, MS PhD *City Univ of New York*

G Nitschke, BSc Hons *Curtin* PhD *VU Amsterdam*

**Lecturer:**

G Stewart BSc Hons *Cape Town*

**Honorary Professor:**

J Bishop, BSc Hons *Rhodes* MSc *Natal* PhD *Southampton*

**Adjunct Professor:**

A C M Hutchison, MSc HDE (PG) *Sec Cape Town* PhD *Zurich*

**Computer System Manager:**

C Balfour, BSocSc *Cape Town* BA (SS) Hons *UNISA*

S Chetty

**Administrative Officer:**

S Valley

**Administrative Assistant:**

E M Gill

**Senior Secretary:**

T Jenneker

**Departmental Assistant:**

B J Sam

### RESEARCH IN COMPUTER SCIENCE

Research in the Department is organised into well-equipped laboratories funded by international, governmental and industrial sponsors. More information can be obtained by writing to the department or on the Departmental Web pages.

COLLABORATIVE VISUAL COMPUTING (Co-ordinator: Associate Professor J Gain). Topics of research include: Collaborative Virtual Environments; Usability and Human-Computer Interaction; Computer Graphics; Image Analysis applied to Medical Images; Virtual Reality and Behavioural Therapy; allowing end-users to create interesting virtual environments; Interaction with Mobile Computing Devices; Scalable Interfaces; and implications of these for Government Information Technology Policy. Special interests within the CVC lab include Socially Aware Computing, VR Methodology, Virtual Environments, Modelling and Procedural Graphics.

DIGITAL LIBRARIES (Co-ordinator: Associate Professor H Suleman). Research areas covered within digital libraries include information storage and retrieval; multilingual retrieval; Web-based systems; scalable and flexible repositories; interoperability and protocols; component-based systems; Open Access; and cultural heritage preservation.

**HIGH PERFORMANCE COMPUTING** (Co-ordinator: Associate Professor M Kuttel). This laboratory hosts investigations into all aspects of high performance and high throughput computing, including: parallel architectures and algorithms; scientific computing; high performance visualisation; large-scale information retrieval; high-performance digital archives; grid and volunteer computing; software optimization; and multi-core and GPU programming.

**ICT FOR DEVELOPMENT CENTRE** (Director: Professor G Marsden). The UCT Centre in ICT for Development seeks to create ICTs that are appropriate for developing nations. To date, most innovation in ICT has been driven by the developed world to meet challenges originating from that context. This centre will design, create and evaluate technologies that address the needs of the developing world and the people who live there.

**NETWORK AND INFORMATION SECURITY** (Co-ordinator: Dr A Kayem). Artificially Intelligent Security Mechanisms: this group aims to design security mechanisms that can adapt automatically to changes in security policies; research includes service oriented architectures, database security and autonomic computing. Computer Network Security: this group aims to design and implement network security protocols to address problems of security in web services, cloud computing environments and enterprise environments; research includes goal-oriented protocol design and identity management.

## Undergraduate Courses

### First-Year Courses

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#### CSC1010H COMPUTER SCIENCE 1010

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Mr G Stewart

**Course entry requirements:** The permission of the Dean or Head of Department is required prior to registration for this course.

**NOTE:** Credit will not be given for CSC1015F and CSC1016S together with any of the following: CSC1010H, CSC1011H.

**Course outline:**

*This course only begins in week 7 and is intended for students who have been advised to transfer to this course after initially registering for CSC1015F (see entry for CSC1015F). It places an emphasis on the strengthening of foundational concepts and skills, the carefully-paced introduction of new material, and the development of sound approaches to effective learning. Note that CSC1010H is equivalent to CSC1015F in level, credit value and as prerequisite for certain other courses.*

This course is an introduction to problem solving, algorithm development and programming in the Python language. It includes fundamental programming constructs and abstractions, sorting and searching techniques, and machine representations of data. The practical component covers input/output, conditionals, loops, strings, functions, arrays, lists, dictionaries, recursion, text files and exceptions in Python. Students are taught testing and debugging, as well as sorting and searching algorithms, algorithm complexity and equivalence classes. Number systems, binary arithmetic, boolean algebra and logic gates are also introduced.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 This includes one tutorial per week.

**Practicals:** One practical per week, Thursdays, 14h00-17h30.

**DP requirements:** Minimum of 45% aggregate in practical work.

**Assessment:** Theory tests count 15%; practical tests and practical assignments count 25%; one 3-hour paper written in November counts 60%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

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**CSC1011H** COMPUTER SCIENCE 1011**NQF credits:** 18 HEQS-F at level 5**Convener:** Mr G Stewart**Course entry requirements:** CSC1010H, MAM1005H**Course outline:**

The first half of the course aims to further develop problem solving and programming in Python. The second half focuses on object-oriented design and programming in Java, as well as introducing important considerations relating to ethical and professional issues. The latter introduces students to ethical issues such as property rights, freedom of expression and privacy, and concepts such as free and open source software, ICT for Development, and Professional Codes of Conduct. The Java component of the course covers object-oriented design techniques and UML class diagrams, as well as elementary data structures such as lists, stacks and queues. The practical component includes use of inheritance, polymorphism, interfaces, generics and GUI programming in Java.

**Period****Mon Tue Wed Thu Fri****Lectures:** 4 4 4 4 This includes one tutorial per week**Practicals:** One practical per week, Mondays, 14h00-17h30.**DP requirements:** Minimum of 45% aggregate in practical work.**Assessment:** Theory tests count 25%; practical tests and practical assignments count 25%; one 3-hour paper written in November counts 50%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

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**CSC1015F** COMPUTER SCIENCE 1015**NQF credits:** 18 HEQS-F at level 5**Convener:** Associate Professor H Suleman**Course entry requirements:** At least 70% for NSC Mathematics

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to CSC1010H from week 7.*

**Course outline:**

This course is an introduction to problem solving, algorithm development and programming in the Python language. It includes fundamental programming constructs and abstractions, sorting and searching techniques, and machine representations of data. The practical component covers input/output, conditionals, loops, strings, functions, arrays, lists, dictionaries, recursion, text files and exceptions in Python. Students are taught testing and debugging, as well as sorting and searching algorithms, algorithm complexity and equivalence classes. Number systems, binary arithmetic, boolean algebra and logic gates are also introduced.

**Lectures:** 4th or 5th period daily. This includes one tutorial per week.**Practicals:** One practical per week, Monday, Tuesday or Wednesday, 14h00-17h30.**DP requirements:** Minimum of 45% aggregate in practical work.**Assessment:** Theory tests count 15%; practical tests and practical assignments count 25%; one 2-hour paper written in June counts 60%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

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**CSC1016S** COMPUTER SCIENCE 1016**NQF credits:** 18 HEQS-F at level 5**Convener:** Associate Professor H Suleman**Course entry requirements:** CSC1015F (or supp for CSC1015F)

**Course outline:**

This course builds on the foundation of CSC1015F/CSC1010H, with a focus on object-oriented design and programming in Java, as well as introducing important considerations relating to ethical and professional issues. The latter introduces students to ethical issues such as property rights, freedom of expression and privacy, and concepts such as free and open source software, ICT for Development, and Professional Codes of Conduct. The Java component of the course covers object-oriented design techniques and UML class diagrams, as well as elementary data structures such as lists, stacks and queues. The practical component includes use of inheritance, polymorphism, interfaces, generics and GUI programming in Java.

**Lectures:** 4th or 5th period daily. This includes one tutorial per week.

**Practicals:** One practical per week, Monday, Tuesday or Wednesday, 14h00-17h30.

**DP requirements:** Minimum of 45% aggregate in practical work.

**Assessment:** Theory tests count 15%; practical tests and practical assignments count 25%; one 2-hour paper written in November counts 60%. Subminima: 45% for practicals and 45% on weighted average of theory tests and examination.

## Second-Year Courses

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### CSC2001F COMPUTER SCIENCE 2001

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr A Mbogho

**Course entry requirements:** CSC1016S or CSC1011H, MAM1000W or equivalent. It is STRONGLY recommended that students register concurrently for second-year courses in Mathematics, Applied Mathematics or Statistics.

**Course outline:**

This course builds on the first year Computer Science foundation with an emphasis on data storage and manipulation. The course covers abstract data types and assertions, recursive algorithms, tree structures such as AVL and B-trees, graph traversals, minimum spanning trees, sets, hashing and priority queues. An introduction to conceptual modelling, database design and relational database manipulation is included. Practical programming in Java in a Unix environment is an important part of the course

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2 Four or five lectures per week.

**Practicals:** One 4-hour practical per week, Monday to Friday, 14h00-18h00.

**DP requirements:** Minimum of 45% aggregate in practical work.

**Assessment:** Tests count for 16.7%; practicals count 33.3%; one 3-hour paper written in June counts 50%. Subminima: 45% on weighted average of theory tests and examination.

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### CSC2002S COMPUTER SCIENCE 2002

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr A Mbogho

**Course entry requirements:** CSC2001F (or supp for CSC2001F), MAM1000W or equivalent. It is strongly recommended that students register concurrently for second-year courses in Mathematics, Applied Mathematics or Statistics.

**Course outline:**

The goal of this course is to complete the basic education of a Computer Scientist. Mobile application development and interface design on the one hand, and an introduction to computer architecture on the other hand, are complemented by developing students' knowledge and skills in concurrent programming and multicore computers. Practical work in Java and in assembler programming are included.



**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	2	2	2	2	2	Four lectures per week.
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**Practicals:** One 4-hour practical per week, Monday to Friday, 14h00-18h00.

**DP requirements:** Minimum of 45% aggregate in practical work and minimum of 50% in practical test.

**Assessment:** Tests count for 16.7%; practicals and practical test count 33.3%; one 3-hour paper written in November counts 50%. Subminima: 45% on weighted average of theory tests and examination.

**CSC2003S COMPUTER GAMES**

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Associate Professor P Marais

**Course entry requirements:** CSC2001F, MAM1000W or equivalent.

**Course outline:**

This course introduces high-level game programming concepts and practical game construction. By the end of the course, students will be able to design and implement simple 2D games. The course begins with a basic introduction to games and game genres for students unfamiliar with gaming, before exploring the game development process. Appropriate terminology, methods, and tools for computer game development are introduced. Fundamentals algorithms for 2D game development and implementation are covered, including pathfinding algorithms suited to tile-based games. Text-based games are also briefly explored using Inform7. This is a practical course where students design and implement games using GameMaker for simple prototyping, before switching to a Java-based game engine which students can extend. The final deliverable is a fully functional 2D game which implements many of the techniques explored in lectures.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	3	3	3	3	3	Four lectures and 1 tutorial per week.
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**Practicals:** One 4-hour practical per week, Monday to Friday, 14h00-18h00.

**DP requirements:** Minimum of 45% aggregate in practical work, minimum of 50% in practical test and minimum of 40% in theory tests.

**Assessment:** Tests count for 16.7%; practicals, practical test and projects count 33.3%; one 3-hour paper written in November counts 50%. Subminima: 45% on weighted average of theory tests and examination.

**Third-Year Courses****CSC3002F COMPUTER SCIENCE 3002**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Professor E Blake

**Course entry requirements:** CSC2001F and CSC2002S. It is strongly recommended that students should have completed a second-year course in Mathematics, Applied Mathematics or Statistics.

**Course outline:**

The course provides an introduction to the three topics (1) structure and organization of operating systems; (2) introduction to functional languages and their basis in the  $\lambda$ -calculus. The approach has new relevance with the rise of multiple processors in computing; (3) a basic knowledge of computer networks. The course will take the student through the various logical layers of the Internet protocol suite.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	2	2	2	2	2
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**Practicals:** Two 4-hour practicals per week, Monday to Friday, 14h00-18h00.

**DP requirements:** Minimum of 45% aggregate in practical work.

**Assessment:** Tests count 15%; practical work counts 35%; one 3-hour paper written in June counts 50%. Subminima: 45% for practicals; 45% on weighted average of theory tests and examinations.

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### **CSC3003S** COMPUTER SCIENCE 3003

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Professor E Blake

**Course entry requirements:** CSC2001F and CSC2002S, and either INF2009F or permission from the Head of Department.

**Course outline:**

This is a course on three advanced topics (1) advanced software design is about turning requirements into effective and efficient implementations in a systematic manner; (2) the compilers module is aimed at exposing students to the theory and practice of parsing and translating high level programming languages into executable code; (3) the algorithms module expands on a topic central to computing. This module describes how algorithms are categorised, and shows interesting algorithms in each category and analyses their complexity. It also touches on Turing machines and the limits of computation.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Practicals:** Two 4-hour practicals per week, Monday to Friday, 14h00-18h00.

**DP requirements:** Minimum of 45% aggregate in practical work.

**Assessment:** Tests count 15%; practical work counts 35%; one 3-hour paper written in November counts 50%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

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### **CSC3020H** THREE DIMENSIONAL & DISTRIBUTED GAMES DESIGN

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor P Marais

**Course entry requirements:** CSC2001F, CSC2002S and CSC2003S.

**Course outline:**

This course covers design and development of simple 3D and networked games. The course describes the game development processes and introduces key terminology, methods, and tools of computer gaming. It includes Game Design, 3D Computer Graphics and software agents that can adapt to uncertain and constantly changing gaming environments, as well as techniques for multi-user and distributed games. This is a practical course: students collaborate with designers and artists to produce a full 3D multi-play game which builds on concepts covered in lectures.

**Lectures:** CSC3020H and CSC3022H together occupy 3<sup>rd</sup> period daily

**Practicals:** 4 hours per week, by arrangement

**DP requirements:** Minimum of 45% aggregate in practical work.

**Assessment:** Tests count 16.7%; practical work counts 33.3%; examinations count 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations.

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**CSC3022H C++ WITH APPLICATIONS****NQF credits:** 36 HEQS-F at level 7**Convener:** Associate Professor P Marais**Course entry requirements:** CSC2001F, CSC2002S**Course outline:**

This course introduces the C++ programming language, followed by a practical exploration of topics in machine learning using C++. Students learn how to use features such as templates and basic concurrency, and a detailed treatment of the C++ memory model is also covered. A number of machine learning algorithms are introduced and students implement a subset of these in C++. By the end of the course, students should understand how to write efficient object-oriented programs in C++, be familiar with major categories of learning algorithms, and be able to select and implement the most appropriate algorithm for a given problem.

**Lectures:** CSC3020H and CSC3022H together occupy 3<sup>rd</sup> period daily**Practicals:** 4 hours per week, by arrangement**DP requirements:** Minimum of 45% aggregate in practical work.**Assessment:** Tests count 16.7%; practical work counts 33.3%; examinations count 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations.

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**EEE3078W DIGITAL, EMBEDDED & ADAPTIVE SYSTEMS****NQF credits:** 44 HEQSF credits at level 7**Convener:** Mr S Ginsberg**Course entry requirements:** CSC2001F, CSC2002S, EEE2040F or equivalent.**Course outline:**

This course comprises EEE3064W: Digital Electronics & Microprocessors, EEE3074W: Embedded Systems and EEE4096S: Neural Fuzzy & Evolving Systems, taken together as a single course. Refer to the Engineering and the Built Environment Faculty handbook for further details.

**Lectures:** EEE3064W has 48 lectures and 8 practicals; EEE3074W has 48 lectures, 6 practicals and projects. EEE4096S has 24 lectures and project(s). Refer to department.

**DP requirements:** Satisfactory completion of coursework in EEE3064W, *as well as* completion of all practical reports and project report in EEE3074W; 80% submission of all assignments and satisfactory completion of a hands-on proficiency test in EEE4096S.

**Assessment:** Final mark for EEE3064W counts 36%, final mark for EEE4096S counts 18% and final mark for EEE3074W counts 46%.

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**Postgraduate Courses****CSC4000W BSc HONOURS IN COMPUTER SCIENCE****NQF credits:** 160 HEQS-F credits at level 8

(includes research project of 60 credits)

*NOTE: Combined entry to CSC4000W and CSC4016W is limited to 45 students.***Convener:** Dr A Kayem**Course entry requirements:** Students must have a BSc degree in Computer Science from UCT, with an average of at least 60% in CSC3002F and CSC3003S**Course outline:**

The modules offered may vary from year to year but will typically be a selection from: Research Methods (compulsory), New Venture Planning (compulsory), Distributed Systems, Database Systems, Mobile Interaction Design, ICT for Development, Computer Graphics, Network Security, Digital Libraries, Biologically Inspired Computing, Image Processing and Computer Vision, Games and Virtual Environments, Intelligent Systems Design, Parallel and Multicore Computing, Wireless Sensor Networks. Some courses may also be taken from other departments, with approval of the Honours course convener. A major research project makes up 60 credits and the remaining 100

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credits is calculated from the coursework modules. A pamphlet outlining the year's programme is available from the Department (and at <http://www.cs.uct.ac.za/teaching>).

**DP requirements:** Students will only be allowed to proceed with the second semester if, by the end of the first semester, they have an overall average of 50% in their coursework having gained credit for at least 60 credits of coursework (including compulsory modules).

**Assessment:** Project mark counts 38% of the total (60 credits). The remaining 62% of the mark (100 credits) is calculated from the best modules taken. They must include Research Methods and New Venture Planning. No module will be considered for course credits unless a student has obtained at least 40% in that module.

**Subminima:** At least 50% must be achieved in the Project. At least 40% must be achieved in the Research Methods and New Venture Planning modules. An average mark of at least 50% must be attained in the modules making up the best 100 course credits. The final mark, calculated as explained above, must not be less than 50%.

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### CSC4016W BSc HONOURS IN INFORMATION TECHNOLOGY

**NQF credits:** 160 HEQS-F credits at level 8

(includes research project of 60 credits)

*NOTE: Combined entry to CSC4000W and CSC4016W is limited to 45 students*

**Convener:** Dr A Kayem

**Course entry requirements:** Entrance requirement is a Bachelors degree with a major in Computer Science or related field. Students must have an average of at least 60% in the major. Priority will be given to students meeting the requirements for CSC4000W. Acceptance will be at the discretion of the Head of Department who will consider quality of final year results and material covered in the undergraduate curriculum.

**Course outline:**

The modules offered may vary from year to year but will typically be a selection from: Research Methods (compulsory), New Venture Planning (compulsory), Distributed Systems, Database Systems, Mobile Interaction Design, ICT for Development, Computer Graphics, Network Security, Digital Libraries, Biologically Inspired Computing, Image Processing and Computer Vision, Games and Virtual Environments, Intelligent Systems Design, Parallel and Multicore Computing, Wireless Sensor Networks. Some courses may also be taken from other departments, with approval of the Honours course convener. A major research project makes up 60 credits and the remaining 100 credits is calculated from the coursework modules. A pamphlet outlining the year's programme is available from the Department (and at <http://www.cs.uct.ac.za/teaching>).

**DP requirements:** Students will only be allowed to proceed with the second semester if, by the end of the first semester, they have an overall average of 50% in their coursework having gained credit for at least 60 credits of coursework (including compulsory modules).

**Assessment:** Project mark counts 38% of the total (60 credits). The remaining 62% of the mark (100 credits) is calculated from the best modules taken. They must include Research Methods and New Venture Planning. No module will be considered for course credits unless a student has obtained at least 40% in that module.

**Subminima:** At least 50% must be achieved in the Project. At least 40% must be achieved in the Research Methods and New Venture Planning modules. An average mark of at least 50% must be attained in the modules making up the best 100 course credits. The final mark, calculated as explained above, must not be less than 50%.

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### MAM4007W BSc HONOURS IN MATHEMATICS OF COMPUTER SCIENCE

See details under the Department of Mathematics and Applied Mathematics.

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**CSC5000W MASTERS IN COMPUTER SCIENCE**

**NQF credits:** 180 HEQS-F credits at level 9

**Convener:** Dr G Nitschke

**Course entry requirements:** A relevant Honours degree or four year equivalent.

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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**CSC5001W and CSC5002W MASTERS IN COMPUTER SCIENCE**

(by coursework and minor dissertation)

Coursework: **NQF credits:** 90 HEQS-F at level 9

Minor dissertation: **NQF credits:** 90 HEQS-F at level 9

**Convener:** Dr G Nitschke

**Course entry requirements:** A relevant Honours degree or four year equivalent.

**Course outline:**

Candidates are required to complete coursework (CSC5001W) involving studies in database theory, computer networks and protocols, artificial intelligence, computer graphics, distributed computing and software engineering, at the end of which they will sit formal examinations. They are required also to submit a minor dissertation (CSC5002W) for formal examination and which counts half of the requirements for the degree. The course lasts at least one year.

**Assessment:** Coursework modules are assessed by a combination of practical work and examination. All modules contribute equally to the final coursework mark, which counts 50% of the final degree requirement, with the other 50% provided by the minor dissertation. Both the coursework component and the minor dissertation must be passed for the degree to be awarded.

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**CSC5005H, CSC5006H, CSC5004W MASTERS IN INFORMATION TECHNOLOGY**

(by coursework and minor dissertation)

Coursework: **NQF credits:** 90 HEQS-F credits at level 9

Minor Dissertation: **NQF credits:** 90 HEQS-F credits at level 9

**Convener:** Associate Professor S Berman

**Course entry requirements:** An Honours degree or 4-year equivalent plus access to the Internet.

**Course outline:**

CSC5005H and CSC5006H together constitute the coursework component. CSC5005H comprises 4 modules selected from the following: Object-oriented programming; Human-Computer Interaction; Databases; Networks; Web Programming; Software Engineering; Cyberlaw and Ethics; Research Methods. CSC5006H comprises the remaining 4 modules, i.e. excluding modules for which credit was received in CSC5005H. All study is via on-line self-study materials. CSC5004W consists of a one year research project submitted as a minor dissertation for formal examination.

**Assessment:** In CSC5005H and CSC5006H assignments count 30% and the examination 70%. A subminimum of 40% for examinations is required in each of CSC5005H and CSC5006H. A module

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can be repeated once only; two unsuccessful attempts constitute a fail. A student who accumulates two failed modules cannot continue in Masters in Information Technology. To pass each course an overall average of at least 50% is required. Both the coursework components and minor dissertation must be passed for the degree to be awarded.

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### **CSC6000W** PhD IN COMPUTER SCIENCE

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field.. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE

The Department is housed in the Shell Environment & Geographical Science Building, South Lane  
Telephone (021) 650-2874 Fax (021) 650-3456

The Departmental abbreviation for Environmental & Geographical Science is EGS.

**Professor and Head of Department:**

M E Meadows, BSc Hons *Sussex* PhD *Cantab* FSSAG

**South African Research Chair in Climate Change:**

B C Hewitson, BSc *Cape Town* MSc PhD *Penn State*

**Professor:**

S M Parnell, MA PhD *Wits*

**Associate Professors:**

S E Oldfield, BA (Hons) *Syracuse* MA PhD *Minnesota*

M F Ramutsindela, MA *UNIN* PhD *London*

M R Sowman MSc PhD *Cape Town*

**Professor and South African Research Chair in Environmental and Social Dimensions of the Bio-economy**

R P Wynberg, BSc Hons MSc MPhil *Cape Town* PhD *Strathclyde*

**Senior Lecturers:**

B J Abiodun, MTech *FUTA* PhD *Uppsala*

F D Eckardt, BSc Hons *KCL* MSc *Cranfield* DPhil *Oxon*

R C Hill, BSc (Eng) *Cape Town* Pr Eng PhD *Cape Town*

Z Patel, MSc *Natal* PhD *Cantab*

G Ziervogel, BSc Hons *Rhodes* DPhil *Oxon*

**Lecturers:**

P Anderson, BSc Hons PhD *Cape Town*

S Daya, MA PhD *Durham*

K J Winter, BA (Hons) *Cape Town* MA *London* PhD *Cape Town*

**Emeritus Professor:**

R F Fuggle, BSc Hons UED *Natal* MSc *Louisiana* PhD *McGill*

**Honorary Professors:**

J Boardman, BSc Hons PhD *Cantab*

J Crush, MA *Cantab* MA *Laurier* PhD *Queens*

D S G Thomas, MA PhD *Cantab*

**Honorary Research Fellow:**

L Nathan BBus Sci/LLB *Cape Town* MPhil *Bradford* PhD *LSE*

**Chief Technical Officer:**

C Jack BSc Hons PhD *Cape Town*

**Administrative Officer:**

S Adams

**Senior Secretary:**

S Samsodien

**Librarian:**

S Reddy, BA PGDipLIS MPhil (Adult Educ) *Cape Town*

**Laboratory Departmental Assistant:**

S Hess

**Library Assistant:**

T George

**ENVIRONMENTAL EVALUATION UNIT**

**Director:**

M R Sowman, MSc PhD *Cape Town*

**Deputy Director:**

R P Wynberg, BSc Hons MSc MPhil *Cape Town* PhD *Strathclyde*

**Honorary Research Associate:**

D Fig, BA *Cape Town* BSc Hons PhD *LSE*

M Hauck, BA (Hons) *Alberta* MA PhD *Cape Town*

**Post-Doctoral Researcher:**

S Raemaekers, MSc *Ghent* PhD *Rhodes*

**Researchers:**

P Mbatha, BSocSc (Hons) MSocSci *Cape Town*

J Sunde, BSc Hons *Cape Town* MA *York*

J van Niekerk, BSc Hons *Stellenbosch* MPhil *Cape Town*

S Williams, BA (Hons) MA *UWC*

**Office Manager:**

A Arendse

**Secretary:**

F Hartley

**CLIMATE SYSTEMS ANALYSIS GROUP**

**Director:**

B C Hewitson, BSc *Cape Town* MSc PhD *Penn State*

**Researchers:**

L Coop, BSc Hons MSc *Cape Town*

O Crespo, MSc *Montpellier II* PhD *Toulouse III*

P Johnston, BSc Hons HDE *Stell* MSc PhD *Cape Town*

C Lennard, BSc Hons MSc PhD *Cape Town*

A Steynor, BSc Hons MSc *Cape Town*

K Sutherland, MSc *NMMU*

M Tadross, BSc Hons *Newcastle* PhD *Cantab*

R Walawege, BSc Hons MSc *Cape Town*

P Wolksi, MSc *Krakow* PhD *Free University*

**IT Support:**

R Duffet

C Jack BSc Hons PhD *Cape Town*

P Mukwena

**Administrative Assistants:**

S Barnard

V Mafanya

**RESEARCH IN ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE**

Research in Environmental and Geographical Science embraces a variety of topics that are listed below. More detailed information can be obtained by writing to the Department of Environmental and Geographical Science or by consulting the departmental website, [www.egs.uct.ac.za](http://www.egs.uct.ac.za).

The Department undertakes research into numerous aspects of the environment, but is particularly involved in studies of environmental change and human-environment interactions. There is an active graduate programme. An 18-month Master's degree in Environment, Society and Sustainability is organised and taught within the Department, and research for higher degrees is also supervised in the more traditional way. There are postgraduate programmes in Environmental & Geographical Science by coursework and dissertation.

Of major interest is the identification and evaluation of environmental problems, along with the assessment of environmental impacts. The Environmental Evaluation Unit of the Department is active in projects which involve assessing the impact of development projects on the biophysical and



social environment.

The problem of urbanization in Africa provides a focus for staff engaged in an analysis of the process in both contemporary and historical contexts. Biogeographical research is also pursued by staff and research students. The ways in which environmental change and human activities have shaped the landscape and vegetation patterns of southern Africa are interpreted through palaeoecological, remote sensing and geomorphological studies. The Department houses a large reference collection of pollen slides and photographs which is used in reconstructing former vegetation types. Research in climatology focuses on Southern Hemisphere climate variability, regional implications of global climate change, climate modelling, precipitation controls, satellite climatology, and mesoscale meteorology.

## Undergraduate Courses

### Field work

All students attending courses in Environmental & Geographical Science are required to take part in field work arranged during the year.

## First-Year Courses

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### AGE1004H INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES

**NQF credits:** 18 HEQS-F at level 5

See course details under the Department of Archaeology.

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### GEO1009F INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES

See course details under the Department of Geological Sciences.

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### EGS1003S GEOGRAPHY, DEVELOPMENT & ENVIRONMENT

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Associate Professor M F Ramutsindela

**Course entry requirements:** Geography at NSC level 4 or GEO1009F (or ERT1000F)

#### Course outline:

The course introduces students to development and environment debates in geography, by exploring the geography of third world development, focusing on the historical roots and spatial patterns that underpin development.

#### Period

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	2	2	2	2	2

**Practicals:** One practical or tutorial per week, Monday, Tuesday or Thursday, 14h00-17h00.

**Fieldwork:** There is a compulsory fieldwork component involving half-day field excursions.

**DP requirements:** Attendance and satisfactory completion of practicals, including fieldwork, and tutorial assignments; students must attain an average mark of not less than 40% for the coursework component.

**Assessment:** Essays, a class test, practical assignments (including fieldwork) and tutorial work count 50%; one 2-hour theory paper written in November counts 50% (subminimum of 40% required).

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### EGS1004S INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES

**NQF credits:** 18 HEQS-F at level 5

*NOTE: EGS1004S is a tutorial-based reinforcement of GEO1009F, offered to students who fail but gain a DP in or are awarded a supplementary for GEO1009F. Credit will not be given for both GEO1009F and EGS1004S. No supplementary examination will be offered.*

**Convener:** Ms W Black

**Course entry requirements:** DP in GEO1009F.

**Course outline:**

*This course is a tutorial-based reinforcement of GEO1009F, offered to students who fail but gain a DP in or are awarded a supplementary for GEO1009F.* It aims to develop a broad understanding of how Earth works, leading to majors in Archaeology, Environmental & Geographical Sciences, Geology and Ocean & Atmosphere Science. The course covers the following general topics: Structure and dynamics of the Earth; stratigraphy and geological history; climatology; surface processes and evolution of landscapes; biogeography; humans and the environment.

**Tutorials:** One tutorial per week, Friday, 14h00-17h00.

**Assessment:** Marked classwork counts 40%; one 3-hour theory examination written in November counts 45%; one 1-hour practical examination written in November counts 15%. Subminima of 40% are required in practical and theory examination papers.

## Second-Year Courses

### EGS2013F THE PHYSICAL ENVIRONMENT

**NQF credits:** 24 HEQS-F credits at level 6

**Convener:** Dr F Eckardt

**Course entry requirements:** GEO1009F or EGS1004S

**Course outline:**

The course focuses on contemporary Atmosphere-Earth surface interactions, in particular the role of precipitation and water from a global to a regional scale and examines temporal dynamics, driven by natural process as well as anthropogenic pressures. It covers in detail global circulation patterns, climate variability, soil formation, polar response to climate change, tropical deforestation, desertification and earth observation technology. It concludes with a detailed study of local scale systems and applications covering stream catchments, estuaries, wetlands and coastlines. It is expected that students will enhance their understanding of Earth system dynamics, systems interactions and develop an appreciation for scales both temporal and spatial. Students are also expected to put the local context into a regional setting and make linkages to the larger global picture.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Practicals:** One practical per week, Friday, 14h00-17h00.

**Fieldwork:** There is a compulsory fieldwork component involving half-day field excursions.

**DP requirements:** Satisfactory completion of practicals and all written assignments, including projects, fieldwork reports, practicals, essays and class tests. Students must attain an average mark of not less than 40% for the coursework.

**Assessment:** Project, essays, class tests and practical assignments including fieldwork report count 50%; one 3-hour examination written in June count 50% (subminimum of 40% required).

### EGS2014S CONTEMPORARY URBAN CHALLENGES

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Professor S Parnell

**Course entry requirements:** For BSc: EGS1003S; For BA or BSocSc: EGS1003S or Social Science Foundation course and two full first year Humanities courses, or equivalent.

**Course outline:**

This course draws together historical and contemporary analysis of social, political, economic and environmental dimensions of the South African city. This conceptual material is grounded in field-based experiential learning in Cape Town.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	5	5	5	5	5
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**Practicals:** One practical or tutorial per week, Friday, 14h00-17h00.

**Fieldwork:** There is a compulsory fieldwork component involving half-day field excursions.

**DP requirements:** Attendance and satisfactory completion of practical including fieldwork and tutorial assignments; students must attain an average mark of not less than 40% for the coursework.

**Assessment:** Essays, a class test, practical assignments based on compulsory fieldwork and tutorial work count 50%; one 3-hour theory paper written in November counts 50% (subminimum of 40% required).

## Third-Year Courses

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### EGS3012S ATMOSPHERIC SCIENCE

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr B J Abiodun

**Course entry requirements:** GEO1009F or equivalent, EGS2013F or SEA2004F (or SEA2002S or SEA2003F) or approved 2000-level Science course or any 1000-level Physics course.

**Course outline:**

This course aims to provide a thorough understanding of the climate system, including the following topics: atmospheric energy balance; winds and circulations; clouds and cloud formation; thermodynamics; rainfall and weather systems in the tropics and midlatitudes; general circulation of the atmosphere; South African weather and climate; droughts and floods.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	1	1	1	1	1
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**Practicals:** One practical per week, Tuesday or Wednesday, 14h00-17h00.

**DP requirements:** Satisfactory completion of practicals and all written assignments, including essays, project reports and class tests.

**Assessment:** Essays and tests count 20%; project reports and practicals count 20%; one 3-hour examination in November counts 60% (subminimum of 40% required).

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### EGS3020F ENVIRONMENTAL CHANGE & CHALLENGE

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Professor M E Meadows

**Course entry requirements:** EGS2013F

**Course outline:**

The course explores the nature of physical environmental change as manifested through processes associated with biological, physical and human components of ecosystems with a focus on southern Africa. The recent geological past (the late Quaternary) provides a longer term perspective that enables recent and contemporary environmental changes to be placed in context. The nature and extent of human impact on landscapes is examined along with a consideration of how conservation efforts are applied in order to mitigate these changes. Environmental change is conceptualised as geohazard; and disaster risk and disaster risk profiling is introduced at the regional and local scale. The course further considers key land surface processes in a range of environments and how these respond to environmental dynamics.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	5	5	5	5	5
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**Practicals:** One practical per week, Thursday, 14h00-17h00.

**Fieldwork:** There is a compulsory four day residential field trip during the University vacation.

**DP requirements:** Attendance at residential fieldwork during a University vacation is compulsory; satisfactory completion of practicals and all written assignments, including fieldwork report, essays and class tests. Students must attain an average mark of not less than 40% for the coursework.

**Assessment:** Field report, essays, class tests and practical assignments count 45%; one 3-hour examination written in June count 55% (sub-minimum of 40% required).

### **EGS3021F SUSTAINABILITY & ENVIRONMENT**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor M Sowman

**Course entry requirements:** EGS2013F, EGS2014S

**Course outline:**

The course critically engages with current debates and discourses in the fields of sustainability, vulnerability and environmental management, including examination of key concepts such as integration, systems-thinking, complexity, equity, vulnerability, risk, resilience, adaptation and mitigation. Approaches and methods for analysing environmental problems and integrating risk reduction as well as sustainability principles and practices into policy, programme, plan and project cycle processes are investigated and applied in different contexts.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Practicals:** One practical per week, Wednesday, 14h00-17h00.

**Fieldwork:** There is a compulsory fieldwork component involving half-day field excursions.

**DP requirements:** Attendance and satisfactory completion of practicals (including fieldwork), other assignments and tests; students must attain an average mark of not less than 40% for the coursework.

**Assessment:** Practical reports (including fieldwork), class tests and other assignments count 50%; one 3-hour June examination counts 50% (subminimum of 40% required).

### **EGS3022S GEOGRAPHIC THOUGHT**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr S Daya

**Course entry requirements:** EGS2014S

**Course outline:**

The course focuses on international debates in classical and contemporary human geography. It considers important thematic areas in the geographical literature, such as: development; spatiality; urban, political and feminist geographies.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 4 4 4 4 4

**Practicals:** One practical or tutorial per week, Wednesday, 14h00-17h00.

**DP requirements:** Satisfactory completion of essay assignments and class test; students must attain an average mark of not less than 40% for the coursework.

**Assessment:** Essay and other assignments count 50%; one 3-hour written examination in November count 50% (subminimum of 40% required).

## **Postgraduate Courses**

**Ancillary activities**

In addition to formal courses, students undertaking postgraduate courses are required to participate fully in other departmental activities of an academic nature. Such activities are weekly seminars on environmental topics addressed by persons prominent in their fields, field camps and field exercises

away from Cape Town, and study tours to obtain first-hand exposure to environmental problems and their solutions. Graduate students who, in the opinion of the Head of Department, have not had adequate exposure to undergraduate courses with environmental content may also be required to attend specified courses.

### **EGS4001W BSc HONOURS IN ATMOSPHERIC SCIENCE**

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 40 credits)

**Convener:** Dr B J Abiodun

**Course entry requirements:** As for EGS4004W, with the additional requirement of at least a half-course in Mathematics or a full-course in Physics, as well as a senior undergraduate course in climatology or atmospheric science. Experience with computers is highly recommended.

**Course outline:**

The Atmospheric Science programme provides a 4th year of development for those interested in following a career associated with atmospheric science and climatology, or for progression to research in this area. The focus is on practical skills and the application of theory to the issues related to the climate system. The programme follows the same pattern as EGS4004W, with the constraint that three of four course modules must be from the atmospheric options, and the fourth module from one of the honours level physical science options in Environmental & Geographical Science or the Oceanography department. Included in the requirements are a research project, two seminar presentations, and course fieldwork. Students will also attend and present at the annual conference of the South African Society for Atmospheric Scientists.

**Assessment:** The examinations will follow the same structure as EGS4004W. Not all course options have formal examinations, and a significant portion of the total coursework mark may be based on set project tasks. Examinations on average count 50% and coursework 50% for each module. The combined module results count 75% and the research project counts 25% of the degree as a whole. Students must pass the project component in order to qualify.

### **EGS4004W BSc HONOURS IN ENVIRONMENTAL & GEOGRAPHICAL SCIENCE**

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 40 credits)

*NOTE: Entrance is limited to 30 students*

**Convener:** Dr P Anderson

**Course entry requirements:** A BSc degree with a major in Environmental & Geographical Science or related field. Acceptance will be at the discretion of the Head of Department who will consider quality of final year results, material covered in the undergraduate curriculum, and referee reports. Preference may be given to UCT graduates who meet the course entry requirements.

**Course outline:**

Students complete four advanced semester modules. One of these four modules must be a research methods module. Students complete a research methods course and then select a further three modules from a range of advanced courses in Environmental and Geographical Science that have foundations in one or more of the following areas of study: Human Geography, Environmental Management, Physical Geography. Curricula must be approved by the course convener in consultation with the Head of Department. In addition, each student completes a research project. At the discretion of the Convener, in consultation with the Head of Department, students may take one course from outside the Department (in addition to the methods course) towards the BSc Honors degree in Environmental & Geographical Science.

**Assessment:** Courses will be examined at the end of each semester, and the marks combined with project, essay, field work and seminar presentation marks. Examinations on average count 50% and coursework 50% for each module. The combined module results count 75% and the research project

counts 25% of the degree as a whole. Students must pass the project component in order to qualify.

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### **EGS5003W MASTERS IN ENVIRONMENTAL & GEOGRAPHICAL SCIENCE**

**NQF credits:** 180 HEQS-F at level 9

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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### **EGS5008H and EGS5009W MPhil IN ENVIRONMENT, SOCIETY & SUSTAINABILITY (by coursework and minor dissertation)**

Coursework: **NQF credits:** 90 HEQS-F at level 9

Minor Dissertation: **NQF credits:** 90 HEQS-F at level 9

*This MPhil course is designed for students with diverse backgrounds who have an interest in environment, society and sustainability. Problems pertaining to the environment, society and sustainability are interdisciplinary in nature and students with backgrounds in geography, natural and social science, planning, engineering, education, economics and law are encouraged to apply.*

*NOTE: Entrance is limited to 12 students*

**Convener:** Dr P Anderson

**Course entry requirements:** An Honours degree (or equivalent). In special circumstances graduates who have shown by examination, or publication, or a record of appropriate training, that they have reached a level equivalent to an Honours degree may be admitted.

Prospective students are advised that, because there is a limit of 12 places in the Environment, Society and Sustainability course, only selected students are admitted. Selection will be at the discretion of the Head of the Department, based on quality of qualification, experiential learning and/or referee reports. It is therefore imperative that intending applicants, in addition to submitting an application to the University, complete the application form available from the Department and submit this before the annual deadline - the date is displayed on the departmental website - see [www.egs.uct.ac.za](http://www.egs.uct.ac.za).

#### **Course outline:**

This interdisciplinary MPhil course is designed for students with diverse backgrounds who have an interest in the issues pertaining to the environment, society and sustainability.

Prescribed coursework (EGS5008H): In the first year, students select four departmental coursework modules in, for example, Theory and Practice of Environmental Management, Capital Politics and Nature, Geography of Development and Environment, Living with Environmental Change, Urban Food Security, Cultural Geographies, Managing Complex Human-Ecological Systems, or Geomorphology.

Minor Dissertation (EGS5009W): In the second year students undertake a research project demonstrating the application of theory to practical issues in the research area of environment, society and sustainability. The work must be submitted in the form of a dissertation for formal examination.

#### **Assessment:**

Assessment for the coursework modules includes both written examinations and coursework assignments. Examinations on average count 50% and coursework 50% for each module. The

combined module results count 50% and the result of the examination of the minor dissertation counts 50% of the final course outcome.

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**EGS5010H and EGS5020W MASTERS IN ENVIRONMENTAL & GEOGRAPHICAL SCIENCE** (by coursework and minor dissertation)

Coursework: **NQF credits:** 90 HEQS-F at level 9

Minor Dissertation: **NQF credits:** 90 HEQS-F at level 9

**Convener:** Dr P Anderson

**Course entry requirements:** A BSc(Hons) degree in Environmental & Geographical Science. Individual specialist modules may carry additional prerequisites. In addition to submitting an application to the University, prospective candidates must complete an application form available from the department.

**Course outline:**

Students select four modules from a range of advanced courses in Environmental & Geographical Science that have foundations in one or more of the following areas of study: Human Geography, Physical Geography, Atmospheric Science, Environmental Management, Geographical Information Systems. In addition, each student conducts a major research project examined by dissertation (EGS5020W). At the discretion of the convener, in consultation with the Head of Department, students may count one or two modules from outside the department towards the coursework component of this Masters degree in Environmental & Geographical Science.

**Assessment:** Modules are conventionally examined by 3-hour written papers in combination with various coursework elements such as essays, projects, practical assignments etc. Examinations on average count 50% and coursework 50% for each module. The combined module results count 50% and the dissertation component counts 50% of the degree as a whole.

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**EGS5012W MASTERS IN CLIMATE CHANGE & SUSTAINABLE DEVELOPMENT** (by coursework and minor dissertation)

Coursework: **NQF credits:** 90 HEQS-F at level 9

Minor dissertation: **NQF credits:** 90 HEQS-F at level 9

*This course is convened by UCT's African Climate and Development Initiative; refer to the section "Inter-faculty Units" later in this handbook.*

**Convener:** Dr B Rink

**Course entry requirements:** A relevant Honours degree (or equivalent). Students with backgrounds in scientific, planning, engineering, economic, educational, social and legal disciplines are encouraged to apply.

**Course outline:**

This full time one-year taught Master's course (MSc or MPhil) provides interdisciplinary training in climate change and sustainable development, with a focus on the issues of relevance to African development. The course is designed for both recent graduates and those with several years' experience who wish to gain a broad understanding of the issues involved in climate change and sustainable development from an African and developing world perspective. The coursework component is designed to include:

- 1) two compulsory core modules (totaling 45 HEQS-F credits) comprising EGS5031F: Introduction to Climate Change & Sustainable Development and EGS5032F: Climate Change Adaptation & Mitigation that together provide an introduction to climate change and sustainable development in addition to the related issues of climate change mitigation and adaptation;
- 2) at least two elective modules, totaling a minimum of 45 HEQS-F credits, chosen from a range of courses such as climate and environmental law, sustainable urban systems, climate variability and prediction, climate change and biodiversity, which offer the student the opportunity to explore new areas, or look at climate and development through existing disciplinary backgrounds;

The minor dissertation component (90 HEQS-F credits) is based on a three- to six-month research

project, to be submitted at the end of January 2015, with the possibility of extension to June 2015. The choice of project and electives will be determined by prior qualification. Students may register for a minor dissertation in a range of Departments across the University, including Biological Sciences, Environmental & Geographical Science, Geological Sciences, Oceanography, Chemical Engineering, Mechanical Engineering, Economics, Sociology, Law.

**Assessment:** Examinations will be held at the end of each core and elective course. The minor dissertation will be examined according to Faculty rules by two external examiners.

A composite grade of the performance on the coursework component as a whole will be reflected against the assessment course EGS5012W.

*Subminima:* (i) 33% for each individual coursework module; (ii) an aggregate coursework mark of 50%; (iii) a dissertation mark of 50%.

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### **EGS5031F INTRODUCTION TO CLIMATE CHANGE & SUSTAINABLE DEVELOPMENT**

**NQF credits:** 23 HEQS-F at level 9

**Convener:** Dr B Rink

**Course entry requirements:** Acceptance for EGS5012W

**Course outline:**

This course provides a broad, integrated, knowledge on key issues in climate change and sustainable development, making students conversant across the spectrum of climate change issues and history. Topics covered include: sustainable development; the climate system, anthropogenic forcing and climate system response; African climate variability and change; international climate change legal frameworks, negotiations, and politics; the economics of climate change and climate change financing; the concept of climate compatible development. The course is lecture, seminar and group-work based. Each section of the course will involve basic framing lectures, supported by either an essay exercise or a group work exercise and seminar.

**DP Requirements:** None

**Assessment:** One essay on each of Sustainable Development, Climate Systems and Climate Change Economics count 20% each; one student presentation on SA climate system counts 10%; one 3-hour examination counts 30%.

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### **EGS5032F CLIMATE CHANGE ADAPTATION & MITIGATION**

**NQF credits:** 23 HEQS-F at level 9

**Convener:** Dr D Sparks, Dr B Rink

**Course entry requirements:** Acceptance for EGS5012W

**Course outline:**

This course provides in depth coverage of (i) adaptation and (ii) mitigation from both a theoretical and practical/applied point of view. Adaptation are the two key domains of academic and applied learning required for students to be qualified to undertake research and be employable in the climate change arena in the South African and developing country context. The issues are explored from a developing country, climate compatible perspective.

Part 1: Climate Change Adaptation covers:

- Introduction to climate vulnerability, impacts and adaptation – key concepts
- Climate modelling, climate projections, climate scenarios, critical uncertainties
- Approaches to climate impacts assessments
- Vulnerability assessment
- Adaptation at different scales: challenges, approaches, limits to adaptation, monitoring and evaluation of adaptation
- Adaptation in practice (including field trip)

Part 2: Climate Change Mitigation covers:

- GHG emissions: inventories, carbon footprints, IPCC guidelines, protocols, SA GHG profile



- Reducing emissions: Mitigation actions – in energy use; energy supply; energy sources (renewables, coal, nuclear); REDD and other approaches to non-energy emission reductions
- Measurement, reporting and verification (MRV) of mitigation actions
- National policy framework – implementing mitigation in SA, national responses, national communication, SA's deviation below BAU, climate policy process in 2010, 2011 white paper, LTMS
- Economic policy and carbon pricing
- Poverty and mitigation of change
- Business and climate change mitigation
- Technology transfer

**DP Requirements:** None

**Assessment:** 1 short essay on climate projections and scenarios (10%); 1 short essay on vulnerability and impacts assessment (10%); 1 long essay on adaptation (20%); 1 short essay on GHG Emissions/Inventories/MRV (10%); 1 short essay on Mitigation actions (10%); 1 long essay on SA Mitigation Issues (20%); one 2-hour exam (20%).

### **EGS6003W** PhD IN ENVIRONMENTAL & GEOGRAPHICAL SCIENCE

**NQF credits:** 360 HEQS-F at level 10

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Prospective candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

### **PBL5045S** ENVIRONMENTAL LAW FOR NON-LAWYERS

**NQF credits:** 15 HEQS-F at level 9

*NOTE: The following course is offered by the Faculty of Law and forms part of the taught modules offered in EGS5008H.*

**Convener:** Professor A Paterson

**Course entry requirements:** Successful completion of any undergraduate degree. Not available to students undertaking an LLB or LLM degree.

**Course outline:**

The inclusion of an environmental right in South Africa's Constitution has led to the emergence of many environmental laws and court decisions in the past 15 years. These developments are of key relevance to those working in the environmental sector including developers, consultants, biologists, zoologists, planners, sociologists and anthropologists. This course provides students undertaking postgraduate studies relevant to the environment with an insight into relevant principles of international and domestic environmental law. Key content covered in the course includes: an introduction to basic legal principles and resources; constitutional aspects (environmental rights, access to information, administrative justice and access to courts); framework environmental laws; land-use planning laws (planning law, environmental impact assessment and protected areas); natural resource laws (biodiversity, water and marine living resources); and pollution laws (fresh water, land and air pollution).

**Lectures:** 2 double lectures per week

**DP requirements:** Satisfactory attendance of lectures and completion of essay.

**Assessment:** Long essay counts 50%, written examination counts 50%.

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## DEPARTMENT OF GEOLOGICAL SCIENCES

The Department is housed in the Geological Sciences Building, 13 University Avenue  
Telephone (021) 650-2931 Fax (021) 650-3783  
The Departmental abbreviation for Geological Sciences is GEO.

**Professor and Head of Department:**

S H Richardson, BSc Hons *Cape Town* PhD *MIT*

**Chamber of Mines Professor of Geochemistry:**

A P le Roex, BSc *Stell* BSc Hons PhD *Cape Town*

**Philipson-Stow Professor of Mineralogy and Geology:**

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**Professor:**

C Harris, MA DPhil *Oxon*

**Associate Professor:**

J S Compton, BA *San Diego* PhD *Harvard*

**Senior Lecturers:**

M E Bordy, MSc *Budapest* PhD *Rhodes*

J F A Diener, MSc *Stell* PhD *Melbourne*

A Fagereng, BSc Hons *Cape Town* PhD *Otago*

P E Janney, BSc *New Hampshire*, PhD *San Diego*

G C Smith, MA *Cantab*

**Lecturers:**

B Kahle, MA *Oxon* PhD *Cantab*

**Emeritus Professor:**

J J Gurney, BSc Hons PhD *Cape Town* FRSSAf

**Emeritus Associate Professor:**

D L Reid, MSc *Wellington* PhD *Cape Town*

**Senior Research Officer:**

P J le Roux, BSc Hons PhD *Cape Town*

**Honorary Research Associates:**

H E Frimmel, PhD *Vienna*

R M Smith, MSc *Wits* PhD *Cape Town*

W L Taylor, MSc PhD *Rochester*

**Principal Technical Officers:**

B A Cairns

J Harrison

V Moisey

**Chief Scientific Officers:**

K Gray, MSc *Cape Town*

C E Tinguely, MSc *Clermont-Ferrand*

**Senior Scientific Officers:**

T S Dreyer, BSc Hons *Cape Town*

F Rawoot, BSc *UWC*

**Administrative Officer:**

S Whitmore

**Senior Secretary:**

D Lesch

**Technical Assistant:**

P Sieas

**Thin Section Technicians:**

R van der Merwe

D Wilson

**Departmental Assistants:**

E W Stout  
 J van Rooyen  
 I Wilson

**RESEARCH IN GEOLOGICAL SCIENCES**

Research in Geological Sciences embraces a variety of topics that are listed below. More detailed information can be obtained by writing to the Department of Geological Sciences.

The Department has research strengths in geochemistry, structural geology and tectonics, igneous and metamorphic petrology, sedimentology, marine geology, economic geology and petroleum geophysics. General research interests include: global tectonics and geodynamics with emphasis on Gondwana geology; structural geology; oceanic and continental igneous processes and the geochemical evolution of the underlying mantle; kimberlites and the genesis of diamonds; open and closed system behaviour during metamorphism and related ore genesis; economic geology with emphasis on base metal deposits; environmental geochemistry; sedimentology, sedimentary geochemistry, and sedimentary processes; chemical stratigraphy and crisis in the geological record; marine sedimentology and geophysics. The Department is well equipped for analytical studies with X-ray fluorescence, electron microprobe and X-ray diffraction equipment, solution and laser ablation ICP-MS facilities, and access to gas-source mass spectrometers for oxygen, hydrogen and carbon stable isotope measurements. The Department is also equipped for structural and tectonic analysis and seismic interpretation, with microcomputer laboratories and relevant software.

**Undergraduate Courses****Field excursions:**

All students attending courses in Geology are required to take part in the field excursions arranged for them during the year. These excursions take place during the Easter and September mid-semester vacations, and full daily participation is required by all students.

*NOTE: Supplementary examinations are not normally granted to students for senior courses in Geology.*

**First-Year Courses****GEO1009F INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES**

**NQF credits:** 18 HEQS-F at level 5

This course is presented jointly by the Departments of Archaeology, Environmental & Geographical Science and Geological Sciences, but administered by Geological Sciences.

**Convener:** Associate Professor J S Compton

**Course entry requirements:** NSC Physical Science, Life Sciences or Geography with at least 60% (or AGE1003/4H).

**NOTE:** Preference will be given to students registered in the Science Faculty.

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to AGE1004H from week 7.*

**Course outline:**

This course aims to develop a broad understanding of how the Earth works, leading to majors in Archaeology, Environmental & Geographical Sciences, Geology and Ocean & Atmosphere Science. The course covers the following general topics: structure and dynamics of the Earth; stratigraphy and geological history; climatology; surface processes and evolution of landscapes; biogeography; humans and the environment.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	2	2	2	2	2

**Practicals:** One practical per week, Monday or Tuesday or Thursday or Friday, 14h00-17h00.

**Fieldwork:** Students are required to attend three half day excursions in the Cape Peninsula.

**DP requirements:** An average of 30% on all marked classwork and tests.

**Assessment:** Marked class work counts 24%; marked class tests count 16%; one 3-hour theory examination in June counts 60%. A subminimum of 40% is required in the theory examination paper.

*NOTE: Supplementary examinations will be written in November.*

**AGE1004H INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES**

**NQF credits:** 18 HEQS-F at level 5

See course details under the Department of Archaeology.

**GEO1006S INTRODUCTION TO MINERALS, ROCKS & STRUCTURE**

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Professor C Harris

**Course entry requirements:** A minimum of 45% in GEO1009F or a pass in EGS1004S or AGE1004H

**Course outline:**

This course introduces students to the Geology major and covers the essentials of the discipline as follows: crystals and minerals; igneous and metamorphic rocks; structural geology; mineral deposits and economic geology; palaeontology.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	5	5	5	5	5

**Practicals:** One practical per week, Thursday or Friday, 14h00-17h00.

**Fieldwork:** Students are required to attend a one-day excursion in the Cape Peninsula and a four-day excursion through the southwestern Cape during the September vacation.

**DP requirements:** An average of 30% in all marked classwork and tests. Compulsory attendance at one tutorial session per week for all students who fail any class test, until such time as a subsequent test is passed.

**Assessment:** Class tests count 35%; field reports count 15%; one 2-hour theory examination in November counts 50%. A subminimum of 40% is required in the theory examination paper.

**Second-Year Courses****GEO2001F MINERALOGY & CRYSTALLOGRAPHY**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: Entrance is limited to 35 students.*

**Convener:** Professor S H Richardson

**Course entry requirements:** GEO1009F (or EGS1004S or AGE1004H from 2015) and GEO1006S, CEM1000W or equivalent.

**Course outline:**

This course covers the fundamentals of physical and chemical mineralogy as a basis for senior courses in petrology. The course comprises four inter-related sections as follows: crystallography, crystallographic calculations and a brief introduction to X-ray crystallography; Crystal optics: the theory and practice of identifying minerals by means of the polarising microscope; Mineralogy: the chemical, physical and optical properties of selected groups of rock-forming minerals; Phase diagrams: interpretation of one, two and simple three component phase diagrams.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	2	2	2	2	2

**Practicals:** One practical per week, Wednesday, 14h00-17h00.**DP requirements:** Attendance at 80% of practicals and an average of 30% in all marked class work and tests.**Assessment:** Marked class work, including tests, count 20%; one 2-hour practical examination in June counts 30%; one 2-hour theory paper in June counts 50%. Subminima of 40% are required in practical and theory examination papers.**GEO2004S PHYSICAL GEOLOGY****NQF credits:** 24 HEQS-F at level 6**Convener:** Dr A Fagereng**Course entry requirements:** GEO2001F, PHY1031F or equivalent**Course outline:**

This course builds on the previous mineralogy course and explores the physical processes involved in igneous, metamorphic and sedimentary rock formation, modification and destruction as follows: Stratigraphy of South Africa; transport and deposition of siliciclastic sediment; sedimentary textures and structure; siliciclastic, carbonate, evaporitic and other sedimentary rocks; earthquakes, stress, displacement and strain; brittle and ductile deformation; classification and petrography of igneous rocks; physical processes in magma chambers; the relationship between chemical and mineralogical composition; types of metamorphism, metamorphic textures and mineral assemblages.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	2	2	2	2	2

**Practicals:** One practical per week, Wednesday, 14h00-17h00.**DP requirements:** An average of 30% in marked class work, and attendance at 80% of practicals.**Assessment:** Class tests and practicals count 25%; one 2-hour practical examination in November counts 30%; one 2-hour theory paper in November counts 45%. Subminima of 40% are required in practical and theory examination papers.**GEO2005X FIELD GEOLOGY & GEOLOGICAL MAPPING (2<sup>nd</sup> year half course)****NQF credits:** 24 HEQS-F at level 6**Convener:** Professor C Harris**Course entry requirements:** GEO1006S, GEO2004S (co-requisite)**Course outline:**

This is a field-based course that introduces techniques used to identify, describe and document rocks in the field and for interpreting their inter-relationships, with the view to producing geological maps, stratigraphic logs and structural sections. Techniques covered include: mineralogical and textural descriptions of rocks using a hand-lens; measurement of attitude of bedding using compass and clinometer; measurement, description and interpretation of depositional and deformational structures; stereo plots, interpretation and use of aerial photographs; identifying contact relationships; GPS positioning. Course material is taught over four separate field camps spread over two years of study.

**Lectures:** None**Practicals:** Five afternoons by arrangement.**Fieldwork:** Nine days in Laingsburg area, nine days in northern Cape, three days in Southwestern Cape, nine days in southern Cape.**DP requirements:** Attendance at all field camps.**Assessment:** Maps and reports count 70%; three 2-hour practical examinations in June and

November count for 30%.

### Third-Year Courses

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#### **GEO3005F** PETROLOGY & STRUCTURAL GEOLOGY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr J F Diener

**Course entry requirements:** GEO2001F, GEO2004S

**Course outline:**

This course covers key concepts in igneous, metamorphic and sedimentary petrology in combination with structural geology as follows: interpreting major and trace element and isotope variations in igneous rocks; origin and evolution of the major magma series; thermodynamics, kinetics and chemography of metamorphic reactions; tectonic setting of metamorphic terrains; principles of interpretations and classification of continental and marine sedimentary environments; fault related folding, fold and thrust systems, kinematic principles and section balancing; ductile deformation.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Practicals:** Two practicals per week, Tuesday and Thursday, 14h00-17h00.

**DP requirements:** Attendance at 80% of practicals and an average of 30% in all marked class work and tests.

**Assessment:** Class work counts 20%; one 4-hour practical examination written in June counts 30%; one 3-hour theory paper written in June counts 50%. Subminima of 40% required in practical and theory examination papers.

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#### **GEO3001S** STRATIGRAPHY & ECONOMIC GEOLOGY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr M E Bordy

**Course entry requirements:** GEO2004S, DP in GEO3005F

**Course outline:**

This course covers the development of the oceanic and continental rock record and associated ore deposits as follows: the principles of stratigraphy with examples drawn from the South African rock record; the methods and procedures involved in dating rocks; the genesis of economic mineral deposits, their microscopic textures, and their valuation and exploitation; geophysical techniques.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Practicals:** Two practicals per week, Tuesday and Thursday, 14h00-17h00.

**DP requirements:** An average of 30% in all marked class work and class tests.

**Assessment:** Practical and tests count 25%; one 3-hour theory examination written in November counts 45%; two 2-hour practical examinations written in November count 30%. Subminima of 40% required in practical and theory examination papers.

### Postgraduate Courses

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#### **GEO4000W** BSc HONOURS IN GEOLOGY

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 40 credits)

*NOTE: Entrance is limited to 16 students*

**Convener:** Professor S H Richardson

**Course entry requirements:** A BSc degree with a major in Geology, first qualifying courses in

Chemistry and Mathematics. A first qualifying course in Physics is recommended. The Senate may accept other courses as being equivalent to these and this criterion will be applied when considering Science graduates from other universities. Registrations are limited to 16 and acceptance will be at the discretion of the Head of Department, who will consider quality of final year results, material covered in undergraduate curriculum, and referee reports in making decisions. Preference will be given to UCT graduates who meet the course entry requirements.

**Course outline:**

Students are required to elect one of two streams of study - General Geology or Petroleum Geology. Selections of compulsory and elective modules are available for each stream, and would normally include the following: Analytical Geochemistry, Applied Geophysics, Petroleum Sedimentology, Economic Geology, Igneous Petrology, Isotope Geochemistry, Mantle Petrology, Marine Geochemistry, Metamorphic Petrology, Petroleum Geology, Sedimentary Basins, Structural Geology. Evolution of the African Plate and Geodata Analysis are compulsory modules for all students. In addition, each student is required to undertake a supervised research project. Choice of optional modules and research project require the approval of the Honours course co-ordinator and Head of Department. All students are required to attend a two week field trip held during the year.

**Assessment:** The compulsory and optional modules will each have an associated examination held in mid-year and towards the end of the Honours year. These examinations will count 60%, practical and assignment work done during the year counts 15%, and the research project 25% towards the final grade. Subminima are required for the overall examination mark (40%) and for the research project (50%).

**GEO4001W BSc HONOURS IN GEOCHEMISTRY**

As for GEO4000W above, but with a restricted choice of modules.

**GEO5000W MASTERS IN GEOLOGY**

**NQF credits** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of the handbook.

**GEO5003W MASTERS IN GEOCHEMISTRY**

**NQF credits:** 180 HEQS-F at level 9

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found at the front of

the handbook.

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**GEO6000W** PhD IN GEOLOGY

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Prospective candidates are referred to the rules for the PhD degree in Book 3, General Rules and Policies.

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**GEO6001W** PhD IN GEOCHEMISTRY

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Prospective candidates are referred to the rules for the PhD degree in Book 3, General Rules and Policies.



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## DEPARTMENT OF HUMAN BIOLOGY

The Department of Human Biology is part of the Faculty of Health Sciences and incorporates the disciplines of Anatomy, Cell Biology, Biomedical Engineering, Physiology, Exercise Science and Sports Medicine. They offer the Human Biology (HUB) courses detailed in this section towards the Human Physiology major for the BSc degree.

The Department is housed in the Anatomy Building, Room 5.14, level 5, Health Sciences Campus and Sports Science Institute building, Newlands

Telephone (021) 406-6235

The Departmental abbreviation for Human Biology is HUB.

### Professor and Head of Department

L A Kellaway, MSc PhD *Cape Town*

### Hyman Goldberg Professor of Biomedical Engineering:

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### Discovery Health Chair of Exercise and Sports Science:

T D Noakes, MBChB MD DSc *Cape Town* FACSM

### Professors:

M R Collins, BSc Hons *Stell* PhD *Cape Town*

E W Derman, MBChB *Pret* BSc Med (Hons) PhD *Cape Town* FACSM

T S Douglas, BSc (Eng) *Cape Town* MS *Vanderbilt* PhD *Strathclyde*

S H Kidson, MSc PhD *Wits* HDE (JCE)

E V Lambert, BA (Phys Ed)(Hons) *Rhodes* MSc *South Carolina* PhD *Cape Town*

M I Lambert, BA (Phys Ed)(Hons) *Rhodes* MSc *South Carolina* PhD *Cape Town*

G J Louw, DVSc *Pret*

A G Morris, BSc (WLU) PhD *Wits*

V A Russell, BSc Hons MSc *Cape Town* PhD *Stell*

M P Schweltnus, MBChB *Wits* MSc MD *Cape Town* FACSM

### Associate Professors:

A N Bosch, BA (PhysEd)(Hons) MA *Rhodes* PhD *Cape Town*

D M Lang, Dr rer Nat *Konstanz*

E M Meintjies, BSc Hons MSc *Pietermaritzburg* PhD *Oregon State*

E Ojuka, BSc MEd (Makerere) PhD *Bingham Young*

S Prince, BSc Hons HDE PhD *Cape Town*

### Senior Lecturers:

K Bugarith, BSc Hons *Natal* PhD *Washington State*

L Davids, MSc PhD *Cape Town*

A Gwanyanya, MBChB MMed (Anae) *Zimbabwe* DA(SA)MSc PHd *Leuven*

T Kolbe-Alexander, BSc *UWC* BSc Hons PhD *Cape Town*

M A J Poluta, BSc (Eng) *Witwatersrand*

D Shamley, BSc Hons PhD *Witwatersrand*

C P Slater, MBChB *Cape Town* FFRad(T) SA

L van der Merwe, Nat Dip Med *Tech Cape Town* BSc (Med) Hons MSc PhD *Cape Town*

C Warton, MBChB *Rhodes* LRCP MRCS *London*

### Senior Lecturer and Principal Biomedical Engineer:

M A J Poluta, BSc (Eng) *Wits*

### Honorary Senior Lecturers:

J de Beer, MBChB MMed (Orthop) *Pretoria*

J Goedecke, PhD *Cape Town*

L Micklesfield, PhD *Cape Town*

M Patrick, PhD *Cape Town*

R Tucker, PhD *Cape Town*

## 94 DEPARTMENT OF HUMAN BIOLOGY

### Lecturers:

E Badenhorst, BA (Hons) *Stell*  
J Friedling, MSc PhD *Cape Town*  
G Gunston, MBChB *Cape Town*  
L R John, BSc (Eng) *Natal PhD Cape Town*

### Honorary Professors:

J L Jacobson, JD *Harvard PhD Harvard*  
S W Jacobson, PhD *Harvard*  
L van der Merwe, MSc PhD *UPE*

### Honorary Research Associates:

N Bergman, MBChB DCH MPH MD *Cape Town*

### Principal Technical Officer:

B Dando Dip Med Tech

### Chief Technical and Scientific Officers:

S Rayise, MSc *UWC*  
T Wiggins, Dip Med Tech BSc (Med) (Hons) *Cape Town*  
C Harris, NTC (Tool, Jig and Die making) *Athlone Tech College*  
G de Bie, BSc *Rhodes* BSc Hons *UOFS*

### Senior Technical and Scientific Officer:

M P Phillips, BSc *Cape Town*

### Technical Officers:

I Fakier, ND Electrical Eng *CPUT*  
V Fourie  
N Kariem, BSc Hons *Cape Town*  
M Peterson, Dip Med Tech BTech *CPUT*

## DIVISION OF HUMAN NUTRITION

### Associate Professor and Head of Division:

M Senekal, PhD (Diet) *Stell RD (SA)*

### Lecturers/Clinical Educators (Full-time):

S Booley, MSc (Nutrition Management) *UWC RD (SA)*  
J Harbron, PhD (Physiology Sciences) *Stell RD (SA)*  
B Najaar, M (Nutrition) *Stell RD (SA)*

### Lecturers/Clinical Educators (Part-time):

D Curling, HDE (Home Economics) *Cape Town*  
Z Ebrahim, MSc (Nutrition and Dietetics) *Cape Town RD (SA)*  
L Fuller, BSc Dipl(Therapeutic Dietetics) *Cape Town* BSc Med(Hons) Epidem & Biostats *Stell RD(SA)*  
F Herrmann, MSc Med (Dietetics) *Cape Town RD (SA)*  
F Hoosen, BSc (Dietetics) *UWC RD (SA)*  
K Sexton, BSc Med Hons (Nutrition and Dietetics) *Cape Town RD (SA)*

## Undergraduate Courses

### Second-Year Courses

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#### HUB2019F INTRODUCTION TO HUMAN BIOLOGY

NQF credits: 24 HEQS-F at level 6

NOTE: Entrance is limited to 60 students

Convener: Associate Professor E Ojuka, Dr E van der Merwe

Course entry requirements: CEM1000W (or equivalent), BIO1000F

#### Course outline:

This course is an introduction to human anatomy and the basics of physiology. The first five weeks

examine the basics of cells and tissues and cell proliferation, along with gross and histological studies and physiology of the integumentar, musculo-skeletal system, cardio-vascular system, GIT, reproductive, urinary and nervous systems. The course includes the study of homeostasis, the chemistry of life, membranes, electrophysiology, nutrition and metabolism.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

Fridays may be used for tutorials, guest lectures and tests. Students are encouraged to attend all lectures and must sign a register of attendance.

**Practicals:** One per week, Mondays or Tuesdays

**DP requirements:** Attendance at all practicals, 40% average in class tests and an average of 50% for all assignments

**Assessment:** Class tests count 30%; assignments count 5%; practicals count 15%; examinations (theory and practical) count 50%. An oral examination may be required in the case of selected students.

**HUB2021S HUMAN BIOLOGY: MAINTENANCE & INTEGRATION**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: Entrance is limited to 60 students*

**Convener:** Dr E van der Merwe

**Course entry requirements:** HUB2019F, CEM1000W (or equivalent)

**Course outline:**

This course aims to provide a thorough grounding of the anatomy, physiology and structure-function relationships of the bodily systems. The course includes lectures, tutorials and practicals on the physiology, anatomy and histology of organ systems in the human body, including the nervous system, excretory & thermoregulation, respiratory, cardiovascular, lymphatic and immune, and reproductive systems. In addition, students are introduced to bone forensics, which builds on their understanding of bone anatomy done in HUB2019F, and to concepts of ageing and disease. In the practical sessions, students work in small groups using computers and other equipment to study a) the physiology and anatomy of the nervous system, b) the electrical events in the contraction of cardiac muscle, c) the mechanics of the respiratory system, d) the immune system, e) excretion and temperature regulation, f) reproduction and g) the study of anatomical parts of the human body from cadavers and histological sections under a microscope.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

Fridays may be used for tutorials, guest lectures and tests. Students are encouraged to attend all lectures and must sign a register of attendance.

**Practicals:** One per week, Mondays or Tuesdays, 14h00-17h00.

**DP requirements:** Attendance at all practicals, 40% average in class tests and an average of 50% for all assignments

**Assessment:** Class tests 30%; practicals, assignments & tutorials 20%;

Final examinations contribute 50% of the final year mark and comprises the following:

Written theory exam 30%, practical 20%. An oral examination may be required in the case of selected students.

### Third-Year Courses

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#### HUB3006F GENERAL & APPLIED PHYSIOLOGY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor A Bosch

**Course entry requirements:** HUB2021S

**Course outline:**

The semester theme is "Living, working and playing". Topics dealt with in detail include: metabolism and homeostasis, cellular homeostasis, nutrition and metabolism, obesity and diabetes, muscle physiology, cardio-respiratory physiology, exercise physiology, thermoregulation, physiology in extreme environments.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

**Practicals:** One practical per week, Wednesdays or Thursdays, 14h00-17h00. The nature of the practicals will sometimes require work outside of these formal times.

**DP requirements:** Attendance at all practicals, 40% average in class tests and an average of 50% for all assignments

**Assessment:** Class tests count 30%; assignments count 5%; practicals count 15%; examinations (written and practical) count 50%. An oral examination may be required in the case of selected students.

#### HUB3007S BIOPHYSICS & NEUROPHYSIOLOGY

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr A Gwanyanya

**Course entry requirements:** HUB2021S

**Course outline:**

The course offers theoretical and practical instructions on advanced concepts in neuroscience, such as: embryological development and repair of the nervous system, histological and gross anatomical appearances of the brain, electrophysiology, principles of electrical and morphological brain imaging, neuronal signalling, signal transduction in sensory, motor and autonomic nervous systems, vascular systems, vision and pain perception, eating disorders and mechanisms of learning and development of memory.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

**Practicals:** One practical per week, Wednesdays or Thursdays, 14h00-17h00. The nature of the practicals will sometimes require work outside of these formal times.

**DP requirements:** Attendance at all practicals, 40% average in class tests and an average of 50% for all assignments.

**Assessment:** Class tests count 30%; assignments count 5%; practicals count 15%; examinations (theory and practical) count 50%. An oral examination may be required in the case of selected students.

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## DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS

The Department is housed in the Mathematics Building, 7 University Avenue  
 Telephone (021) 650-3191 Fax (021) 650-2334. The website address is <http://www.mth.uct.ac.za>  
 The Departmental abbreviation for Mathematics and Applied Mathematics is MAM.

### Professor and Head of Department:

H- P A Künzi, MSc PhD *Berne*

### South African Research Chair in Computational Mechanics:

B D Reddy, BSc (Eng) *Cape Town*, PhD *Cantab* FRSSAf

### Professors:

I V Barashenkov, MSc *Moscow* PhD *Dubna*

B A Bassett, MSc *Cape Town* PhD *Trieste*

P K S Dunsby, BSc PhD *London*

G Janelidze, MSc PhD *Tbilisi Georgia* DSc *St Petersburg*

### Associate Professors:

P V Bruyns, MA DPhil *Oxon* LRSM MSc *Cape Town*

C A Clarkson, BSc Hons *Edinburgh* PhD *Glasgow*

C R A Gilmour, MSc PhD *Cape Town*

C W Hellaby, BSc Hons *St Andrews* MSc PhD *Queen's (Ontario)*

A B Ianovsky, MSc *Sofia* PhD *Dubna*

### Honorary Research Associates:

V Brattka, MSc PhD *Hagen Germany*

E E Plagányi-Lloyd, BSc *Natal* MSc PhD *Cape Town*

R A Rademeyer, MSc PhD *Cape Town*

F D Richardson, BSc (Agric) *Nottingham* PhD *London* PhD *Cape Town*

### Senior Lecturers:

F Ebobisse Bille, PhD *Pisa*

D J Erwin, MSc *Natal* PhD *Western Michigan*

J L Frith, MSc PhD *Cape Town*

H de G Laurie, BA *Stell* BSc *Unisa* BSc Hons PhD *Cape Town*

J Murugan, MSc PhD *Cape Town*

K T P Rafel, BSc Hons *Wits* MSc *Cape Town*

N R C Robertson, MSc PhD *Cape Town*

A Schauerte, BSc Hons *Natal* MSc *Cape Town* PhD *McMaster*

H Skokos, BSc PhD *Athens*

A Weltman, BSc Hons *Cape Town* PhD *Columbia*

### Lecturers:

NV Alexeeva, MSc *Sofia* PhD *Cape Town*

M L Archibald, MSc PhD *Wits*

T Chinyoka, MSc *Zimbabwe* PhD *Virginia Tech*

E Fredericks, MSc PhD *Wits*

R Martin, BSc *Guelph* MSc PhD *Waterloo*

J Ratzkin, BA *Berkeley* PhD *Washington*

J P Shock, MPhys *Bristol* PhD *Southampton*

D Solomons, MSc PhD *Cape Town*

H Spakowski, PhD *Heinrich-Heine Germany*

C S Swart, MSc *Natal* MSc PhD *London*

T C van Heerden, MSc *Cape Town* MAST *Cantab*

V Vougalter, BSc Hons *Nizhny Novgorod* PhD *Georgia Tech*

### Senior Scholar and Emeritus Distinguished Professor of Complex Systems:

G F R Ellis, BSc Hons BCom (Hons) *Cape Town* PhD *Cantab* DSc (h.c) *Natal, Haverford*

**Emeritus Professors:**

R I Becker, BSc Hons *Cape Town* PhD *MIT*  
G C L Brümmer, MSc *Stell* Docts Math *Amsterdam* PhD *Cape Town*  
D S Butterworth, MSc *Cape Town* PhD *London*  
K A Driver, BSc Hons *Wits* MSc *Stanford* PhD *Wits*  
K A Hardie, MSc *Natal* PhD *Cantab*  
J H Webb, BSc Hons *Cape Town* PhD *Cantab*

**Emeritus Associate Professor:**

R W Cross, MA *St Andrews* PhD *London* DSc *London*

**Visiting Professor and Principal Research Officer:**

R Maartens, PhD *Cape Town*

**Senior Research Officers:**

A D G Brandao, BSc *Wits* MSc PhD *Cape Town*  
C L de Moor, PhD *Imperial College, London*  
S J Holloway, MSc PhD *Cape Town*

**Principal Technical Officer:**

J Gordon, BSc *Tel Aviv*

**Administrative Manager:**

H S Leslie, BA (Hons) *UPE*

**Administrative Assistants:**

M King  
C D Sher  
N Trikam, BCom *UNISA*  
A Willis-Thomas

**Senior Secretaries:**

P Tukwayo  
G McBride

**Departmental Assistants:**

S Allie  
J M Steenveld

**RESEARCH IN MATHEMATICS AND APPLIED MATHEMATICS**

Research activities in the Department cover the spectrum of mathematics, and there are groups which are active in areas as diverse as Topology, Analysis, Discrete Mathematics and Theoretical Computer Science, General Relativity and Cosmology, Biological Modelling, and Continuum Mechanics. Fields of research of staff members include:

Functional Analysis, Operator Theory (J J Conradie, R W Cross, F Ebobisse, R Martin, N R C Robertson, J H Webb)

Financial Mathematics (R Becker)

Dynamical Systems (A B Ivanovsky)

General Relativity and Cosmology (B A Bassett, C A Clarkson, P K S Dunsby, G F R Ellis, C W Hellaby, J Murugan, D Solomons, J P Shock, A Weltman)

Group Theory, Universal Algebra, Set Theory and Model Theory (P V Bruyns, H P A Künzi)

Industrial Mathematics (H de G Laurie)

Discrete Mathematics, Combinatorics, Computational Complexity, Cryptography, Graph Theory (M L Archibald, D J Erwin, H Spakowski, C S Swart)

Marine Population Dynamics (A Brandao, D S Butterworth, C de Moor, S J Holloway)

Mathematical Ecology (H de G Laurie)

Mathematics Education (J J Conradie, G F R Ellis, J L Frith, C R A Gilmour, H de G Laurie, K Rafel, J H Webb)

Nonlinear Dynamics and Mathematical Physics (I V Barashenkov, N V Alexeeva)

Partial Differential Equations of Mechanics, Numerical Analysis, Dynamical Systems (B D Reddy)  
Approximation theory, special functions (K Driver)

Geometric Analysis (J Ratzkin)

Partial differential equations, quantum field theory (V Vougalter)  
 Sampling theory, operator algebras (R Martin)  
 Computational Fluid Dynamics (T Chinyoka)  
 Stochastic Ordinary Differential Equations (E Fredericks)  
 Rangeland Systems Modelling (F D Richardson)  
 National Astrophysics and Space Science Programme (B A Bassett, C A Clarkson, P K S Dunsby, G F R Ellis, C W Hellaby, J Murugan, P A Whitelock, D Solomons, J P Shock, A Weltman)  
 Topology and Category Theory (J L Frith, C R A Gilmour, K A Hardie, G Janelidze, H P A Künzi, A Schauerte, G C L Brümmer)  
 String Theory and Quantum Gravity (J Murugan, J P Shock, A Weltman)  
 Category Theory (G Janelidze)  
 Nonlinear dynamical systems, chaotic dynamics and Computational Mathematics (H Skokos)  
 Further information may be found in the Department's website at <http://www.mth.uct.ac.za>.

## Courses Offered by the Department

For convenience and ease of reference, the undergraduate courses have been grouped separately under Applied Mathematics and Mathematics. All postgraduate courses offered by the Department are listed together. Most course administrative information, e.g. booklists, lecture/tutorial timetables, test details etc, can be found on the Departmental website under "Undergraduate courses" and "Postgraduate courses".

1. All students registered for a course in the Department will be required to attend the lectures and tutorial classes prescribed for that course.
2. Most syllabuses indicate the contents of the various courses as recently given. All courses are subject to revision without advance notice.
3. Courses for Engineering and Commerce Faculty students are offered by the Department. See relevant Handbooks.
4. In exceptional cases, the usual Course entry requirements may be waived with the special permission of the Head of Department.

## Undergraduate Courses in Applied Mathematics

### Recommended course selection

The following are recommended course selections emphasising particular interests:

#### *Mathematical Modelling/Mechanics:*

MAM1043H, MAM1044H, MAM2046W, MAM3040W with courses in Mathematics, Oceanography, Statistics and Computer Science.

#### *Mathematical Physics:*

MAM1043H, MAM1044H, MAM2046W (or MAM2047H+MAM2004H), MAM3040W with courses in Physics, Astronomy and Mathematics.

#### *Biomathematics and Life Sciences:*

MAM1043H, MAM1044H, STA1006S, MAM2046W, MAM3041H (modules 3ND and 3AN) with courses in the Life Sciences or Environmental & Geographical Science.

## First-Year Courses in Applied Mathematics

The Mathematics Hot Seat in Room 210 on level 2 in the Mathematics Building is open for several hours every day and students in the courses MAM1042S, MAM1043H and MAM1044H are encouraged to go there for help with their mathematics problems.

### **MAM1043H MODELLING & APPLIED COMPUTING**

*NOTE: This course can be taken in conjunction with MAM1044H as lectures are arranged so that this is possible.*

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr H Laurie (1<sup>st</sup> semester), Dr A Weltman (2<sup>nd</sup> semester)

**Course entry requirements:** MAM1000W (corequisite), or already have an equivalent knowledge of Mathematics.

**Course outline:**

The aim of this course is to introduce Applied Mathematics and Mathematical Modelling including approximations and estimation theory, numerical methods, dynamical systems and modelling and simulation of discrete and continuous processes with MATLAB. Exposure to research methodology and mathematical communication is provided.

**Lectures:** First Semester: 2nd period Monday, Wednesday, Friday.

Second Semester: 2nd period Tuesday, Thursday

**Tutorials:** One 1-hour tutorial per week.

**DP requirements:** A class record of 30% or more.

**Assessment:** Class record counts 40%; one no longer than 3-hour paper written in October/November makes up the balance.

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### **MAM1044H DYNAMICS**

*NOTE: This course can be taken in conjunction with MAM1043H as lectures are arranged so that this is possible.*

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr D Solomons (1<sup>st</sup> semester), Dr J Murugan (2<sup>nd</sup> semester)

**Course entry requirements:** MAM1000W (corequisite), or already have an equivalent knowledge of Mathematics.

**Course outline:**

The aim of this course is to introduce the elements of mechanics. Topics covered include: Kinematics in three dimensions. Newton's laws 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.

**Lectures:** First semester: 2nd period Tuesday, Thursday.

Second semester: 2nd period Monday, Wednesday, Friday.

**Practicals:** One practical every second week, Friday, 6th and 7th periods.

**DP requirements:** A class record of 30% or more.

**Assessment:** Class record counts up to 33%; one no longer than 3-hour paper written in October/November makes up the balance.

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## **Second-Year Courses in Applied Mathematics**

### **MAM2046W APPLIED MATHEMATICS 2046**

**NQF credits:** 48 HEQS-F at level 6

**Convener:** Dr N Alexeeva

**Course entry requirements:** MAM1043H, MAM1044H and MAM1000W

**Co-requisites:** Modules 2LA and 2AC of MAM2000W/2004H

**Course outline:**

The course consists of four 30-lecture modules. Modules 2OD and 2ND are offered in the first semester and modules 2BP and 2NA in the second semester. The aim of this course is to introduce the student to a selection of fundamental topics in Applied Mathematics. The syllabus covers the



following topics:

2NA NUMERICAL ANALYSIS (coded as MAM2053S for Engineering students)

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.

2OD ORDINARY DIFFERENTIAL EQUATIONS

First order linear and nonlinear equations; existence and uniqueness of solutions. Linear equations of the n-th order and systems of n linear first order equations. Nonhomogeneous linear equations and systems; variation of parameters; qualitative theory of nonlinear equations; phase plane analysis; externally and parametrically driven oscillators; resonances; application to the theory of nonlinear vibrations. Calculus of variations.

2BP BOUNDARY-VALUE PROBLEMS (coded as MAM2050S for Engineering students)

Boundary-value problems, Sturm-Liouville problems, Green's function. Variational calculus, applications to Lagrangean and Hamiltonian mechanics. Diffusion, Laplace's and wave equation. Solution by separation of variables.

2ND NONLINEAR DYNAMICS

Fixed points, bifurcations, phase portraits. Conservative and reversible systems. Index theory, Poincaré-Bendixson theorem, Liénard systems, relaxation oscillators. Hopf bifurcations, quasiperiodicity and Poincaré maps. Applications to oscillating chemical reactions and Josephson junctions. Chaos on a strange attractor, Lorenz map, logistic map, Hénon map, Lyapunov exponents. Fractals.

#### Period

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	3	3	3	3	3
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**Tutorials:** One tutorial per week, Thursday, 14h00-16h00.

**DP requirements:** A class record of 30% or more is required in each module of the course.

**Assessment:** For each module the class record counts 30% and one no longer than 2-hour examination paper counts 70%.

### MAM2047H APPLIED MATHEMATICS 2047

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr N Alexeeva

**Course entry requirements:** MAM1043H, MAM1044H and MAM1000W

**Co-requisites:** Modules 2LA and 2AC of MAM2000W/2004H

#### Course outline:

The aim of this course is to introduce the student to a selection of fundamental topics in Applied Mathematics. This half-course consists of two modules from MAM2046W, one of which should be the module 2OD: ORDINARY DIFFERENTIAL EQUATIONS, which covers:

First order linear and nonlinear equations; existence and uniqueness of solutions. Linear equations of the n-th order and systems of n linear first order equations. Nonhomogeneous linear equations and systems; variation of parameters; qualitative theory of nonlinear equations; phase plane analysis; externally and parametrically driven oscillators; resonances; application to the theory of nonlinear vibrations. Calculus of variations.

**Lectures:** Depending on modules chosen, as for MAM2046W.

**Tutorials:** One tutorial per week, Thursday, 14h00-16h00.

**DP requirements:** A class record of 30% or more is required in each module of the course.

**Assessment:** Please refer to the MAM2046W examination requirement entry for the class record and examination weighting for each module.

**MAM2048H APPLIED MATHEMATICS 2048****NQF credits:** 24 HEQS-F at level 6**Convener:** Dr N Alexeeva**Course entry requirements:** MAM2047H**Course outline:**

The aim of this course is to introduce the student to a selection of fundamental topics in Applied Mathematics. This course is for students who have already obtained credit for MAM2047H. It consists of two modules of MAM2046W which were not taken as MAM2047H. A student who takes both MAM2047H and MAM2048H may count the combination as equivalent to MAM2046W.

**Lectures:** Depending on modules chosen, as for MAM2046W.**Tutorials:** One tutorial per week, Thursday, 14h00-16h00.**DP requirements:** A class record of 30% or more is required in each module of the course.**Assessment:** Please refer to the MAM2046W examination requirement entry for the class record and examination weighting for each module.

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**Third-Year Courses in Applied Mathematics**

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**MAM3040W APPLIED MATHEMATICS 3040****NQF credits:** 72 HEQS-F at level 7**Convener:** Dr I V Barashenkov**Course entry requirements:** MAM2000W and either MAM2046W or both MAM2047H and MAM2048H**Course outline:**

The aim of this course is to introduce the student to a selection of advanced topics in Applied Mathematics. A total of five 30-lecture modules is offered, four of which make up MAM3040W. The module 3MP constitutes core (compulsory) material while the other three modules can be chosen from 3CV, 3FD, 3AN and 3GR. Modules 3AN and 3CV will be offered in the first semester, and modules 3FD, 3GR and 3MP in the second semester. A written project will be a compulsory component of the course. The syllabus covers the following topics:

**3MP METHODS OF MATHEMATICAL PHYSICS** (coded as MAM3043S for Engineering students)

The Fourier-transform and Laplace-transform solution of linear PDEs on the line; the influence function; the Parseval identity. The long-term asymptotic behaviour of solutions: the methods of Laplace, stationary phase and steepest descents. Nonlinear waves: the method of characteristics; Riemann invariants. The effect of dissipation; the Cole-Hopf transform for the Burgers equation; travelling fronts for the KPP equation. The effect of dispersion: KdV, nonlinear Schroedinger and sine-Gordon equation. Elliptic integrals and elliptic functions; cnoidal waves and solitons; kinks and breathers for the sine-Gordon equation. Multisoliton solutions: the Hirota method and Baecklund transformations.

**3CV METHODS OF FUNCTIONS OF COMPLEX VARIABLES**

Complex calculus, calculus of residues, special functions, applications to physics.

**3AN ADVANCED NUMERICAL METHODS** (coded as MAM3050F for Engineering Students).

Advanced methods for ODEs boundary value problems, differential eigenvalue problems. Numerical solution of PDEs by the methods of finite differences, finite elements and spectral methods.

**3GR INTRODUCTION TO GENERAL RELATIVITY** (coded as MAM3049S for Engineering students) *NOTE: This module is also available to interested parties on the Internet. Further details may be obtained from the website <http://www.mth.uct.ac.za/omei/gr>.*

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.

3FD FLUID DYNAMICS (coded as MAM3054S for Engineering students)

Description of fluids, equations of fluid flow for simple fluids, analytical techniques. Applications.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Tutorials:** One tutorial per week, Thursday, 6th and 7th periods.

**DP requirements:** A class record of 30% or more is required in each module of the course.

**Assessment:** For modules 3GR and 3FD the year mark counts 25% and the examination counts 75%. For modules 3MP, 3AN and 3CV, the year mark counts 35% and the examination counts 65%. The papers for module 3AN and 3CV are written in June and modules 3FD, 3GR and 3MP are written in October/November. All papers are no longer than 2 hours, except 3GR which is no longer than 3 hours.

**MAM3041H APPLIED MATHEMATICS 3041**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr I V Barashenkov

**Course entry requirements:** MAM2000W and either MAM2046W or both MAM2047H and MAM2048H

**Course outline:**

The aim of this course is to introduce the student to a selection of advanced topics in Applied Mathematics. This half course consists of two modules of MAM3040W, at least one of which should be 3MP: *METHODS OF MATHEMATICAL PHYSICS (coded as MAM3043S for Engineering students) which covers: The Fourier-transform and Laplace-transform solution of linear PDEs on the line; the influence function; the Parseval identity. The long-term asymptotic behaviour of solutions: the methods of Laplace, stationary phase and steepest descents. Nonlinear waves: the method of characteristics; Riemann invariants. The effect of dissipation; the Cole-Hopf transform for the Burgers equation; travelling fronts for the KPP equation. The effect of dispersion: KdV, nonlinear Schroedinger and sine-Gordon equation. Elliptic integrals and elliptic functions; cnoidal waves and solitons; kinks and breathers for the sine-Gordon equation. Multisoliton solutions: the Hirota method and Baecklund transformations.*

**Lectures:** Depending on modules chosen, as for MAM3040W.

**Tutorials:** One tutorial per week, Thursday, 6th and 7th periods.

**DP requirements:** A class record of 30% or more is required in each module of the course.

**Assessment:** Please refer to the MAM3040W examination requirements entry for the class record and examination weighting for each module.

**MAM3048H APPLIED MATHEMATICS 3048**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Prof I V Barashenkov

**Course entry requirements:** MAM3041H

**Course outline:**

This course is for students who have already obtained credit for MAM3041H. It consists of two modules of MAM3040W which were not taken as MAM3041H and which, together with MAM3041H, would constitute the contents of MAM3040W. A student who takes both MAM3041H and MAM3048H may count the combination as equivalent to MAM3040W, provided a written project is completed.

**Lectures:** Depending on modules chosen, as for MAM3040W.

**Tutorials:** One tutorial per week, Thursday, 6th and 7th period.

**DP requirements:** A class record of 30% or more is required in each module of the course.

**Assessment:** Please refer to the MAM3040W examination requirements for the class record and examination weighting for each module.

## Undergraduate Courses in Mathematics

### First-Year Courses in Mathematics

One full course in Mathematics at first-year level is offered in the Science Faculty, MAM1000W. (The courses MAM1010 and MAM1012 are intended for Commerce students and the courses MAM1020 and MAM1021 for Engineering students. Details of these can be found in the Handbooks for the Faculty of Commerce and the Faculty of Engineering and the Built Environment respectively). Credit equivalent to MAM1000W can be obtained by passing MAM1005H and MAM1006H. In special cases MAM1004F or MAM1004S may be taken in place of MAM1005H; detailed rules are given under the entry for MAM1006H.

Students who intend to major in Mathematics must obtain credit for the half course MAM1019H at some point in their undergraduate career.

No student may register for more than one of MAM1000W, MAM1004F, MAM1004S, MAM1005H and MAM1006H simultaneously. Credit will not be given for more than one of MAM1004F, MAM1004S and MAM1005H. Credit for any first-year half course in Mathematics falls away on obtaining credit for MAM1000W.

The course STA1001F/S carries no credit in the Faculty of Science. The Mathematics Hot Seat in Room 210 on level 2 in the Mathematics Building is open for several hours every day and students in all first year courses are encouraged to go there for help with their mathematics problems.

#### MAM1000W MATHEMATICS 1000

**NQF credits:** 36 HEQS-F at level 5

**Convener:** Dr D J Erwin

**Course entry requirements:** A pass in NSC Mathematics with at least 70%, or at least a D symbol at A-level.

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to MAM1005H from week 7.*

**Course outline:**

The aim of this course is to introduce the fundamental ideas in calculus, linear algebra and related topics, including differential and integral calculus of functions of one variable, differential equations, partial derivatives, vector geometry, matrix algebra, complex numbers, Taylor series.

**Lectures:** Five lectures per week, Monday to Friday, 1st or 3rd period.

**Tutorials:** One 2-hour tutorial per week

**DP requirements:** Minimum of 30% for class tests and satisfactory tutorial work.

**Assessment:** Year mark counts 33.3%; two no longer than 3-hour papers written in October/November make up the balance.

#### MAM1004F MATHEMATICS 1004

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Mr T C van Heerden

**Course entry requirements:** The normal minimum requirement is a pass in Mathematics with at least 70% for students with a NSC, or at least an E symbol at A-level. Students who fail MAM1004F are usually expected to register for MAM1004S in the 2<sup>nd</sup> semester

**Course outline:**

The aim of this course is to provide mathematics for applications, particularly in the Life and Earth

sciences. The syllabus covers the following topics: Functions and graphs. Straight lines, power functions, polynomials, exponential and logarithmic functions, trigonometric functions (radians). Discrete-time dynamical systems. Stability and equilibria. Rates of change. Limits, derivatives. Maxima and minima. Concavity. Asymptotes and curve sketching. Newton's Method. Taylor Polynomials. Antiderivatives and integrals. Mathematical modelling. Separable and linear differential equations.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	1	1	1	1	1
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**Tutorials:** One per week, Monday or Wednesday, 14h00-16h00.

**DP requirements:** Minimum of 30% in class tests, and at least 80% attendance at tutorials.

**Assessment:** Year mark counts up to 40%; one no longer than 3-hour paper written in June makes up the balance.

**MAM1004S MATHEMATICS 1004**

**NQF credits:** 18 HEQS-F at level 5

**Convener:** To be advised

**Course entry requirements:** For students with a National Senior Certificate, a pass in Mathematics with at least 70%, or at least an E symbol at A-level. Students who fail MAM1004F (see above) will be allowed to register for MAM1004S at the beginning of the second semester.

**Course outline:**

This 2<sup>nd</sup> semester course is intended for students who have failed MAM1004F; the syllabus is the same as for MAM1004F. The aim of this course is to provide mathematics for applications, particularly in the Life and Earth sciences. The syllabus covers the following topics: Straight lines, power functions, polynomials, exponential and logarithmic functions, trigonometric functions (radians). Discrete-time dynamical systems. Stability and equilibria. Rates of change. Limits, derivatives. Maxima and minima. Concavity. Asymptotes and curve sketching. Newton's Method. Taylor Polynomials. Antiderivatives and integrals. Mathematical modelling. Separable and linear differential equations.

**Lectures:** Five lectures per week, in meridian.

**Tutorials:** One tutorial per week, Monday or Wednesday, 14h00-15h00.

**DP requirements:** As for MAM1004F.

**Assessment:** Year mark counts up to 40%; one no longer than 3-hour paper written in October/November makes up the balance.

**MAM1005H MATHEMATICS 1005**

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr B Osano

**Course entry requirements:** A pass in NSC Mathematics with at least 70%, or at least an E symbol at A-level. The permission of the Dean or Head of Department is required prior to registration for this course.

**Course outline:**

*This course only begins in week 7 and is intended for students who have been advised to transfer to this course after initially registering for MAM1000W (see entry for MAM1000W). It places an emphasis on the strengthening of foundational concepts and skills, the carefully-paced introduction of new material, and the development of sound approaches to effective learning. Note that MAM1005H + MAM1006H is equivalent to MAM1000W in level, credit value and as prerequisite for certain other courses.*

The aim of this course is to introduce the topics in the first half of MAM1000W at a slower pace. This course starts in the 2<sup>nd</sup> quarter. Topics covered include differential and integral calculus of functions of one variable.

**Lectures:** Monday to Thursday, 1<sup>st</sup> or 3<sup>rd</sup> period

**Tutorials:** Friday, 1st or 3<sup>rd</sup> period

**Workshops:** Monday, 6th and 7th period.

**DP requirements:** Minimum of 35% for class record and very satisfactory attendance at all lectures, workshops and tutorials.

**Assessment:** Year mark counts up to 40%; one 2-hour paper written in October/November makes up the balance.

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### MAM1006H MATHEMATICS 1006

**NQF credits:** 18 HEQS-F at level 5

**Convener:** To be advised

**Course entry requirements:** MAM1005H or a pass with at least 65% in MAM1004F or MAM1004S. Students who have passed MAM1004F or MAM1004S with less than 65% and who wish to register for MAM1006H will be required to write and pass the examination paper for MAM1005H in November or the supplementary examination paper in January before they are allowed to register for MAM1006H. Such students are required to inform the course co-ordinator for MAM1005H by 1 September or 1 December, respectively, of their intention to write the examination and at the same time obtain information about the reading to be done as preparation for the examination.

**Course outline:**

The course consists of those topics in the MAM1000W syllabus that were not covered in MAM1005H the previous year, including differential equations, partial derivatives, vector geometry, matrix algebra, complex numbers, Taylor series.

**Lectures:** First period, three days per week.

**Tutorials:** First period, two days per week.

**DP requirements:** Minimum of 35% in class tests and very satisfactory attendance at lectures and tutorials.

**Assessment:** Year mark counts up to 40%; one 2-hour paper written in October/November makes up the balance.

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### MAM1019H FUNDAMENTALS OF MATHEMATICS

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Professor G Janelidze (1<sup>st</sup> semester), Associate Professor P Bruyns (2<sup>nd</sup> semester)

**Course entry requirements:** At least 70% NSC Mathematics or a D symbol at A-level.

**Course outline:**

The aim of this course is to familiarise students with the most fundamental concepts and tools of modern mathematics at an elementary level. These include: fundamentals of logic and set theory, concepts of a function, of relations, of equivalence and order relations as well as some basic algebraic structures and the fundamental number systems.

**Lectures:** Five lectures every two weeks in meridian.

**Tutorials:** One hour per week, Wednesdays in meridian.

**DP requirements:** Minimum of 30% in year mark.

**Assessment:** Year mark counts up to 40%; one 2-hour examination paper written in November makes up the balance.

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## Second-Year Courses in Mathematics

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### MAM2000W MATHEMATICS 2000

**NQF credits:** 48 HEQS-F at level 6

**Convener:** Dr F Ebobisse Bille

**Course entry requirements:** MAM1000W or equivalent.

**Course outline:**

The aim of this course is to introduce the student to a selection of fundamental topics in mathematics. The course consists of four modules chosen from the list below, but with the module 2LA being compulsory. All students must take at least one of the modules 2IA or 2RA. Students who intend to proceed to MAM3000W should do both these modules. The modules listed below are included in this course (Note: all the modules may not be offered in any one year).

		Semester	Prerequisites
2AC	Advanced Calculus	1	-
2DE	Differential Equations	2	Modules 2AC and 2LA
2FM*	Fourier Methods	2	-
2IA	Introductory Algebra	2	Module 2LA
2LA	Linear Algebra	1	-
2RA	Real Analysis	2	-

\* This module will not be offered in 2014.

The syllabus covers the following topics:

2AC ADVANCED CALCULUS Differentiable functions, independence of order of repeated derivatives, chain rule, Taylor's theorem, maxima and minima, Lagrange multipliers. Curves and surfaces in three dimensions, change of coordinates, spherical and cylindrical coordinates. Line integrals, surface integrals. Stokes' theorem. Green's theorem, divergence theorem.

2DE DIFFERENTIAL EQUATIONS: This module is aimed at Actuarial and Business Science students. A selection from the following topics will be covered: First order difference equations. Second order difference equations with constant coefficients. Systems of first order difference equations. Linear differential equations and systems with constant coefficients. Laplace transforms and applications. Nonlinear equations and phase plane analysis. Parabolic partial differential equations, separation of variables, two point boundary value problems. Option pricing by the Black-Scholes equation. Stochastic Differential Equations. All topics will have applications to economics and finance.

2FM FOURIER METHODS (this module will not be offered in 2014): Signals and systems. Fourier series. Analysis of periodic Fourier series. Discrete frequency spectra. Fourier transforms, convolution, continuous spectra. Applications. Discrete and Fast Fourier Transforms.

2IA INTRODUCTORY ALGEBRA: Group theory: basic properties, subgroups, cosets, equivalence relations, Lagrange's theorem, order of an element, cyclic groups, generation of groups, permutation groups, parity, conjugation, cycle structure, normal subgroups, quotients, homomorphisms, group actions. Number theory: basic properties of the integers, unique factorization, congruences. Ring theory: subrings, ideals, integral domains, Euclidean domains, polynomial rings, application to linear algebra. Field theory: field of fractions, finite fields.

2LA LINEAR ALGEBRA Matrices, Gauss reduction, invertibility. Vector spaces, linear independence, spans, bases, row space, column space, null space. Linear maps. Eigenvectors and eigenvalues with applications. Inner product spaces, orthogonality.

2RA REAL ANALYSIS Sequences, subsequences, Cauchy sequences, completeness of the real numbers. Series: convergence, absolute convergence and tests for convergence. Continuity and differentiability of functions. Taylor series and indeterminate forms. Sequences and series of functions, uniform convergence, power series.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5 with options in 4th period.

**Tutorials:** One tutorial per week, Thursday or Friday, 14h00-16h00.

**DP requirements:** Minimum of 30% in class record.

**Assessment:** Year mark counts up to 40%; the examination mark makes up the balance. The examination consists of four papers of up to 2 hours each. First semester modules will be examined in June and second semester modules in October/November.

**MAM2001H, MAM2004H and MAM2002S** MATHEMATICS 2001, 2004 & 2002

**NQF credits:** each 24 HEQS-F at level 6

*MAM2001H: This course will not be offered in 2014.*

MAM2004H is a half-course in Mathematics at second-year level. It is also the minimum co-requisite for MAM2046W and for PHY2014F, in which case modules 2LA and 2AC are compulsory. MAM2002S is a half-course in Mathematics at second-year level. It is usually taken by students who are doing it in addition to either MAM2000W or MAM2004H.

**Convener:** Dr F Ebobisse Bille

**Course entry requirements:** MAM1000W (or equivalent).

**Course outline:**

The aims of these half courses are to introduce the student to a selection of fundamental topics in mathematics. Each half course consists of two modules. A student may register for a half course in the same year as MAM2000W or in a subsequent year. Refer to the MAM2000W course outline for the module details.

**Lectures:** For MAM2004H, MAM2002S: 5th period Monday to Friday, with some modules in 4th period; all students must have 5th period free.

**Tutorials:** One tutorial per week, Thursday or Friday, 14h00-16h00.

**DP requirements:** Minimum of 30% in class record.

**Assessment:** As for MAM2000W except that the examination consists of two papers of up to 2 hours each.

**Third-Year Courses in Mathematics****MAM3000W** MATHEMATICS 3000

**NQF credits:** 72 HEQS-F at level 7

**Convener:** Associate Professor A B Ianovsky

**Course entry requirements:** MAM2000W. MAM1019H required as a pre- or co-requisite from 2012

**Course outline:**

The aim of this course is to introduce students to a selection of advanced topics in mathematics. MAM3000W is the full-year major course for the BSc degree. Credit for MAM3000W is obtained by selecting an approved combination of four modules from those listed below.

Such a selection must include at least one of the modules 3AL or 3MS. A student will not be given credit for MAM3000W without having completed the modules 2RA Real Analysis and 2IA Introductory Algebra. Students who did not take both these modules for MAM2000W will be allowed to take one of them as one of the modules for MAM3000W. Students who are given permission to do a second-year module as part of MAM3000W might be required to do additional reading and be examined on it. Written projects with oral presentations will be a component of this course.

While the modules listed below are included in this course, all the modules may not be offered in any one year. Each module consists of thirty lectures and twelve tutorials.

		Semester	Prerequisites
3AL	Algebra	1	Module 2IA
3CA	Complex Analysis	2	Module 2RA
3LC	Logic and Computation	1	-
3MS	Metric Spaces	1	Module 2RA
3TA	Topics in Algebra	2	-
3TN	Topics in Analysis	2	Module 3MS

The syllabus covers the following topics:

3AL ALGEBRA An introductory course of modern abstract algebra involving the following concepts: algebraic operations; magmas and unitary magmas; semigroups; monoids; closure



operators; equivalence relations; categories; isomorphism; initial and terminal objects; algebras, homomorphisms, isomorphisms; subalgebras; products; quotient algebras; canonical factorizations of homomorphisms; free algebras. Various classical-algebraic constructions for groups, rings, fields, and vector spaces, seen as examples of these concepts, will be described in tutorials.

3CA COMPLEX ANALYSIS An introduction to the theory of complex functions with applications.

3LC LOGIC AND COMPUTATION The propositional and predicate calculi: their syntax, semantics and metatheory. Resolution theorem proving

3MS METRIC SPACES An introduction to metric spaces and their topology, with applications.

3TA TOPICS IN ALGEBRA A selection from lattices and order, congruences, Boolean algebra, representation theory, naive set theory, universal algebra. (Please note that this module is not a prerequisite for entry to the Honours course in Algebra.)

3TN TOPICS IN ANALYSIS A selection from the implicit function theorem and inverse mapping theorem, Lebesgue integral, Fourier analysis, Hilbert spaces, Lebesgue and Sobolev spaces, Fractals and approximation theory. (Please note that this module is not a prerequisite for entry to the Honours course in Functional Analysis.)

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5 with options in 4th period.

**Tutorials:** Friday, 14h00-17h00, with tutorials for some modules at other times to be arranged.

**DP requirements:** A class record of 30% or more.

**Assessment:** Year mark counts up to 40%; the examination mark counts at least 60% of the final mark; a project and test on additional reading, where applicable, may also contribute to the overall final mark. The examination consists of four papers of up to 2 hours each. First-semester modules will be examined in June and second-semester modules in October/November.

**MAM3001W MATHEMATICS 3001**

**NQF credits:** 72 HEQS-F at level 7

**Convener:** Associate Professor A B Ianovsky

**Course entry requirements:** MAM2000W

**Course outline:**

The aim of this course is to introduce the student to a selection of advanced topics in mathematics. The modules offered are the same as those for MAM3000W. A second-year module may be selected with the course co-ordinator's approval. MAM3001W is a third-year senior course for students selecting four modules which do not satisfy the requirements for the major course MAM3000W. No project is required for this course. Refer to the MAM3000W course outline for the module details.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5 with options in 4th period.

**Tutorials:** Friday, 14h00-17h00, with tutorials for some modules at other times to be arranged.

**DP requirements:** A class record of 30% or more.

**Assessment:** Year mark counts up to 40%; the examination mark accounts for the balance. The examination consists of four papers of up to 2 hours each. First-semester modules will be examined in June and second-semester modules in October/November.

**MAM3002H and MAM3003S MATHEMATICS 3002 & MATHEMATICS 3003**

**NQF credits:** each 36 HEQS-F at level 7

MAM3002H is a half course for students who register at the beginning of the year. MAM3003S is a half course for those who register in the second semester, or those who have already obtained credit for MAM3002H.

**Convener:** Associate Professor A B Ianovsky

**Course entry requirements:** MAM2000W

**Course outline:**

These half courses may consist of any two third-year modules. Either half course may be taken instead of a full course or in addition to it. A student who takes both MAM3002H and MAM3003S may count the combination as a major only if the four modules studied would be acceptable for MAM3000W and if the necessary project is completed. Otherwise the combination may be equivalent to MAM3001W. A second-year module may be taken as part of a third-year half course with the course co-ordinator's approval.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	5	5	5	5	

with options in 4th period.

**Tutorials:** Friday, 14h00-17h00, with tutorials for some modules at other times to be arranged.

**DP requirements:** A class record of 30%.

**Assessment:** As for MAM3000W, except that the examination consists of two papers of up to 2 hours each.

**Postgraduate Courses**

There are a number of Honours courses available to students who have completed senior courses in Applied Mathematics and Mathematics. A booklet is available from the Department giving details. Those interested should enquire at the Department's offices. The course co-ordinator for all Honours courses in the Department is Dr C S Swart.

**MAM4000W BSc HONOURS IN MATHEMATICS**

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 30 credits)

**Convener:** Dr J P Shock

**Course entry requirements:** Normally a BSc degree with MAM3000W, or equivalent. In all cases acceptance is subject to individual approval by the Head of Department.

**Course outline:**

A minimum of 160 credits is required for the Honours degree and each module offered at Honours level carries a specific credit rating. Each student will be required to do a project and a research seminar. Two streams are available:

**Mathematical orientation:** This course provides an introduction to some topics which are basic to a professional mathematician. The following modules are among those that have been offered in recent years: Algebra, Algebraic Geometry, Algebraic Topology, Category Theory, Computability and Complexity, Differential Geometry, Differential Topology, Functional Analysis, Lie Algebras, Measure Theory, Number Theory, Quantum Computing, Topology.

**Teaching orientation:** This course is for students who intend to enter the teaching profession. It aims at a very broad coverage of mathematics, without necessarily providing great depth. Students may be required to take some of the undergraduate courses that they did not take in their first degree. Students taking this orientation may need to undertake a programme of further work if they wish to proceed to a Master's degree.

**Assessment:** The project counts 18.75% of the final mark for the course, and must be passed (with 50%). On average, the examination counts at least 50% of the balance of the final mark for the course.

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**MAM4001W** BSc HONOURS IN APPLIED MATHEMATICS

NQF credits: 160 HEQS-F at level 8

(includes research project of 40 credits)

**Convener:** Dr J P Shock

**Course entry requirements:** Normally a BSc degree with MAM3040W, or an equivalent. In all cases acceptance is subject to individual approval by the Head of Department.

**Course outline:**

A minimum of 160 credits is required for the Honours degree and each module offered at Honours level carries a specific credit rating. Each student will be required to do a research project and an associated seminar. Among the modules which have been offered in recent years are: Advanced Mathematical Methods, Nonlinear Optimisation, Finite Element Analysis, General Relativity and Cosmology, Continuum Mechanics, and String Theory. It is a requirement that all Honours curricula include the module, Project and Seminar, but otherwise there is considerable flexibility in the structure of individual curricula. Furthermore, it is recommended that students include one or more modules from cognate departments in order to make up a well-rounded degree. However, the curriculum must include a minimum of 110 credits from Applied Mathematics modules.

**Assessment:** The project counts 25% of the final mark for the course and must be passed (with 50%). On average, the examination counts at least 50% of the balance of the final mark for the course.

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**MAM4007W** BSc HONOURS IN MATHEMATICS OF COMPUTER SCIENCE

NQF credits: 160 HEQS-F at level 8

(includes research project of 30 credits)

**Convener:** Dr J P Shock

**Course Entry requirements:** Normally a BSc degree with a major in either Computer Science or Mathematics and at least second-year level in the other, but in all cases subject to individual approval by the Heads of both departments.

**Course outline:**

A minimum of 160 credits is required for the Honours degree and each module offered at Honours level carries a specific credit rating. Each student will be required to do a research project. This Honours degree is offered jointly by the Departments of Computer Science and Mathematics & Applied Mathematics. Its subject matter involves logical and mathematical theories and structures relevant to computer science, together with their applications. Students will be required to do approximately half their work in each department, including course work in both departments for the course. Courses that are offered typically include some of the following: Computational Complexity, Cryptography, Enumerative Combinatorics, and Graph Theory. Every syllabus must be approved by the Heads of both departments. Completion of this degree could yield admission to Master's studies in either Mathematics or Computer Science.

**Assessment:** The project counts 18.75% of the final mark for the course and must be passed (with 50%). On average, the examination counts at least 50% of the balance of the final mark for the course.

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**AST4007W** BSc HONOURS IN ASTROPHYSICS & SPACE SCIENCE (National Astrophysics and Space Science Programme (NASSP))

For course details see entry under Department of Astronomy.

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**AST5003F** TAUGHT COMPONENT OF THE MASTERS IN ASTROPHYSICS & SPACE SCIENCE (National Astrophysics and Space Science Programme (NASSP))

For course details see entry under Department of Astronomy.

**MAM5005W** DISSERTATION COMPONENT OF THE MASTERS IN  
ASTROPHYSICS & SPACE SCIENCE

**NQF credits:** 90 HEQS-F at level 9

**Course entry requirements:** AST5003F

**Minor dissertation:** Students will work on an approved research topic on which a minor dissertation must be presented for formal examination.

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**MAM5000W** MASTERS IN MATHEMATICS

**NQF credits:** 180 HEQS-F credits at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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**MAM5001W** MASTERS IN APPLIED MATHEMATICS

**NQF credits:** 180 HEQS-F credits at level 9

**Course outline:**

The course will consist of the investigation of one or two topics chosen for intensive study by the candidate and approved by the Head of Department. Examination will be by dissertation. An oral examination may be required. The Department has research programmes in four particular areas of Applied Mathematics, namely (i) general relativity and astrophysics, (ii) mathematical modelling of biological, ecological and environmental systems, (iii) continuum mechanics, applied analysis and finite elements, and (iv) nonlinear evolution equations and non-integrable systems. See also 'Research in Mathematics & Applied Mathematics'. Candidates will be particularly encouraged to take part in one of these programmes. General rules for this degree may be found in the front of the handbook.

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**MAM6000W** PhD IN MATHEMATICS

**NQF credits:** 360 HEQS-F credits at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the general rules for the PhD as set out in Book 3, General Rules and Policies.

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**MAM6001W** PhD IN APPLIED MATHEMATICS**NQF credits:** 360 HEQS-F credits at level 10**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the general rules for the PhD as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF MOLECULAR AND CELL BIOLOGY

The Department is housed in the Molecular Biology Building, 22 University Avenue

Telephone (021) 650-3270 Fax (021) 689-7573

The Departmental abbreviation for Molecular and Cell Biology is MCB.

### **Associate Professor and Head of Department:**

V E Coyne, BSc Hons PhD *Cape Town*

### **Professors:**

J M Farrant, BSc Hons PhD *Natal*

J P Hapgood, BSc Hons PhD *Cape Town*

N Illing, MSc *Cape Town* DPhil *Oxon*

E P Rybicki, MSc PhD *Cape Town*

### **Associate Professors:**

V R Abratt, BSc Hons Rhodes PhD *Cape Town*

S J Reid, BSc Hons PhD *Rhodes*

### **Senior Lecturers:**

R A Ingle, BA (Hons) DPhil *Oxon*

P Meyers, BSc Hons PhD *Cape Town*

S Rafudeen, BSc Hons, PhD *Cape Town*

C O'Ryan, BSc Hons PhD *Cape Town*

L Roden, BSc Hons *Wits* PhD *Cantab*

### **Lecturers:**

T Oelgeschläger Dr rer nat *Hanover*

S Murray, MSc *Natal* PhD *Edinburgh*

Z L Woodman, BSc (Med Hons) PhD *Cape Town*

### **Emeritus Professors:**

H Klump, Dr rer nat habil *Freiberg* Dipl Chem

J A Thomson, BSc *Cape Town* MA *Cantab* PhD *Rhodes*

### **Principal Scientific Officers:**

M Chauhan

F Davids

### **Chief Scientific Officers:**

A M Clennell, BSc Hons *Cape Town*

T Millard, BSc *Pret*

### **Senior Scientific Officers:**

B L Arendze-Bailey, BSc Hons *Cape Town*

M D Krige, MSc *Stell*

Z McDonald, MSc *UKZN* PhD *Cape Town*

P Ma, MSc *Cape Town*

S Sattar, MSc *Cape Town*

### **Principal Technical Officer:**

N Bredekamp

### **Chief Technical Officer:**

U R Mutzeck

D September

### **Department Manager:**

Y L Burrows

### **HR/Postgraduate Administrator:**

E J Liebenberg

### **Finance Administrator:**

C Saunders

**Procurement Administrator:**

G Spannberg

**SAP Purchaser:**

P Louw

**Departmental Assistants:**

M Andreas

M Batyi

K Diedericks

C Fulani

C Hendrickse

M Jacobs

J Solomons

F Stuurman

**RESEARCH IN MOLECULAR AND CELL BIOLOGY**

The Department has interests and expertise in diverse areas of biology. Plant desiccation research (Professors Farrant and Illing): the problem of desiccation in plants is being tackled by a combination of physiological and molecular approaches. Plant biotechnology (Professor Rybicki and Drs Ingle, Rafudeen and Roden): research is focussed on developing virus-resistant and drought-tolerant crops, and optimising transient and transgenic expression of pharmaceutically-relevant proteins. Signal transduction in *Arabidopsis thaliana* is being studied during plant-pathogen and plant-insect interactions, as well as in the control of flowering time. Eukaryotic gene expression (Professors Hapgood, Illing and Drs Oelgeschläger and Roden): projects include regulation of transcription by steroid receptors, the role of chromatin modifications in regulating the onset of flowering, the regulation of gene transcription in the malaria parasite *Plasmodium*, and the regulation of gene expression during neuronal differentiation. Evolutionary genetics (Dr O'Ryan): projects focus on the evolution of neutral DNA markers to address population-genetics questions. Molecular virology (Professor Rybicki): studies focus on the expression of antigens from human and animal viruses in plants and insect cells for use as human and animal vaccines, and on the genetic diversity and molecular biology of single-stranded DNA viruses. Research in biochemistry (Professor Hapgood and Drs Oelgeschläger and Woodman): includes investigating the structure, function and posttranslational modification of HIV proteins and their interactions with host proteins with a view to understanding mechanisms of viral pathogenesis and drug development, and studies into the structure, assembly, function and regulation of the transcription initiation machinery in *Plasmodium falciparum*, the causative agent of severe malaria. Research in marine biotechnology (Associate Professor Coyne): includes genomic and proteomic studies of the effect of stress and disease on the abalone immune system, and the role of marine microorganisms in abalone nutrition and disease resistance. Research in microbiology (Associate Professors Abratt and Reid and Dr Meyers): includes molecular-genetic investigations of industrially and medically important anaerobic bacteria such as *Corynebacterium*, *Bacteroides fragilis*, *Bifidobacterium* and fibre-degrading bacteria in the ostrich gut. South African soil and marine actinomycete bacteria are being screened for novel antibiotics and strains of *Clostridium acetobutylicum* are being optimised for biofuel production. Analytical services: the Department runs a DNA synthesis facility and a Proteomics/Metabolomics platform.

**Undergraduate Courses****Second-Year Courses****MCB2020F** BIOLOGICAL INFORMATION TRANSFER**NQF credits:** 24 HEQS-F at level 6*NOTE: Entrance is limited to 140 students.***Convener:** Dr R Ingle**Course entry requirements:** CEM1000W or equivalent, BIO1000F and BIO1004S (or equivalent)

**Course outline:**

This course introduces students to concepts of molecular genetics that are fundamental to molecular and cell biology. Topics covered will include genome organisation and gene structure of viruses, plasmids, bacteria (including plasmids), transposons, plants and animals; horizontal gene transfer, mechanisms of heredity; prokaryotic and eukaryotic gene structure and information transfer as applied to viruses, plasmids, bacteria, plants and animals; basic cell signalling in bacteria, plants and animals; principles of evolutionary genetics.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	4	4	4	4	4

**Tutorials:** One tutorial per week.

**Practicals:** One practical per week, Thursday or Friday 14h00-17h00.

**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals.

**Assessment:** Tests and assignments count 40%; practicals count 10%; one 3-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

**MCB2021F MOLECULAR BIOSCIENCE**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: Entrance is limited to 140 students.*

**Convener:** Dr T Oelgeschläger

**Course entry requirements:** CEM1000W (or equivalent), BIO1000F and BIO1004S (or equivalents)

**Course outline:**

This course will introduce students to the concepts of biological chemistry fundamental to molecular biology as a basis to understanding the distinctive properties of microbial and eukaryotic living systems. Properties of biological molecules and macromolecules will be discussed, as well as recombinant DNA technology and energy production in cells. Students will also learn basic molecular techniques and experimental design.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	5	5	5	5	5

**Tutorials:** One tutorial per week.

**Practicals:** One practical per week, Monday or Tuesday, 14h00-17h00.

**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals

**Assessment:** Tests and assignments count 40%; practicals count 10%; one 3-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

**MCB2022S METABOLISM & BIOENGINEERING**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: Entrance is limited to 140 students.*

**Convener:** Dr Z Woodman

**Course entry requirements:** MCB2020F and MCB2021F (or at least 40% subminimum for the examinations and a final mark of 45% (supplementary) for these courses

**Course outline:**

This course will introduce students to some key aspects of metabolic energy production and how this can be exploited in developing renewable energy production. It aims to raise awareness of issues at the forefront of the discipline and give students the ability to dissect problems in order to identify solutions. Specific topics covered will include the metabolic diversity in Bacteria and Archaea e.g. nitrogen fixation, methane production; anoxygenic photosynthesis will be considered and well as how the growth of microorganisms can be controlled by physical, chemical, mechanical, or



biological means. The harnessing of photosynthesis in plants and algae for renewable energy production, as well as the conversion of biomass to other fuels, will also be discussed.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Tutorials:** One tutorial per week.

**Practicals:** One practical per week, Monday or Tuesday, 14h00-17h00.

**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals.

**Assessment:** Tests and assignments count 40%; practicals count 10%; one 3-hour paper written in November counts 50%. A subminimum of 40% in the examination is required.

**MCB2023S FUNCTIONAL GENETICS**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: Entrance is limited to 140 students.*

**Convener:** Professor N Illing

**Course entry requirements:** MCB2020F AND MCB2021F (or at least a 40% subminimum for the examinations and a final mark of 45% (supplementary) for these courses)

**Course outline:**

The course lays the foundation for the major in genetics, and shows how the tools of classical and molecular genetics can be applied to understanding the regulation of gene expression, cell differentiation and patterning in bacteria and eukaryotes. Concepts covered will include forward and reverse genetics; the genetics of mitochondria and chloroplasts; human genetics; the genetic analysis of cell cycle regulation and axis determination in *Drosophila*; microbial genetics, including regulation of the lac operon, and lysogeny and lysis of bacteriophage lambda.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 4 4 4 4 4

**Tutorials:** One tutorial per week.

**Practicals:** One practical per week, Thursday or Friday 14h00-17h00.

**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals.

**Assessment:** Tests and assignments count 40%; practicals count 10%; one 3-hour paper written in November counts 50%. A subminimum of 40% in the examination is required.

**Third-Year Courses**

*NOTE: All MCB majors must complete MCB3012Z (Research project in Molecular and Cell Biology) during the second semester. This course replaces practical classes for all third year second semester MCB courses.*

**MCB3012Z RESEARCH PROJECT IN MOLECULAR & CELL BIOLOGY**

**NQF credits:** 0 HEQS-F credits

**Convener:** Dr S Murray

**Course entry requirements:** MCB3019F, MCB3020F or MCB3021F (or concurrent registration in MCB3022S, MCB3023S or MCB3024S).

**Course outline:**

Groups of students will select and perform a research project two afternoons per week by arrangement. The work will be written up in the form of a research paper.

**Practicals:** Two afternoons per week

**DP requirements:** None

**Assessment:** Project counts 100%.

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**MCB3019F RECOMBINANT DNA, GENOMICS & PROTEOMICS****NQF credits:** 36 HEQS-F at level 7*NOTE: Entrance is limited to 90 students.***Convener:** Dr S Rafudeen**Course entry requirements:** Any two second year MCB semester courses, MAM1004F (or MAM1000W), STA1007S or STA1000F/S**Course outline:**

This course includes recombinant DNA techniques and an introduction to genomic/proteomic and computational approaches to study molecular systems. Topics include: DNA isolation, restriction endonucleases, cloning, polymerase chain reaction, genetic and physical maps, DNA sequencing, databases, comparative genomics, gene expression analysis, proteomics.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	3	3	3	3	3
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**Tutorials:** One tutorial per week.**Practicals:** One practical per week, Friday, 14h00-17h00.**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals.**Assessment:** Tests count 40%; practicals, tutorials, essays and assignments count 10%; one 3-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

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**MCB3020F PROTEIN STRUCTURE & FUNCTION****NQF credits:** 36 HEQS-F at level 7*NOTE: Entrance is limited to 90 students.***Convener:** Professor J Hapgood**Course entry requirements:** MCB2015S, MAM1004F (or MAM1000W), STA1007S or STA1000F/S**Course outline:**

This course deals with aspects of protein structure and function covering the following topics: protein purification, protein secondary, tertiary and quaternary structure, advanced aspects of enzymology, non-Michaelis Menten Kinetics, WMC model, cooperativity and allostery, Scatchard and Hill plots, haemoglobin, myoglobin, bisubstrate reactions, protein-DNA interactions, cell signalling, signal transduction, receptor structure, channels and neurotransmission.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	4	4	4	4	4
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**Tutorials:** One tutorial per week.**Practicals:** One practical per week, Thursday, 14h00-17h00.**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals.**Assessment:** Tests count 40%; practicals, tutorials essays and assignments count 10%; one 3-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

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**MCB3021F MOLECULAR MICROBIAL GENETICS****NQF credits:** 36 HEQS-F at level 7*NOTE: Entrance is limited to 60 students.***Convener:** Associate Professor V R Abratt**Course entry requirements:** MCB2017S, MCB3019F highly recommended, MAM1004F (or MAM1000W), STA1007 or STA1000F/S**Course outline:**

This course deals with the major aspects of molecular microbial genetics, including bacterial

genetics, recombination and repair, and prokaryotic gene regulation.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 5 5 5 5 5

**Tutorials:** One tutorial per week.

**Practicals:** One practical per week, Tuesday, 14h00-17h00

**DP requirements:** 40% test average; 50% average for assignments; attendance at practicals.

**Assessment:** Tests count 40%; practicals, tutorials, essays and assignments count 10%; one 3-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

**MCB3022S ADVANCED BIOTECHNOLOGY**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr P Meyers

**Course entry requirements:** MCB2017S, MAM1004F (or MAM1000W), STA1007S or STA1000F/S

**Course outline:**

This course focusses on developments in the area of advanced biotechnology, including new venture planning, metabolic engineering, bioethanol; beer and wine biotechnology; biotransformations; heterologous gene expression; bioprocess technology; bioprocess kinetics.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Tutorials:** One tutorial per week, Wednesday, 14h00-17h00

**DP requirements:** 40% test average; 50% average for assignments; attendance at tutorials.

**Assessment:** Tests count 20%; project counts 20%; one 3-hour paper written in November counts 60%. A subminimum of 40% in the examination is required.

**MCB3023S MOLECULAR EVOLUTIONARY GENETICS & DEVELOPMENT**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr L Roden

**Course entry requirements:** MCB2018F, MAM1004F (or MAM1000W), STA1007S or STA1000F/S MCB2019S and MCB3019F highly recommended.

**Course outline:**

This course provides advanced level studies in the area of molecular evolutionary genetics and development. The topics covered include: Molecular data used in evolutionary genetics: neutral theory of evolution; behavioural genetics. Principles of mouse molecular genetics applied to vertebrate eye, limb and neural development. Evolution of development; evolution of sex; interactions between the environment and development.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Tutorials:** One tutorial per week.

**DP requirements:** 40% test average.

**Assessment:** Tests count 40%; one 3-hour paper written in November counts 60%. A subminimum of 40% in the examination is required.

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**MCB3024S DEFENCE & DISEASE****NQF credits:** 36 HEQS-F at level 7**Convener:** Associate Professor V Coyne**Course entry requirements:** Any two second year MCB semester courses, MAM1004F (or MAM1000W), STA1007S or STA1000F/S**Course outline:**

This course will introduce the vertebrate immune system and its components such as MHC cell structure and pathogen recognition. The immune systems of invertebrates and plants will then be examined. The focus will switch to the three major disease challenges in South Africa, HIV, TB and malaria, and host-pathogen interactions. Finally, the course will focus on strategies to produce vaccines that enable immunity to viral infection.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	5	5	5	5	5
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**Tutorials:** One tutorial per week.**DP requirements:** 40% test average.**Assessment:** Tests count 40%; one 3-hour paper written in November counts 60%. A subminimum of 40% in the examination is required.

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**Postgraduate Courses**

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**MCB4002W BSc HONOURS IN MOLECULAR & CELL BIOLOGY****NQF credits:** 160 HEQS-F at level 8

(includes research project of 64 credits)

*NOTE: Entrance is limited to 30 students***Convener:** Dr C O'Ryan**Course entry requirements:** BSc degree with a major in Biochemistry, Biotechnology, Genetics or Microbiology. Molecular-based courses are highly recommended. Preference may be given to UCT graduates. Entrance is limited to 30 students, dependent on availability of supervisors and funding. Acceptance will be at the discretion of the Head of Department who will consider quality of senior course results and material covered in the undergraduate curriculum.**Course outline:**

The first part of this course consists of a ten week techniques course including gel electrophoresis, recombinant DNA technology, PCR, sequencing, bioinformatics, gene expression, protein isolation and analysis, confocal and electron microscopy, and large data set analysis. After successful completion of the techniques course, a six month research project on a specific topic will be undertaken.

**DP requirements:** Techniques examination must be passed at 50% to continue course.**Assessment:** Two 3-hour techniques examinations written in May, and the techniques course assignments, count 20%; essays count 15%; oral presentations count 20%; statistics module 1%, one 4-hour examination written in November counts 10%; project counts 34%. The research project must be passed at 50%.

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**MCB5005W MASTERS IN MOLECULAR & CELL BIOLOGY****NQF credits:** 180 HEQS-F at level 9**Course outline:**

General rules for this degree may be found in the front of the handbook. This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be

clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook

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**MCB5008W MASTERS IN BIOINFORMATICS**

**NQF credits:** 180 HEQS-F at level 9

*NOTE: New registrations will not be offered in 2014.*

**Course entry requirements:** An Honours degree in either Molecular & Cell Biology, Computer Science or Mathematics.

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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**MCB6002W PhD IN MOLECULAR & CELL BIOLOGY**

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies. The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF OCEANOGRAPHY

The Department is housed in the RW James Building, Residence Road  
Telephone (021) 650-3277 Fax (021) 650-3979  
The Departmental abbreviation for Oceanography is SEA.

### **Professor and Head of Department:**

C J C Reason, BSc Hons *Cape Town* MPhil *City* MSc PhD *British Columbia*

**South African Research Chair in Modelling of the Coupled Ocean-Land-Atmosphere  
Phenomena Related to Climate:**

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### **Associate Professor:**

M Rouault, MSc PhD *Aix-Marseille*

M Vichi, PhD *Oldenburg*

### **Senior Lecturers:**

I J Anson, BSc *Plymouth* MSc PhD *Cape Town*

H N Waldron, BSc Hons *Swansea* MSc PhD *Cape Town*

### **Lecturer:**

J A Jackson-Veitch, MSc PhD *Cape Town*

### **Emeritus Professors:**

G B Brundrit, BSc Hons PhD *Manchester*

### **Senior Scholar:**

J G Field, BSc Hons PhD *Cape Town* FRSSAf

### **Honorary Professor in Oceanography:**

L V Shannon, MSc PhD *Cape Town* FRSSAf

### **Honorary Research Associates:**

S Bernard, BSc *Soton* PhD *Cape Town* (CSIR)

D A Byrne, PhD *Columbia*

C M Duncombe Rae, BSc *Rhodes* BSc(Hons) PhD *Cape Town* (University of Maine)

N Fauchereau, PhD *Cape Town*

J Hermes, BSc *Bangor* PhD *Cape Town* (SAEON)

M Krug, MSc PhD *Cape Town*

T Lamont, PhD *Cape Town*

A Mavume, PhD *Cape Town*

P M S Monteiro, MSc PhD *Cape Town* (CSIR)

S Swart, PhD *Cape Town*

### **Departmental Librarian:**

N Jabaar, ND (Cost accounting) *CPUT*

### **Principal Technical Officer:**

P Truter, BSc *Stell*

### **Senior Scientific Officer:**

R Roman, MSc PhD *Cape Town*

### **Administrative Officer:**

C Khai, Nat. Dipl Bus Management *South Peninsula College*

## NANSEN-TUTU CENTRE FOR MARINE ENVIRONMENTAL RESEARCH

### **Co-Directors:**

F A Shillington, BSc Hons *Wits* MSc PhD *Cape Town*

J A Johannessen, PhD *Bergen*

### **Associates:**

J A Veitch, BSc Hons PhD *Cape Town*

B Backeberg, BSc Hons PhD *Cape Town*

**MARINE RESEARCH INSTITUTE (MA-RE)**

The Department of Oceanography is affiliated to the Marine Research Institute. For more information refer to the "Inter-Faculty Units" section, further on in this handbook.

**RESEARCH IN OCEANOGRAPHY**

Physical Oceanography: Ocean and atmospheric modelling, coastal oceanography, air-sea interaction, shelf dynamics, marine climatology, climate change and variability, marine and coastal meteorology, extreme events, regional oceanography, marine biogeochemistry (Professors C J C Reason, F A Shillington, Associate Professors M Rouault and M Vichi, and Drs I J Anson, J A Veitch and H N Waldron).

**Undergraduate Courses****Second-Year Courses****SEA2004F PRINCIPLES OF OCEANOGRAPHY**

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr H N Waldron

**Course entry requirements:** BIO1004S or GEO1009F.

**Course outline:**

A basic introduction to the principles of oceanography, including an introduction to physical, biological and chemical oceanography, marine geology, and the ocean atmosphere system. The course comprises six 2-week modules, which cover the above topics. Oceanographic instrumentation and methods of data analysis will be covered in the tutorials and practicals.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 4 4 4 4 4

**Practicals:** One tutorial or practical per week, Tuesday, 14h00-17h00.

**DP requirements:** Attendance at tutorials and practicals and a class mark of at least 40%.

**Assessment:** Tutorials/practicals and tests count 40%; one 3-hour paper written in June counts 60%. A subminimum of 40% in the examination is required.

**SEA2005S MARINE SYSTEMS**

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr J Jackson-Veitch

**Course entry requirements:** BIO1004S or GEO1009F, SEA2004F

**Course outline:**

Building on the principles of oceanography, this advanced course will cover the main ocean and atmosphere systems. These include the physical forcing and response of upwelling ecosystems (coastal and equatorial upwelling and upwelling domes), coastal systems (waves and beaches), shelf circulation, western boundary systems, Southern Ocean and polar systems, and oligotrophic systems. Emphasis will be on treating the systems as a whole. The course comprises six 2-week modules, which cover the above topics. Oceanographic field visits and methods of data sampling and analysis will be covered in the tutorials and practicals.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 4 4 4 4 4

**Practicals:** One tutorial or practical per week, Tuesday, 14h00-17h00.

**DP requirements:** Attendance at tutorials and practicals, and a class mark of at least 40%.

**Assessment:** Tutorials/practicals and tests count 40%; one 3-hour paper written in June counts 60%. A subminimum of 40% in the examination is required.

### Third-Year Courses

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#### SEA3004F OCEAN & ATMOSPHERE DYNAMICS

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr IJ Ansonge

**Course entry requirements:** PHY1031F or equivalent, BIO1004S or GEO1009F, SEA2004F, SEA2005S.

**Course outline:**

The Ocean & Atmosphere dynamics course will begin to specialise in advanced material related to physical oceanography, atmospheric science and climate. These topics will include a quantitative approach to ocean/atmosphere dynamics, theories of circulation and the development of ocean and atmospheric weather systems, coupled ocean/atmosphere processes, interactions and feedbacks and climate change. Oceanographic field visits and methods of data sampling and analysis will be covered in the tutorials and practicals.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 4 4 4 4 4

**Practicals:** One tutorial or practical per week, Monday, 14h00-17h00.

**DP requirements:** Attendance at tutorials and practicals, and a class mark of at least 40%.

**Assessment:** Tutorials/practicals and tests count 40%; one 3-hour paper written in October counts 60%. A subminimum of 40% in the examination is required.

### Postgraduate Courses

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#### SEA4001W BSc HONOURS IN OCEAN & ATMOSPHERE SCIENCE

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 48 credits)

**Convener:** Dr IJ Ansonge, Professor C J C Reason

**Course entry requirements:** A BSc degree with a major/specialisation in Ocean & Atmosphere Science or in a related discipline. Acceptance will be at the discretion of the Head of Department who will consider quality of final year results, material covered in the undergraduate curriculum, and possibly referee reports. Preference may be given to UCT graduates who meet the Course entry requirements.

**Course outline:**

Honours students intending careers in ocean and atmosphere science will complete a full set of modules and a research project. Honours students from Environmental & Geographical Science, Applied Mathematics, and other physical science and engineering departments, are encouraged to attend selected modules. The curriculum includes lecture-tutorials, seminars and practical work in advanced physical oceanography, meteorology and climate, an introduction to modelling and data analysis. Practical work may include dive training (class 4 diving qualification) and field work at sea. Student performance in each module may be assessed by project work, seminar presentations, written assignments and examinations, together making up 70% of the final mark. In the second half of the year the research project will take priority. Students will be expected to present a seminar on their projects at the year's end.

**Assessment:** Module assessment by submission of a research portfolio, which includes field trip reports, skills examination and formal test results. A weighted average of the continuous assessment of reports and tests counts 70% of the final mark; the research project counts 30% of the final mark. The research project must be passed at 50%.



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**SEA5000W MASTERS IN OCEAN & ATMOSPHERE SCIENCE****NQF credits:** 180 HEQS-F at level 9**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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**SEA5001W MASTERS IN PHYSICAL OCEANOGRAPHY****NQF credits:** 180 HEQS-F at level 9

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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**SEA5009H and SEA5010W MASTERS IN OCEAN & CLIMATE DYNAMICS**

(by coursework and minor dissertation)

Coursework: 90 HEQS-F at level 9

Minor Dissertation: 90 HEQS-F at level 9

**Convener:** Professor C J C Reason**Course entry requirements:** Students entering the programme must have completed an Honours degree in Oceanography, Ocean & Atmosphere Science, Atmospheric Science, Meteorology, or related field.**Course outline:**

This Masters course in Ocean & Climate Dynamics is designed for students who wish to gain advanced training in the ocean component of the climate system and how it interacts with the atmosphere, the cryosphere and the land surface. It is intended to be completed in one academic year.

Prescribed coursework (SEA5009H): During the first semester, modules in ocean modelling and data analysis, climate dynamics, marine biogeochemistry, marine remote sensing and instrumentation must be completed. Participation in an oceanic research cruise and associated observational analyses is also required.

Minor dissertation (SEA5010W): A research project must be completed and submitted as a dissertation for formal examination, which addresses a particular aspect of Ocean & Climate Dynamics. Students are expected to complete the dissertation by the end of the academic year.

**Assessment:** Coursework and dissertation each count 50% to the final assessment of the degree and

both must be passed for the award of the degree. The dissertation will be formally examined.

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**SEA6000W** PhD IN PHYSICAL OCEANOGRAPHY

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF PHYSICS

The Department is housed in the R W James Building, 9 University Avenue  
 Telephone (021) 650-3326 Fax (021) 650-3342  
 The Departmental abbreviation for Physics is PHY.

**Professor and Head of Department:**

A Buffler, MSc PhD HDE *Cape Town*

**Professors:**

D T Britton, MSc PhD *London*

A Peshier, MA PhD *Dresden*

**Associate Professors:**

M S Allie, MSc PhD *Cape Town* (CHED)

M D Blumenthal, BSc *Wits* Dipl Phys *Bonn* PhD *Cantab*

R W Fearick, BSc Hons PhD *Wits*

M Härting, Dipl Phys *Regensburg* Dr. Ing BW *München*

H W G Weigert, Dipl Phys Dr rer nat habil *Regensburg*

**Senior Lecturers:**

I Govender, BSc Hons PhD *Cape Town* HDE *Unisa*

A Hamilton, MSc PhD *Alberta*

G Leigh, HDE MSc *Cape Town*

S M Wheaton, MSc PhD *Cape Town*

**Lecturers:**

T Dietel, Dipl Phys *Heidelberg* Dr phil nat *Frankfurt am Main*

W A Horowitz, MA MSc PhD *Columbia*

S W Peterson, MA PhD *Wisconsin*

D L Taylor, BSc Hons HDE *UKZN* MSc PhD *Wits* (CHED)

**Senior Scholars:**

J W A Cleymans, MSc D en Sc *Louvain* FRSSAf

C A Dominguez, MSc PhD *Buenos Aires* FRSSAf

**Emeritus Professors:**

D G Aschman, BSc Hons *Cape Town* DPhil *Oxon*

S M Perez, BSc Hons *Wits* DPhil *Oxon*

R D Viollier, Dipl Phys Dr phil nat *Basel* FRSSAf

**Emeritus Associate Professors:**

C M Comrie, MSc *Natal* PhD *Cantab*

P E Spargo, BSc (Eng) MSc *Wits* Cert Ed *Cantab* FRSSAf

G N v d H Robertson, BSc Hons *Cape Town* DPhil *Oxon*

**Honorary Professor:**

Z Z Vilakazi, MA PhD *Wits*

**Honorary Research Associates:**

M Loewe, Phd *Hamburg*

F E Lubben, MSc *Delft* MA *York* PGCE *Delft*

K Schilcher, PhD *Vienna*

**Principal Technical Officer:**

K J Ontong

**Chief Technical Officers:**

J Dickson

G K Fowle

C J J Sadler

**Principal Scientific Officer:**

J E Fearon, MSc *Cape Town*

**Department Administrator:**

N Lovric

**Senior Secretary:**

M Maich (part-time)

L C van Zyl

**Laboratory Attendants:**

M Christians

L Oliver

G Swartz

**Departmental Assistant:**

M Lawrence

**RESEARCH IN PHYSICS**

The Department of Physics is accommodated in the R W James Building, which houses laboratories equipped for nuclear physics, solid state and nanophysics, and physics education research.

Additional facilities available to the Department are provided by iThemba Laboratories for Accelerator Based Sciences (200 MeV cyclotron and a 5 MeV Van de Graaff accelerator).

Major areas of interest at present include:

1. Experimental nuclear physics at iThemba LABS (D G Aschman, A Buffler, R W Fearick, comprising: (a) Gamma ray spectroscopy with the AFRODITE array; (b) Giant resonance reactions with the magnetic spectrometer; (c) Fast neutron physics.
2. Theoretical Physics (J W A Cleymans, C A Dominguez, W A Horowitz, A Peshier, S M Perez, H W G Weigert, S M Wheaton and R D Viollier), comprising: (a) Research within the Centre for Theoretical and Mathematical Physics; (b) Structure of elementary particles; (c) Neutrino physics and astrophysics (d) Quantum field theory, quantum electrodynamics and chromodynamics in free space, in the cavity and at extreme temperatures and pressures; (e) Renormalization group equations, both linear and nonlinear (Color Glass Condensate); (f) Nonlinear effects in QCD at high densities; (g) Phenomenology of heavy ion reactions; (h) Quark gluon plasma; (i) Nuclear structure and models.
3. Experimental high energy physics (J W A Cleymans, T Dietel, A Hamilton), comprising: (a) Research within the UCT-CERN Research Centre; (b) Relativistic heavy ion collisions within the ALICE collaboration at CERN; (c) High energy proton-proton collisions within the ATLAS collaboration at CERN.
4. Nanophysics and solid state physics (M D Blumenthal, D T Britton, C M Comrie and M Härting), comprising: (a) Research within the Nanosciences Innovation Centre; (b) Structural and electrical properties of thin films; (c) X-ray diffraction studies of strain fields and residual stress analysis; (d) Single electron transport and interactions.
5. Applied Physics (A Buffler, I Govender, S W Peterson, S M Wheaton), comprising: (a) Positron Emission Particle Tracking at PEPT Cape Town, iThemba LABS; (b) Particulate flow and interaction characterization in engineering and biological systems by computational and mechanistic modelling; (c) Radiation transport modelling in industrial and medical systems; (d) Applied nuclear physics using neutrons; (e) Geo-neutrino detection (EARTH collaboration).
- 6 Tertiary physics education (M S Allie, A Buffler and D L Taylor), comprising: (a) Curriculum design and evaluation; (b) Role of language; (c) Understanding of measurement and uncertainty; (d) Modelling and visualization.

**Undergraduate Courses**

Credit will not be given for both PHY1023H and PHY1031F. Credit can be given for both of PHY1023H and PHY1004W.

## First-Year Courses

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### PHY1004W MATTER & INTERACTIONS

**NQF credits:** 36 HEQS-F credits at level 5

**Convener:** Professor A Buffler

**Course entry requirements:** Students will be expected to have passed NSC Physical Science with at least 60%. MAM1000W (or equivalent) must have been passed or be taken concurrently.

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to PHY1031F or PHY1023H from week 7.*

**Course outline:**

PHY1004W is an advanced calculus-based introductory course for Science students intending to continue with second-year Physics. It features the modelling of physical systems from fundamental principles, and computational problem solving using VPython. The course includes the following topics: Modern mechanics: Conservation laws, the momentum principle, atomic nature of matter, conservation of energy, energy in macroscopic systems, energy quantization, multi-particle systems, exploring the nucleus, angular momentum, entropy, kinetic theory of gases, efficiency of engines. Electric and magnetic interactions: Electric fields, electric potential, magnetic fields, electric circuits, capacitance, resistance, magnetic force, Gauss' law, Ampere's law, Faraday's law, induction, electromagnetic radiation, waves and particles.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Practicals:** One practical or tutorial per week, Tuesday, 14h00-17h00.

**DP requirements:** Minimum of 40% in class record, including 50% in laboratory assessment.

**Assessment:** Class record (weekly problem sets, class tests and laboratory record) counts 50%; one June 2-hour examination counts 25%; one November 2-hour examination counts 25%.

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### PHY1031F GENERAL PHYSICS A

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr S M Wheaton

**Course entry requirements:** Students will be expected to have passed NSC Physical Science with at least 60%.

*Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to PHY1023H from week 7.*

**Course outline:**

PHY1031F is an algebra-based introductory course for Science students who do not intend proceeding to second-year courses in Physics. Some calculus may be used. The course includes the following topics: Mechanics: vectors, kinematics, forces, dynamics, momentum, impulse, work, energy, power, collisions, rotation, rotational dynamics, torque, angular momentum, static equilibrium, gravitation. Properties of matter: elasticity, hydrostatics, hydrodynamics. Vibrations and waves: simple harmonic motion, damped oscillations, forced oscillations, resonance, travelling waves, superposition, standing waves, sound waves, sound intensity, Doppler Effect.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Practicals:** One practical or tutorial per week, Monday, Wednesday or Thursday, 14h00-17h00.

## 130 DEPARTMENT OF PHYSICS

**DP requirements:** Minimum of 40% in class record, including 50% in laboratory assessment.

**Assessment:** Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination counts 50%.

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### PHY1023H PRINCIPLES OF PHYSICS

**NQF credits:** 18 HEQS-F at level 5

*Note that students passing PHY1023H may proceed into PHY1032F. Students who pass PHY1023H and then register for and pass PHY1004W will gain credit for both courses.*

**Convener:** Dr D L Taylor

**Course entry requirements:** Students will be expected to have passed NSC Physical Science at least 60%. The permission of the Dean or Head of Department is required prior to registration for this course.

**Course outline:**

*PHY10213H begins in week 7 and is intended for students who have been advised to transfer to this course after initially registering for PHY1004W or PHY1031F. It places an emphasis on the strengthening of foundational concepts and skills, the carefully-paced introduction of new material, and the development of sound approaches to effective learning.*

PHY1023H is an algebra-based introductory course for Science students. Some calculus may be used. The course includes the following topics: Tools and skills: Essential mathematical, diagrammatic and conceptual tools and skills for Physics, coordinate systems, vectors, rates of change, the fundamental forces, mathematical techniques and their relationship with physical phenomena. Mechanics: kinematics, forces, dynamics, momentum, impulse, work, energy, power, collisions, rotation, rotational dynamics, torque, angular momentum, static equilibrium, gravitation. Properties of matter: elasticity, hydrostatics, hydrodynamics. Vibrations and waves: simple harmonic motion, damped oscillations, forced oscillations, resonance, travelling waves, superposition, standing waves, sound waves, sound intensity, Doppler Effect.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Practicals:** One practical or tutorial per week, Tuesday, 14h00-17h00.

**DP requirements:** Minimum of 40% in class record, including 50% in laboratory assessment.

**Assessment:** Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination counts 50%.

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### PHY1032S GENERAL PHYSICS B

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr A Hamilton

**Course entry requirements:** PHY1031F or PHY1023H

**Course outline:**

PHY1032S is an algebra-based introductory course for Science students who do not intend proceeding to second-year courses in Physics. Some calculus may be used. The course includes the following topics: Electricity and magnetism: electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, magnetic field, Biot Savart law, Ampere's law, electromagnetic induction, inductance, alternating currents. Thermal physics: temperature, heat, kinetic theory of gases, first and second laws of thermodynamics. Optics: Geometrical optics, polarization, electromagnetic waves, interference, diffraction. Modern physics: atomic structure, quantum physical phenomena, wave-particle duality, X-rays, elementary nuclear physics, radioactivity.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 3 3 3 3 3

**Practicals:** One practical or tutorial per week, Monday, Wednesday, or Thursday, 14h00-17h00.

**DP requirements:** Minimum of 40% in class record, including 50% in laboratory assessment.

**Assessment:** Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination counts 50%.

### PHY1032F GENERAL PHYSICS B

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr W A Horowitz

**Course entry requirements:** PHY1023H or PHY1031F

#### Course outline:

PHY1032F is an algebra-based introductory course usually taken by Science students who have completed PHY1023H. Some calculus may be used. The course includes the following topics: Electricity and magnetism: electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, magnetic field, Biot Savart law, Ampere's law, electromagnetic induction, inductance, alternating currents. Thermal physics: temperature, heat, kinetic theory of gases, first and second laws of thermodynamics. Optics: Geometrical optics, polarization, electromagnetic waves, interference, diffraction. Modern physics: atomic structure, quantum physical phenomena, wave-particle duality, X-rays, elementary nuclear physics, radioactivity.

#### Period

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	3	3	3	3	3

**Practicals:** One practical or tutorial per week, Wednesday 14h00-17h00.

**DP requirements:** Minimum of 40% in class record, including 50% in laboratory assessment.

**Assessment:** Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination counts 50%.

## Second-Year Courses

### PHY2014F WAVES & ELECTROMAGNETISM

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Associate Professor M D Blumenthal

**Course entry requirements:** PHY1004W, a full first-year course in Mathematics, and MAM2000W or (MAM2004H and MAM2047H) as co-requisite.

#### Course outline:

PHY2014F and PHY2015F develop the foundations of a major in Physics and together allow continuation to third year Physics. The course includes the following topics: Vibrations and waves: Harmonic oscillations damped and forced oscillations, resonance, Fourier analysis, harmonic chains, waves, dispersion, interference, diffraction. Electromagnetism: 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, Maxwell's equations.

#### Period

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	4	4	4	4	4

**Practicals:** One practical per week, Monday, 14h00-17h00.

**Tutorials:** One tutorial per week, Tuesday, 14h00-16h00

**DP requirements:** Minimum of 40% in class record; completion of all laboratory reports, 75% of tutorial work and problem sets; attendance at all tests.

**Assessment:** Class record (tests, weekly problem sets and laboratory work) counts 50%; one 3-hour examination in June counts 50%. A subminimum of 45% is required in the final examination.

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**PHY2015S CLASSICAL & QUANTUM MECHANICS****NQF credits:** 24 HEQS-F at level 6**Convener:** Associate Professor R W Fearick**Course entry requirements:** PHY1004W, a full first-year course in Mathematics, and MAM2000W or (MAM2004H and MAM2047H) as co-requisite.**Course outline:**

PHY2014F and PHY2015F develop the foundations of a major in Physics and together allow continuation to third year Physics. The course includes the following topics: Classical mechanics: Review of Newton's laws; inertial and non-inertial frames; constraints and d'Alembert's principle; the Lagrangian formulation of mechanics; Noether's theorem; symmetries and conservation laws; applications from planetary motion to rigid body motion. Quantum mechanics: The basic assumptions of quantum mechanics, solutions of Schrödinger's equation, properties of wave functions and operators, one-dimensional applications, angular momentum in quantum mechanics, three-dimensional applications, the hydrogen atom, approximate methods.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	4	4	4	4	4
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**Practicals:** One computational practical per week, Monday, 14h00-17h00.**Tutorials:** One tutorial per week, Tuesdays 14h00-16h00**DP requirements:** Minimum of 40% in class record; completion of all laboratory reports, 75% of tutorial work and problem sets; attendance at all tests.**Assessment:** Class record (tests, weekly problem sets and laboratory work) counts 50%; one 3-hour paper written in November counts 50%. A subminimum of 45% is required in the final examination.

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**Third-Year Courses****PHY3021F ADVANCED PHYSICS A****NQF credits:** 36 HEQS-F at level 7**Convener:** Associate Professor H Weigert**Course entry requirements:** PHY2014F and PHY2015S, and 40% in MAM2000W or (MAM2004H and MAM2047H).**Course outline:**

PHY3021F and PHY3022S together lead to a major in Physics. The course includes the following topics: Electromagnetism: Maxwell's equations in vacuum and in matter, conservation laws, momentum and angular momentum in electromagnetic fields, electromagnetic waves, the Fresnel relations, laws of optics, absorption and dispersion, frequency dependence of permittivity, wave guides, gauge transformations, retarded potentials, electric and magnetic dipole radiation, power radiated by a point charge, special relativity, four-vectors, relativistic kinematics, relativistic electrodynamics, the electromagnetic field tensor. Thermodynamics and statistical physics: Temperature, heat and work, First law of thermodynamics, Ensembles and entropy, Second law of thermodynamics, Boltzmann distribution and Helmholtz free energy, thermal radiation, chemical potential and Gibbs distribution, Fermi-Dirac statistics, electrons in metals, Bose-Einstein statistics, phonons, photons and the black-body distribution, the Bose-Einstein condensate, applications to classical and quantum systems.

**Period**

	Mon	Tue	Wed	Thu	Fri
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<b>Lectures:</b>	4	4	4	4	4
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**Practicals:** Monday, 14h00-17h00; other days by arrangement.**Tutorials:** By arrangement**DP requirements:** Class record 40%, including 50% for laboratories and satisfactory completion of tutorial assignments.



**Assessment:** Class record (tests, essays, projects and laboratory reports) counts 50%; one 3-hour paper and one 2-hour paper count 50%. A subminimum of 45% is required in the final examination.

### PHY3022S ADVANCED PHYSICS B

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Professor A Buffler

**Course entry requirements:** PHY2014F and PHY2015S, and at least 40% in PHY3021F.

**Course outline:**

PHY3021F and PHY3022S together lead to a major in Physics. The course includes the following topics: Atomic physics: angular momentum, atomic structure and spectra, selection rules, spin, fine structure, Zeeman effect, time dependent and independent perturbation theory, molecular structure and spectra. Nuclear and particle physics: properties of nuclei, nuclear forces, nuclear structure and reactions, radioactivity, decay modes, nuclear models, interactions of elementary particles, quarks and leptons, symmetries and the gauge forces. Solid state physics: crystal structure; lattice vibrations, electron states in solids, energy band theory, semiconductor physics and devices.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 4 4 4 4 4

**Practicals:** Monday, 14h00-17h00; other days by arrangement

**Tutorials:** By arrangement.

**DP requirements:** Class record 40%, including 50% for laboratories and satisfactory completion of tutorial assignments.

**Assessment:** Class record (tests, essays, projects and laboratory reports) counts 50%; one 3-hour paper and one 2-hour paper count 50%; oral exam 2% (bonus). A subminimum of 45% is required in the final examination.

## Postgraduate Courses

### PHY4000W BSc HONOURS IN PHYSICS

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 40 credits)

**Convener:** Professor A Peshier

**Course entry requirements:** The entrance requirement is a BSc degree with a major in Physics. Acceptance will be at the discretion of the Head of Department who will consult the Honours course co-ordinator. Criteria for acceptance include a pass of 60% in PHY3021F and PHY3022S, or equivalent; and a pass of 60% in MAM2000W or MAM2046W or equivalent; and in cases where the Head of Department deems it necessary, favourable referee reports. Enrolment is limited to 15 students. Preference may be given to UCT graduates who meet the Course entry requirements.

**Course outline:**

The Honours course in Physics consists of several modules comprising at least 12, but not more than 14 units. The compulsory modules are: Research Project (3 units), Electromagnetism 1, Electromagnetism 2, Quantum Mechanics 1, Quantum Mechanics 2, and Statistical Physics. At least three further modules must be chosen from: Classical Mechanics, Computational Physics, Particle Physics, Nuclear Physics, Relativistic Quantum Mechanics, Quantum Field Theory, and Solid State Physics. The course starts with a compulsory non-credit bearing module dealing with mathematical tools and skills, and aspects of physics education. Furthermore, the course can be complemented by physics-related modules offered by the Departments of Astronomy, and Mathematics and Applied Mathematics. The choice of modules and research project must be approved by the Head of Physics in consultation with the Honours co-ordinator. Details appear on the Physics website: [www.phy.uct.ac.za](http://www.phy.uct.ac.za).

**DP requirements:** 30% for class tests and problem sets, and suitable progress in the Research Project.

**Assessment:** The pass mark is 50% and is based on an aggregation of all modules, and is further subject to the subminimum criteria of obtaining a minimum mark of 50% in the Research Project, passing two thirds of all modules, and achieving a mark of at least 35% in all but two of the compulsory modules. The Research Project will count 25% of the final mark.

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### **PHY5000W MASTERS IN PHYSICS**

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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### **PHY5001W MASTERS IN THEORETICAL PHYSICS**

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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### **PHY5003W DISSERTATION COMPONENT OF THE MASTERS IN ASTROPHYSICS & SPACE SCIENCE**

Minor dissertation: **NQF credits:** 90 HEQS-F at level 9

**Course entry requirements:** AST5003F

Students will work on an approved research topic on which a dissertation must be presented for formal examination.

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### **PHY5006W MASTERS IN TERTIARY PHYSICS EDUCATION**

**NQF credits:** 180 HEQS-F at level 9

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified

supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the front of the handbook.

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**PHY6000W** PhD IN PHYSICS

**NQF credits:** 360 HEQS-F at level 10

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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**PHY6001W** PhD IN TERTIARY PHYSICS EDUCATION

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in Book 3, General Rules and Policies.

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## DEPARTMENT OF STATISTICAL SCIENCES

The Department is housed in the P D Hahn Building, Level 5  
Telephone (021) 650-3219 Fax (021) 650-4773  
The Departmental abbreviation for Statistical Sciences is STA.

### **Associate Professor and Head of Department:**

F Little, MSc PhD *Cape Town*

### **Professors:**

G D I Barr, MSc PhD *Cape Town*

D J Bradfield, MSc PhD *Cape Town* HED *Unisa*

### **Associate Professors:**

R Altwegg, PhD *Zurich*

S Lubbe, MCom PhD *Stell*

C Thiar, BSc Agric (Hons) *Stell* MSc PhD *Cape Town*

### **Senior Lecturers:**

B Ermi, BSc Hons MSc *Cape Town* PhD *Basel*

F N Gumedze, MSc PhD *Cape Town*

J C Nyirenda BSc *Newcastle Upon Tyne* PhD *Cambridge*

LD Scott, MSc PhD *Cape Town*

K Stielau, BSc Hons *Natal*

M Varughese, BSc Hons MSc *Wits* DipAc&Tech *Edinburgh* PhD *Cape Town*

### **Adjunct Senior Lecturer:**

I Durbach, MSc PhD *Cape Town*

### **Lecturers:**

A Clark, MSc *Cape Town*

G Distiller, BCom (Hons) MSc *Cape Town*

S Er, PhD *Istanbul*

H Gerber, MSc *NMMU* MSc *UPE*

D Katshunga, BSc Hons *DRC* MSc *Cape Town*

M J P Lacerda, MSc *Cape Town* PhD *Galway*

S Silal, MSc *Cape Town*

B J Stray, MSc *Arizona State* PhD *Stellenbosch*

N Watson, MSc *Cape Town*

### **Senior Scholars:**

R K Guo, BSc *Tsinghua* MSc PhD *Iowa State*

T J Stewart, BSc (Chem Eng) *Cape Town* MSc (OR) PhD *Unisa*

### **Emeritus Professors:**

T T Dunne, BA (Hons) BSc Hons UED BEd *Natal* PhD *Cape Town* CStat

L M Haines, BA MA *Cambridge* BSc Hons *Natal* MPhil *UCL* PhD *Unisa* FRSSAF

### **Emeritus Associate Professor:**

J M Juritz, BSc Hons *UNISA*, MSc PhD *Cape Town*

### **Principal Scientific Officer (Consultant):**

U Galal, MSc *Wits*

K Mauff, BBusSci (Hons) MSc *Cape Town*

### **Administrative Manager:**

B King, HDE *UWC*

### **Administrative Assistants:**

A Davids Meyer

L Futuse

S Meyer, BComm *UNISA*

### **Senior Clerk:**

K Jeptha

**Receptionist:**

C Jansen-Fielies

**RESEARCH IN STATISTICAL SCIENCES****Research areas:**

**OPERATIONAL RESEARCH and MULTICRITERIA DECISION SUPPORT:** The development of interactive decision aids, to assist in the analysis of decision problems with multiple and conflicting objectives, with particular reference to natural resource management and others; combinatorial optimization; application to decision making and planning in private and public sectors (T J Stewart, L Scott, J Nyirenda, J Stray, N Watson).

**BAYESIAN DECISION THEORY:** General principles of Bayesian statistical analysis; applications in sequential stochastic optimization and other fields (T J Stewart, T T Dunne, R K Guo).

**FINANCIAL MODELLING:** Econometric techniques are being used to test theories related to the South African economy in the fields of finance, monetary economics, interest rate theory and stock market research. Time series, portfolio construction and risk management (G D I Barr, R K Guo, L M Haines, D Bradfield, A Clark).

**RELIABILITY MODELLING AND QUALITY CONTROL:** System Reliability and Maintenance Modelling and statistical quality control methods and applications (R K Guo, T J Stewart, T T Dunne).

**BIOSTATISTICS:** Medical applications of statistics (T T Dunne, F Little, L M Haines, J M Juritz, F Gumedze, S Silal). The objectives of the Biostatistics Interest Group are to develop statistical methodology motivated by medical problems, particularly in the area of community health, and to provide statistical support to medical researchers in the form of short courses and consulting.

**SPATIAL AND GIS MODELING:** Statistics of large geoscience datasets. Geographic information systems (GIS). Geostatistics and spatial modeling (C Thiant, M M Varughese). Imprecise spatial data analysis (R K Guo). Mixed models with spatial data (B Emi).

**MULTIVARIATE ANALYSIS:** Detection of outliers and influential observations (T T Dunne, C Thiant, F Gumedze); multivariate distribution theory; multidimensional scaling, correspondence analysis and cluster analysis (L G Underhill, S Lubbe); robust regression procedures (C Thiant); classification and discrimination procedures; graphical displays of multivariate data (S Lubbe).

**EDUCATIONAL APPLICATIONS:** Statistical examination of data pertaining to schools, disadvantaged students and to science education (T T Dunne, K Stielau, L Scott, G Barr).

**MIXED EFFECTS LINEAR MODELS:** Longitudinal data analysis, analysis of repeated measures data, generalized linear (mixed) models, hierarchical generalized linear mixed models (robust estimation and diagnostics) (F Gumedze, C Thiant, J M Juritz, T T Dunne, F Little).

**SOCIAL SCIENCE STATISTICS:** Research surveys; local government support; analysis of poverty and development, structural equation modelling (T T Dunne, S Er).

**OPTIMAL DESIGN:** The design of experiments in agriculture, biology and engineering which are in some sense optimal (L M Haines).

**ASTROSTATISTICS:** The application of statistical techniques to problems in astronomy (M M Varughese).

**BIOINFORMATICS:** The application of statistical and computational techniques to problems in genetics and molecular biology (M J P Lacerda).

**STATISTICS IN ECOLOGY:** Applications of statistics to biological and environmental data (B Emi, G Distiller, R Altwegg, M Varughese, A Clark)

**Undergraduate Courses****NOTES**

1. Students may not obtain credit for both STA2030S and STA2004F.
2. Students who intend to specialise in Statistics are strongly advised to include Computer Science in their curriculum.
3. Note that MAM1000W is a prerequisite for STA3041F, STA3043S, STA3045F and MAM2000W is strongly recommended.

4. A major in Mathematical Statistics for the BSc requires STA2004F, STA2005S, STA3041F and STA3043S.
5. A non-Science major in Applied Statistics requires STA2020F (or STA2007F), STA2030S, STA3030F and STA3036S (See Commerce and Humanities handbooks).

## First-Year Courses

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### STA1000F INTRODUCTORY STATISTICS

*(No first year students)*

**NQF credits:** 18 HEQS-F at level 5

STA1000F and STA1000S are identical courses offered in first and second semesters. Owing to the mathematics prerequisites, first-year students can only register for STA1000S in the second semester and STA1000F on completion of the mathematics prerequisite.

**Course co-ordinator:** Dr L Scott

**Course entry requirements:** A pass in any of MAM1004F/S or MAM1005H or MAM1000W or MAM1006H or MAM1020F/S or MAM1010F/S or STA1001F.

**Course outline:**

This is an introductory statistics course where the collection, display, analysis and interpretation of data are discussed. It is a service course offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will be reading and applying statistics in their other courses and professions. It is useful to students who would like an introduction to statistics with an applied emphasis. Topics covered include: Exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; binomial, Poisson, exponential, normal and uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including various tests on means); determining sample sizes; simple linear regression and measures of correlation.

#### Period

Mon Tue Wed Thu Fri

**Lectures:** 1 1 1 1 1

**Tutorials:** One compulsory tutorial or practical per week, at times to be arranged.

**DP requirements:** A class record of at least 35%.

**Assessment:** The class record counts 30% (consists of the following components (and their contribution)): Class test 1 (25%), class test 2 (25%), Excel test (30%) and Tutorial mark (20%). The tutorial mark comprises of tutorial hand-ins (70%) and tutorial/practical attendance (30%). One 3-hour examination counts 70%.

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### STA1000S INTRODUCTORY STATISTICS

**NQF credits:** 18 HEQS-F at level 5

STA1000F and STA1000S are identical courses offered in first and second semesters. Owing to the mathematics prerequisites, first-year students can only register for STA1000S in the second semester.

**Course co-ordinator:** Ms H Kroon

**Course entry requirements:** A pass in any of MAM1004F/S or MAM1005H or MAM1020F/S or MAM1010F/S or STA1001F. In addition students will be admitted to STA1000S if they are concurrently registered for MAM1000W or MAM1012S.

**Course outline:**

This is an introductory statistics course where the collection, display, analysis and interpretation of data are discussed. It is a service course offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will be reading and applying statistics in their other courses and professions. It is useful to students who would like an introduction to statistics with an applied emphasis. Topics covered include: Exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; binomial,

Poisson, exponential, normal and uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including various tests on means); determining sample sizes; simple linear regression and measures of correlation.

**Lectures:** Monday to Friday, 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> or 4<sup>th</sup> period

**Tutorials:** One compulsory tutorial or practical per week, at times to be arranged.

**DP requirements:** A class record of at least 35%.

**Assessment:** The class record counts 30% (consists of the following components (and their contribution)): Class test 1 (25%), class test 2 (25%), Excel test (30%) and Tutorial mark (20%). The tutorial mark comprises of tutorial hand-ins (70%) and tutorial/practical attendance (30%). One 3-hour examination counts 70%.

## STA1006S MATHEMATICAL STATISTICS I

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Dr F Gumedze

**Course entry requirements:** At least 70% in NSC Mathematics; concurrent registration on MAM1000W, or MAM1006H or MAM1012S

### Course outline:

This is an introduction to statistics: the study of collecting, analysing, and interpreting data. It is the key entry-point into a Mathematical Statistics major and hence it is compulsory for students intending to major in Mathematical Statistics. This course provides foundation knowledge in statistical theory, and is useful for any student who wishes for an introduction to the fundamentals of statistics, from a mathematical perspective. Topics covered include: Types of data variables. Exploratory data analysis. Grouping and graphing of data. Set theory and counting rules. Probability: conditional probabilities, independence. Bayes theorem. Random variables and values, probability mass and density functions, cumulative distribution functions. Population models and parameters: binomial, poisson, geometric, negative binomial, hypergeometric. Uniform, exponential, Gaussian, expectation. Coefficient of variation. Sampling: sampling distribution t, Chi-square, F and their tables. Point and interval estimation. Sample size estimation. Hypotheses testing: Z-test and T-test (means, difference between means: for independent samples and dependent samples). F-test (ratio of two independent variances). Chi-square-test. Meaning of p-values. Bivariate data: scatterplot, simple linear regression and correlation.

**Lectures:** There will be five lectures per week, Monday to Friday, 1<sup>st</sup> and 4<sup>th</sup>

**Tutorials:** One compulsory 2-hour tutorial per week.

**DP requirements:** Attendance and completion of all tests and assignments; class record of 35%.

**Assessment:** Class record counts 30% (comprising of two tests counting 45% each and weekly tutorial tests counting 10% in total). One 3-hour examination counts 70%.

## STA1007S BIONUMERACY

**NQF credits:** 18 HEQS-F at level 5

**Convener:** Mr G Distiller

**Course entry requirements:** A pass in any of MAM1004F/S or MAM1005H. In addition students will be admitted to STA1007S if they are concurrently registered for MAM1000W.

### Course outline:

This course aims to provide an introduction to statistics for Science students, and the topics covered include: exploratory data analysis and summary statistics. Set theory. Probability: conditional probabilities, independence, Bayes theorem. Random variables. Probability mass and density functions. Binomial, Poisson, exponential, normal and uniform distributions. Sampling distributions. Confidence intervals. Hypothesis testing: Z-test and t-test (means, difference between means for independent and dependent samples). Chi-square test for independence and for Goodness-of-fit. Meaning of p-values. Determining sample size. Simple linear regression and measures of correlation. Practical data analysis will be taught using Excel. The course is the equivalent of

STA1000S, in a biological setting.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1

In addition to this there are three lab sessions scheduled and take place instead of the usual lecture.

**Tutorials:** One compulsory tutorial per week.

**DP requirements:** Attendance and completion of all tests; class record of 35%.

**Assessment:** Coursework 30%, made up of two tests (60%), tutorial (20%) and excel test (20%). One 3-hour examination counts 70%.

## Second-Year Courses

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### STA2004F STATISTICAL THEORY & INFERENCE

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr M Lacerda

**Course entry requirements:** (MAM1000W or MAM1012S) and STA1006S

**Course outline:**

STA2004F is a rigorous introduction to the foundation of the mathematical statistics and aims to provide students with a deeper understanding of the statistical concepts covered in STA1006S. The course is intended for students studying Mathematical Statistics or Actuarial Science. STA2004F is divided into two broad sections: (1) Distribution theory and (2) Statistical Inference. During the first part of the course, students will learn to derive the distributions of random variables and their transformations, and explore the limiting behaviour of sequences of random variables. The last part of the course covers the estimation of population parameters and hypothesis testing based on a sample of data.

Distribution Theory: Univariate and bivariate distributions. Conditional distributions. Moments. Generating functions (moment, probability and cumulative). Convergence in distribution and central limit theorem. Transformations of random variables. Sampling distributions from the normal distribution (chi-squared, t, F). Order statistics.

Statistical Inference: Parameter estimation. Methods of moments. Maximum likelihood. Asymptotic theory. Efficiency and sufficiency. The exponential family. Hypothesis testing. Confidence intervals.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

**Tutorials:** One compulsory tutorial of 2 hours per week, by arrangement.

**DP requirements:** Attendance at all tests, attendance at 80% of tutorials, 35% average for tutorial tests, class record of at least 35%.

**Assessment:** Class record counts 30% (comprising of two tests counting 40% each and weekly tutorial tests counting 20% in total). One 3-hour examination counts 70%.

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### STA2005S LINEAR MODELS

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Dr B Erni

**Course entry requirements:** DP certificate for STA2004F.

**Course outline:**

This course gives an introduction to statistical modelling and the theory of linear statistical models. The student is introduced to the principles of experimental design, statistical software and practical data analysis through weekly computer practicals and the exposure to many data sets. The course has three sections:

Regression: The multivariate normal distribution; quadratic forms; the linear model; maximum



likelihood; estimates of parameters in the linear model; the Gauss-Markov theorem; variable selection procedures; analysis of residuals.

Design and analysis of experiments: Introduction to the basic design principles, basic experimental designs (completely randomised design, the randomised block design, latin square design,) factorial experiments, analysis of variance, the problem of multiple comparisons, power and sample size calculations, introduction to random effects and repeated measures.

Nonparametric statistics: Introduction to nonparametric tests and methods, including Mann-Whitney U, Kruskal Wallis, Friedman and randomisation tests.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

**Tutorials:** One tutorial per week.

**Practicals:** One practical per week, by arrangement.

**DP requirements:** Attendance and completion of all tests and assignments, class record of 35%.

**Assessment:** Class record counts 30%. The class record is made up of two tests, and two assignments, contributing equally towards the class record. Either or both of the assignments may be group work (hence group work can count up to 50% of class record). One 3-hour examination counts 70%.

**STA2007F APPLIED STATISTICAL MODELLING**

**NQF credits:** 24 HEQS-F at level 6

**Convener:** Associate Professor R Altwegg

**Course entry requirements:** STA1000F/S or STA1006S or STA1007S

**Course outline:**

The course aims to equip students with practical experience and skills in analysing data, using some statistical techniques frequently used in the sciences. The skills include designing experiments, choosing appropriate statistical methods for visual display and statistical modelling of data, model checking, interpretation and reporting of statistical results, and understanding of limitations of statistical methods and data. By the end of the course the student should have gained enough confidence to transfer these skills to new problems or data sets in their own profession. Topics covered include: Introduction to statistical notation, linear regression, design and analysis of experiments, generalized linear models. There will be strong emphasis on the practical application of the above methods, using open-source statistical software such as R.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 2 2 2 2 2

**Tutorials:** One 2-hour tutorial/practical per week, to be arranged.

**DP requirements:** At least 35% for class record and satisfactory completion of all projects (subminimum of 40% for each project).

**Assessment:** Class record counts 40% (equally divided between two tests and two projects). One 2-hour examination counts 60%.

**STA2020F BUSINESS STATISTICS**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: This course will be counted as a non-Science credit.*

**Convener:** Mrs H Kroon

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

**Course Outline:**

This is an extension to the STA1000F/S course, aiming to introduce business and commerce students to intermediate statistical techniques relevant to business and management problems. The emphasis in the course is on applying statistical methods and modelling techniques to data rather than focussing on the mathematical rigor underpinning these methods. Topics covered include: Analysis of variance (ANOVA) and experimental design; revision and extension of simple linear regression; multiple regression; econometric models; time series analysis; and non-parametric statistics.

**Lectures:** Monday to Friday, 1<sup>st</sup> or 5<sup>th</sup> period

**Tutorials:** Tutorials/workshops by arrangement.

**DP requirements:** At least 35% for class record and satisfactory completion of the project.

**Assessment:** Class record counts 30%. The class record consists of the following components (and their contribution): Class test 1 (45%), Class test 2 (45%) and Project (10%). One 3-hour examination counts 70%.

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**STA2020S BUSINESS STATISTICS**

**NQF credits:** 24 HEQS-F at level 6

*NOTE: This course will be counted as a non-Science credit.*

**Convener:** Mr N Watson

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

**Course Outline:**

This is an extension to the STA1000F/S course, aiming to introduce business and commerce students to intermediate statistical techniques relevant to business and management problems. The emphasis in the course is on applying statistical methods and modelling techniques to data rather than focussing on the mathematical rigor underpinning these methods. Topics covered include: Analysis of variance (ANOVA) and experimental design; revision and extension of simple linear regression; multiple regression; econometric models; time series analysis; and non-parametric statistics.

**Lectures:** Monday to Friday, 7<sup>th</sup> period

**Tutorials:** Tutorials/workshops by arrangement.

**DP requirements:** At least 35% for class record and satisfactory completion of the project.

**Assessment:** Class record counts 30%. The class record consists of the following components (and their contribution): Class test 1 (45%), Class test 2 (45%) and Project (10%). One 3-hour examination counts 70%.

**Third-Year Courses**

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**STA3041F MARKOV PROCESSES & TIME SERIES**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Mr A Clark

**Course entry requirements:** STA2004F and STA2005S, MAM2000W is strongly recommended (linear algebra and advanced calculus modules).

**Course outline:**

This course forms part of the third year major in Mathematical Statistics. It consists of two modules. The aim of the Stochastic Processes module is to provide grounding for theory and basic applications in financial modelling while the aim of the Time Series module is to introduce students to the foundations of the Box-Jenkins methodology with the intention of applying the techniques using statistical software. The content of the modules are as follows:

Stochastic processes: The modules cover the general theory underlying stochastic processes and their classifications, definitions and applications of discrete Markov chains. Branching processes are

examined for extinction or survival. Probabilities associated with multiple events are derived and applications presented. Counting processes in discrete and continuous time are modelled with a view to establishing methods of forecast and backcast. Ruin theory and reinsurance themes are insurance of continuous time processes. Ruin and loss are considered in a framework covering single claims for losses or insured events. Students are also introduced to run-off triangles.

Time series analysis: Topics that are covered include: global and local models of dependence, stationary ARMA processes, unit root processes as well as a brief introduction to univariate Volatility models as well as cointegration.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

**Tutorials:** One tutorial and one computer practical session per week, by arrangement.

**DP requirements:** Attendance and completion of all tests; class record of at least 35%.

**Assessment:** Class record counts 30% (made up of two tests contributing equally towards the class record). One 3-hour examination counts 70%.

**STA3043S DECISION THEORY & GLM**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Associate Professor F Little

**Course entry requirements:** STA2004F and STA2005S. MAM2000W is strongly recommended (linear algebra and advanced calculus modules).

**Course outline:**

This course forms part of the third year major in Mathematical Statistics. It consists of two modules: The Generalised Linear Models module introduces students to the theory and application of fitting linear models to different types of response variables with different underlying distributions. The Decision and Risk Theory module is an introduction to the structure of decision making under uncertainty. The content of the modules are as follows:

Generalized linear modules: Topics covered include: the exponential family of distributions, the GLM formulation, estimation and inference, models for continuous responses with skew distributions, logistic regression, Poisson regression and loglinear models.

Decision theory: Topics covered include: game theory and non probabilistic decision criteria; probabilistic decision criteria; expected value and utility; use of Bayes' theorem; value of information; Bayesian statistical analysis for Bernoulli and normal sampling; empirical Bayes and credibility theory; loss and extreme value distributions; Monte Carlo method.

**Period**

**Mon Tue Wed Thu Fri**

**Lectures:** 1 1 1 1 1

**Tutorials:** Two tutorial/practical sessions per week, by arrangement.

**DP requirements:** Attendance and completion of all tests and assignments; class record of at least 35%.

**Assessment:** Class record counts 30% (made up of two tests, each contributing 30% towards class record and practical work contributing 40% towards class record). One 3-hour examination counts 70%.

**STA3045F ADVANCED STOCHASTIC PROCESSES**

**NQF credits:** 36 HEQS-F at level 7

**Convener:** Dr M Varughese

**Course entry requirements:** STA2004F, STA2005S, MAM2000W and concurrent registration for STA3041F

**Course outline:**

This course is a third year module for students studying Actuarial Science or Mathematical Statistics, though not a requirement for a major in Mathematical Statistics. The course gives a theoretical overview of stochastic processes with the models covered spanning both discrete and continuous time as well as discrete and continuous state-space. Though the emphasis is on the theoretical properties of the models, the application of the methods to real-world problems is also explored at length. Topics covered include: Poisson processes, continuous-time Markov chains, random walks, probability theory, discrete-time martingale processes, Brownian motion and diffusion processes.

**Period**

	Mon	Tue	Wed	Thu	Fri
<b>Lectures:</b>	2	2	2	2	2
<b>Tutorials:</b>	Two tutorial sessions per week.				

**DP requirements:** Attendance and completion of all tests; class record of at least 35%.

**Assessment:** Class record counts 30% (made up of two tests, each contributing 50% towards the class record). One 3-hour examination counts 70%.

## Postgraduate Courses

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### STA4007W BSc HONOURS IN STATISTICAL SCIENCES

**NQF credits:** 160 HEQS-F at level 8

(includes research project of 40 credits)

*NOTE: Entrance is limited to 22 students for the combined Honours courses made up of STA4007W, STA4019H, STA4006W and STA4010W*

**Convener:** Dr B Erni

**Course entry requirements:** Completion of STA2004F, STA2005S, STA3041F, STA3043S, or their deemed equivalents, at a satisfactory level (an average of 65% or more in the 3rd year courses at first attempt). Acceptance will be at the discretion of the Head of Department who will consider quality of final year results, material covered in the undergraduate curriculum, and possibly referee reports. Preference may be given to UCT graduates who meet the entrance requirements.

**Course outline:**

This honours programme covers theoretical and applied statistics and operations research. It aims to give students a good theoretical basis and statistical computing skills through the teaching of core modules (81 HEQS-F credits). It further exposes students to the practical application of statistics in different areas through the offering of elective modules (39 HEQS-F credits). It provides training in research through supervised project work (40 HEQS-F credits). Elective modules include Econometrics, Time Series, Biostatistics, Multivariate Statistics, Decision Modelling, Spatial Statistics.

**Assessment:** Each coursework module comprises tests, assignments and a final examination. The relative weighting placed on the year work within different modules varies between 30% and 50%. The final grade for STA4007W as a whole is a weighted average (3: 1) of the combined final marks for each coursework module (weighted by the number of credits), and the individual project. In addition, the student is required to obtain a mark of at least 50% in all core courses, at least 40% in each of the required elective modules and at least 50% for the individual project.

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### STA4019H STATISTICAL SCIENCES FOR ACTUARIES

**NQF credits:** 104 HEQS-F at level 8

(includes research project of 40 credits)

*NOTE: Entrance is limited to 22 students for the combined Honours courses made up of STA4007W, STA4019H, STA4006W and STA4010W*

**Convener:** Dr B Erni

**Course entry requirements:** Completion of STA2004F, STA2005S, STA3041F, STA3043S, or their deemed equivalents, at a satisfactory level (an average of 65% or more in the 3rd year courses at first attempt), as well as a pass in MAM2000W. In addition, admission to STA4019H requires that the student is admitted by the Actuarial Science Division of the School of Management Studies to BUS4027W and BUS4028F. Acceptance will be at the discretion of the Head of Department who will consider quality of final year results, material covered in the undergraduate curriculum, and possibly referee reports. Preference may be given to UCT students who meet the course entry requirements.

**Course outline:**

This course covers theoretical and applied statistics and operations research. It constitutes 65% of the 160 HEQS-F credit requirements for the BSc Hons in Actuarial Science. Students are required to complete a selection of credits from the STA4007W course including 25 core credits covering theory, Operational Research and Statistical Computing, 39 elective credits chosen from Econometrics, Time Series, Biostatistics, Multivariate Statistics, Decision Modelling and Spatial Statistics, and a research project counting 40 credits.

**Assessment:** Each coursework module comprises tests, assignments and a final examination. The relative weighting placed on the year work within different modules varies between 30% and 50%. The final grade for STA4019H as a whole is a weighted average (5 : 3) of the combined final marks for each coursework module (weighted by the number of credits), and the individual project. In addition, the student is required to obtain a mark of at least 50% in all core courses, at least 40% in best 39 credits for elective modules and at least 50% for the individual project. In addition the courses BUS4027W and BUS4028F must also be passed for the degree to be awarded.

### **STA5000W MASTERS IN MATHEMATICAL STATISTICS**

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the beginning of the handbook.

### **STA5001W MASTERS IN OPERATIONAL RESEARCH**

**NQF credits:** 180 HEQS-F at level 9

**Course outline:**

This course consists of an investigation of an approved topic chosen for intensive study by the candidate (student), culminating in the submission of a dissertation. The dissertation shall demonstrate the successful completion of a programme of training in research methods, a thorough understanding of the scientific principles underlying the research and an appropriate acquaintance with the relevant literature. It must be clearly presented and conform to the standards of the department and faculty. The dissertation will usually consist of a report detailing the conduct, and analysis of the results of, research performed under the close guidance of a suitably qualified supervisor/s. The dissertation should be well-conceived and acknowledge earlier research in the field. It should demonstrate the ability to undertake a substantial and informed piece of research, and to collect, organise and analyse material. General rules for this degree may be found in the beginning of the handbook.

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**STA5003W and STA5004W MASTERS IN STATISTICAL SCIENCES**

(by coursework and minor dissertation)

**Course Convenor:** Associate Professor S Lubbe

Coursework: 90 HEQS-F at level 9

Minor dissertation: 90 HEQS-F at level 9

**Course entry requirements:** Honours degree in Statistics or closely related field or a four year Bachelor's degree like B.Business Science (not extended 3 year degree). At least 65% in 4<sup>th</sup> year of study.

**Course Outline:**

The coursework component of the Masters degree in Statistical Sciences (STA5003W) aims to train students in more advanced statistical methodology and application in order to prepare them for either a vocational or research career. Students need to complete the 4 core modules, Longitudinal Data Analysis, Advanced Topics in Regression, Multivariate Statistics, Simulation and Optimisation and 2 of the specialisation modules Statistical Inference and Design, Bayesian Decision Analysis, Biological Statistics (either Biostatistics, Bioinformatics or Ecological Statistics), Financial Statistics, Problem Structuring and Project Management, or modules from a different department. Each module accounts 15 HEQS-F credits on level 9 and students need to complete 90 credits with the option of completing a maximum of 30 credits in a different department or faculty or from level 8 Statistics courses. Not all modules will be offered every year; the course will be tailored to the interests and needs of the particular students. In addition, students are required to submit a minor dissertation (STA5004W) that counts 50% towards the final mark for the degree.

**Assessment:** Both coursework (STA5003W) and dissertation (STA5004W) components must be passed separately for the degree to be awarded. Of the coursework component, 6 components need to be passed where for each module class assessments will count a minimum of 40% and examinations will count a maximum of 60%. Subminima: a minimum of 40% needs to be obtained for both the class assessments and examination for each module. The minor dissertation must be presented for formal examination.

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**STA5010W and STA5011W MASTERS IN OPERATIONAL RESEARCH IN DEVELOPMENT**

(by coursework and minor dissertation)

**Coursework Convenor:** Dr L Scott

Coursework: **NQF credits:** 90 HEQS-F at level 9

Minor Dissertation: **NQF credits:** 90 HEQS-F at level 9

*NOTE: This course may not be offered in 2014.*

**Course entry requirements:** Entry to the programme requires a good honours degree including a strong quantitative component (normally at least two years of Mathematics at a tertiary level). In selecting candidates for admission to the course, consideration will also be given to recommendations from at least two referees who are able to attest to the applicants' academic abilities and suitability.

**Course outline:**

The aim of this course is to provide a broad professional training in the principles and tools of operational research (OR), with particular emphasis on application in the context of development and the developing world. OR has been defined as the discipline of applying advanced analytical methods (system analysis, and computer and mathematical models) to help make better decisions. The OR in Development programme focuses on preparing graduates for a career in applying OR to the unique problems of the developing world, such as conflicting objectives in balancing, for example, socio-economic development and corrective actions, less reliable infrastructures, and a post-colonial need for community participation in all levels of planning. The course is structured over two years, although completion in 18 months may be possible. The first academic year is based

primarily on coursework (STA5010W), supplemented by group discussions and case studies. The coursework includes the basic techniques of operational research and statistics, specific developmental issues, problem structuring and decision analysis.

On successful completion of the coursework component, students will undertake an individual applied research project on a suitable topic, the results of which are to be written up as a minor dissertation (STA5011W). In some cases, the project might be undertaken on a local problem at the student's home base.

**Assessment:** In order to qualify for the Masters degree, the student will need to pass both the coursework and dissertation. A pass for the coursework requires an average of 50% over all modules, as well as a minimum of 50% for certain modules designated as core material. The minor dissertation must be presented for formal examination.

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### **STA6001W** PhD IN STATISTICAL SCIENCES

**NQF credits:** 360 HEQS-F at level 10

**Course outline:**

The PhD is a research degree on an advanced topic under supervision which can be taken in any of the departments in the Faculty. Examination is by thesis alone. A candidate shall undertake doctoral research and advanced study under the guidance of a supervisor/s appointed by Senate. The thesis must constitute a substantial contribution to knowledge in the chosen subject, must show evidence of original investigation and give a full statement of the literature on the subject. The PhD degree demands that the candidate is able to conduct independent research on his/her own initiative. Through the thesis the candidate must be able to demonstrate that he/she is at the academic forefront in the topic selected, that the work is original and that it advances our knowledge in the relevant field. Candidates are referred to the rules for this degree as set out in book 3, General Rules and Policies.

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## INTER-FACULTY UNITS

### African Climate and Development Initiative (ACDI)

**Director:**

Professor M New, MPhil, PhD *Cambridge*

**Masters Course Convener:**

B Rink, PhD *Cape Town*

**Administrative Officer:**

L Mota

**Research Coordinator:**

Lorena Pasquini, PhD *York*

The African Climate and Development Initiative (ACDI) has been established at UCT to facilitate, stimulate and coordinate research and teaching partnerships and knowledge across disciplines on climate and development issues. With a strong African and Global South perspective, the ACDI's work is focused on research, teaching at post-graduate level, public awareness and close interaction with policy makers, business and civil society. Its interdisciplinary focus provides a multi-layered perspective on climate change and development, bringing both interdisciplinary breadth and specialist depth to problems and solutions.

**Research Partnerships**

In addition to cross university activities, the ACDI supports innovative research in partnership with government, business and civil society. For example, the Climate Change Think Tank is a partnership between ACDI, the African Centre for Cities, and the City of Cape Town, where researchers work with the city to develop better understanding of key mitigation and adaptation issues facing the City of Cape Town, and to incorporate research insights into city policy. The Wild Coast Living Laboratory is an alliance between UCT, several other universities, Eastern Cape Parks, and local communities that undertakes research and community education to address the issues of climate, development and conservation in community-owned nature reserves.

**Graduate and Professional Training**

ACDI convenes a one-year coursework Masters in Climate Change & Development, which provides students with interdisciplinary training in climate change and sustainable development, with a specific focus on the issues of relevance to African development. The Masters includes core modules in Climate and Development, Mitigation and Adaptation, and optional courses across a spectrum of disciplines, including Business Sustainability, Biodiversity, Climate Prediction and Environmental Law. Many of these modules can also be taken as professional short courses, and a number of summer and winter courses for practitioners are also offered. ACDI supports Masters and PhD research through the ACDI Graduate Network, a forum for students from different departments to interact across disciplinary boundaries to explore innovative approaches to their research. Refer to page 83 of this Handbook for detailed course outlines. For more information on the ACDI and its activities, see <http://acdi.uct.ac.za/>

### Electron Microscope Unit

**Director:**

Professor B T Sewell, MSc *Witwatersrand* PhD *Lond*

**Principal Scientific Officer:**

B W Weber, BSc Hons, PhD *Cape Town*

**Principal Technical Officer:**

M A Jaffer, BSc Hons *Cape Town*



**Principal Technical Officer (Part-time):**

J Duncan

**Principal Scientific Officer:**M Waldron, BSc Hons *Swansea* MSc *Cape Town***Chief Scientific Officers:**

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**Technical Assistant:**

S Karriem

The Electron Microscope Unit is housed in the R W James Building at 9 University Avenue and provides scanning, transmission and light microscopy facilities for staff and research students in all faculties. The Unit has two Scanning Electron Microscopes: the ultra high resolution FEI Nova Nano field emission gun (FEG)SEM with accessories including X-ray analyser and electron backscattered diffraction pattern analysis, and a Zeiss S440, equipped with a range of accessories including an X-ray analyser, cathodoluminescence detector and cryo facilities. The Unit also has three Transmission Electron Microscopes two of which are considered high resolution, namely the 200 kV Tecnai TF20 (FEG)TEM and the Tecnai G<sup>2</sup>20 energy-filter (EF)TEM equipped with a LaB6 filament. The third is a 120 kV Leo912 TEM equipped with an in-column energy filter and LaB6 filament. Preparative, darkroom, light microscopy, image analysis and library facilities are also provided.

Enquiries regarding the use of these facilities are welcome. The Unit is able to provide information and training on a wide range of microscopy related topics. More information is available at <http://sbio.uct.ac.za/webemu/>

## **Marine Research Institute (Ma-Re)**

**Director:**C L Moloney, BSc Hons PhD *Cape Town***Deputy Directors:**J G Field, BSc Hons PhD *Cape Town*J Glazewski BCom LLB MA *Cape Town* LLM *London***Science Director:**L Shannon, MSc PhD *Cape Town***Manager:**E Balarin, BSc Hons *Rhodes***Scientific Officers:**G E Smith, BSc *Cape Town*P Pillay, BSc (WITS) BSc Hons MSc *Cape Town***Administrative Assistant:**S Bosma, BA BSc Hons MSc *Cape Town*

Ma-Re is a virtual marine institute with an administrative unit based in the R W James Building, Residence Road. The Institute is an inter-departmental and cross-faculty network that links staff and students involved in all aspects of marine research. It aims to foster interdisciplinary research, conduct global change research under its own research project(s), link with other national and international marine institutions and groups, and raise funds for student bursaries and mentoring. It is associated with over forty tenured researchers from a range of units, departments and faculties and has over 160 postgraduates in its postgraduate network (please visit [www.ma-re.uct.ac.za](http://www.ma-re.uct.ac.za) for more details). One of Ma-Re's primary functions is to provide administrative and other support to collaborative research projects within its remit of being an inter-faculty unit. Ma-Re along with the Department of Biological Sciences administers and co-convenes the taught master's programme in Applied Marine Sciences.

**UCT Departments/units that have research staff affiliated with Ma-Re:**

Department of Biological Sciences  
Department of Economics  
Department of Electrical & Computer Engineering  
Department of Mechanical Engineering  
Department of Environmental & Geographical Sciences  
Environmental Evaluation Unit  
Department of Geological Sciences  
Department of Historical Studies  
Department of Mathematics & Applied Mathematics  
Institute of Marine Environmental Law  
Department of Molecular & Cell Biology  
Department of Oceanography  
Department of Socio-Anthropology  
Department of Sociology

*For details of affiliated staff members, visit <http://ma-re.uct.ac.za/staff/academic-staff/>*

**Honorary Research Associates nominated by Ma-Re are hosted by various affiliated departments:**

R Anderson, Hon Prof *Cape Town* (Biological Sciences, DAFF)  
L Atkinson, MSc PhD *Cape Town* (Biological Sciences, SAEON)  
R Barlow, MSc Natal PhD *Cape Town* (Biological Sciences)  
S Bernard, MSc PhD *Cape Town* (Oceanography, CSIR)  
D A Byrne, PhD *Columbia* (Oceanography, University of Maine)  
B Clark, MSc PhD *Cape Town* (Biological Sciences)  
A Cockcroft, MSc PhD *UPE* (DEA, Biological Sciences)  
C M Duncombe Rae, BSc *Rhodes* BSc Hons PhD *Cape Town* (Oceanography, University of Maine)  
D Durholtz, BSc Hons PhD *Cape Town* (DEA, Biological Sciences)  
N Fauchereau PhD *Cape Town*  
J Huggett, MSc PhD *Cape Town* (Biological Sciences, DEA)  
P B Hulley, PhD *Cape Town* (Biological Sciences)  
L Hutchings, Hon Prof *Cape Town* (Biological Sciences)  
K Hutchings, BSc Hons PhD *Cape Town* (Biological Sciences)  
S Kerwath, MSc *Erlangen* PhD *Rhodes* (Biological Sciences, DAFF)  
R Leslie, BSc *Stellenbosch* PhD *Cape Town* (Biological Sciences, DAFF)  
A Mavume, PhD *Cape Town* (Oceanography, University Eduardo Mondlane, Mozambique)  
P M S Monteiro, MSc PhD *Cape Town* (Oceanography, CSIR)  
B Paterson, BSc Hons *Natal* PhD *Cape Town* (Biological Sciences)  
G Pitcher BSc Hons *Natal* PhD *Cape Town* (Biological Sciences, DAFF)  
C Roy PhD *France* (UBO, France)  
C Ruiz-Sebastian MSc PhD *Cape Town* (Wildlife Conservation Society Bronx NY)  
T Samaai BSc Hons *IC London* PHD *UWC* (Biological Sciences, DEA)  
C Savage MSc *Cape Town* PhD *Stockholm* (Biological Sciences)  
C van der Lingen MSc *Rhodes* PhD *Cape Town* (Biological Sciences, DEA)  
H Verheye MSc *Ghent* PhD *Cape Town* (Biological Sciences, DEA)

## SCHEDULE OF COURSES - LECTURE AND PRACTICAL TIMES

### LECTURE PERIODS

The academic day is divided into lecture periods as follows:

Period 1	08h00 to 08h45	Meridian	13h00 to 13h45
Period 2	09h00 to 09h45	Period 6	14h00 to 14h45
Period 3	10h00 to 10h45	Period 7	15h00 to 15h45
Period 4	11h00 to 11h45	Period 8	16h00 to 16h45
Period 5	12h00 to 12h45	Period 9	17h00 to 17h45

COURSE CODE	COURSE TITLE	LECTURE TIMES	PRACTICAL/ TUTORIAL TIMES	COURSE ENTRY REQUIREMENTS
AGE1002S	AFRICA & WORLD ARCHAEOLOGY	5 M to Th	By arrangement; F 5 <sup>th</sup>	None
AGE1004H	INTRODUCTION TO EARTH & ENVIRONMENT SCIENCES	2 M to F	One practical per week, F 14h00-17h00	See departmental entry
AGE2011S	HUMAN EVOLUTION	2 M to Th	One per week, by arrangement	See departmental entry
AGE2012F	SOUTHERN AFRICAN HUNTERS & HERDERS	2 M to Th	One per week, by arrangement	See departmental entry
AGE3006H	DIRECTED READING & RESEARCH	By arrangement	None	See departmental entry
AGE3011F	ROOTS OF BLACK IDENTITY	4 M to Th	One per week, by arrangement	See departmental entry
AGE3012S	GLOBAL INTERACTION & THE TRANSFORMATION OF SOUTH AFRICAN SOCIETY	4 M to Th	One 2-hour practical per week, by arrangement	See departmental entry
AGE3013H	ARCHAEOLOGY IN PRACTICE	See departmental entry	None	See departmental entry
AST1000F	INTRODUCTION TO ASTRONOMY	5 M to F	W 14h00-17h00	None
AST2002H	ASTROPHYSICS	2 M, W, F	W 14h00-16h30	See departmental entry
AST2003H	ASTRONOMICAL TECHNIQUES	2 T, Th	W 14h00-1630	See departmental entry
AST3002F	STELLAR ASTROPHYSICS	2 M to F	W 14h00-16h30	See departmental entry
AST3003S	GALACTIC & EXTRAGALACTIC ASTROPHYSICS	2 M to F	W 14h00-16h30	See departmental entry
BIO1000F	CELL BIOLOGY	5 M to F	One prac a week, M,Tu,W or Th 14h00-17h00	See departmental entry
BIO1000H	CELL BIOLOGY	5 M to F	One prac a week, M,Tu,W or Th 14h00-17h00	See departmental entry
BIO1004F/S	BIOLOGICAL DIVERSITY	5 M to F	One prac a week, M,Tu,W,Th or F 14h00-17h00	See departmental entry
BIO2010F	PRINCIPLES OF ECOLOGY & EVOLUTION	1 M to F	M 14h00-17h00	BIO1000F/H, BIO1004F/S
BIO2011S	LIFE ON LAND: ANIMALS	4 M to F	M 14h00-17h00	BIO1000F/H, BIO1004F/S
BIO2012S	LIFE ON LAND : PLANTS	2 M to F	Th 14h00-17h00	BIO1000F/H, BIO1004F/S
BIO2013S	LIFE IN THE SEA	3 M to F	W 14h00-17h00	BIO1000F/H, BIO1004F/S

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>LECTURE TIMES</b>	<b>PRACTICAL/ TUTORIAL TIMES</b>	<b>COURSE ENTRY REQUIREMENTS</b>
BIO3002F	MARINE ECOSYSTEMS	1 M to F	W 14h00-17h00	See departmental entry
BIO3013F	GLOBAL CHANGE ECOLOGY	2 M to F	M 14h00-17h00	BIO1000F or BIO1000H, BIO1004F/S
BIO3014S	CONSERVATION: GENES, POPULATIONS & BIODIVERSITY	2 M to F	M 14h00-17h00	See departmental entry
BIO3015F	ECOSYSTEM ECOLOGY	5 M to F	By arrangement	BIO2010F
BIO3016S	SYSTEMATICS AND MACROEVOLUTION	5 M to F	Tu 14h00-17h00	BIO2010F
BIO3017S	MARINE RESOURCES	3 M to F	F 14h00-17h00	See departmental entry
CEM1000W	CHEMISTRY 1000	2 or 4 M to W, F	Tu or Th or F, 14h00-17h00	See departmental entry
CEM1009H	CHEMISTRY 1009	4 W to F	W 14h00-17h00	See departmental entry
CEM1010H	CHEMISTRY 1010	4 M to F	Th 14h00-17h00	CEM1009H
CEM2007F	PHYSICAL CHEMISTRY & SPECTROSCOPY	3 M to F	Th 13h30-17h00	See departmental entry
CEM2008S	ORGANIC & INORGANIC CHEMISTRY	3 M to F	Th 13h30-17h00	See departmental entry
CEM3005W	CHEMISTRY 3005	3 M to F	Two pracs per week W and F, 14h00-17h00	See departmental entry
CSC1010H	COMPUTER SCIENCE 1010	5 M to Th	Th 14h00-17h30	See departmental entry
CSC1011H	COMPUTER SCIENCE 1011	4 M to Th	M 14h00-17h30	CSC1010H, MAM1005H
CSC1015F	COMPUTER SCIENCE 1015	4 or 5 M to F	M or Tu or W, 14h00-17h30	See departmental entry
CSC1016S	COMPUTER SCIENCE 1016	4 or 5 M to F	M or Tu or W, 14h00-17h30	CSC1015F
CSC2001F	COMPUTER SCIENCE 2001	2 M to F	One prac per week, 14h00-18h00 M,Tu,W,Th or F	CSC1016S or CSC1011H, or MAM1000W equivalent
CSC2002S	COMPUTER SCIENCE 2002	2 M to F	One prac per week, 14h00-18h00 M,Tu,W,Th or F 14h00-17h00	CSC2001F, MAM1000W or equivalent
CSC2003S	COMPUTER GAMES	3 M to F	One prac per week, 14h00-18h00 M,Tu,W,Th or F 14h00-17h00	CSC2001F, MAM1000W or equivalent
CSC3002F	COMPUTER SCIENCE 3002	2 M to F	Two pracs per week, M,Tu,W,Th or F 14h00-18h00	CSC2001F and CSC2002S
CSC3003S	COMPUTER SCIENCE 3003	2 M to F	Two pracs per week, M,Tu,W,Th or F 14h00-18h00	As for CSC3002F
CSC3020H	THREE DIMENSIONAL & DISTRIBUTED GAMES DESIGN	3 M to F alternating with CSC3022H	4 hours per week, by arrangement,	CSC2001F, CSC2002S and CSC2003S
CSC3022H	C++ WITH APPLICATIONS	3 M to F alternating with CSC3022H	4 hours per week, by arrangement	CSC2001F, CSC2002S

COURSE CODE	COURSE TITLE	LECTURE TIMES	PRACTICAL/TUTORIAL TIMES	COURSE ENTRY REQUIREMENTS
EEE3078W	DIGITAL, EMBEDDED & ADAPTIVE SYSTEMS	See Departmental entry	See Departmental entry	See Departmental entry
EGS1003S	GEOGRAPHY, DEVELOPMENT & ENVIRONMENT	2 M to F	M or Tu or Th, 14h00-17h00	See departmental entry
EGS1004S	INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES	None	F 14h00-17h00	DP in GEO1009F
EGS2013F	THE PHYSICAL ENVIRONMENT	5 M to F	F 14h00-17h00	GEO1009F or EGS1004S
EGS2014S	CONTEMPORARY URBAN CHALLENGES	5 M to F	F 14h00-17h00	See departmental entry
EGS3012S	ATMOSPHERIC SCIENCE	1 M to F	Tu or W, 14h00-17h00	See departmental entry
EGS3020F	ENVIRONMENTAL CHANGE & CHALLENGE	5 M to F	Th 14h00-17h00	EGS2013F
EGS3021F	SUSTAINABILITY & ENVIRONMENT	3 M to F	W 14h00-17h00	See departmental entry
EGS3022S	GEOGRAPHIC THOUGHT	4 M to F	W 14h00-17h00	EGS2014S
GEO1006S	INTRO TO MINERALS, ROCKS & STRUCTURE	5 M to F	Th or F 14h00-17h00	See departmental entry
GEO1009F	INTRO TO EARTH & ENVIRONMENTAL SCIENCES	2 M to F	M or Tu or Th or F, 14h00-17h00	See departmental entry
GEO2001F	MINERALOGY & CRYSTALLOGRAPHY	2 M to F	W 14h00-17h00	See departmental entry
GEO2004S	PHYSICAL GEOLOGY	2 M to F	W 14h00-17h00	GEO2001F
GEO2005X	FIELD GEOLOGY & GEOLOGICAL MAPPING (second-year half course)	None	See departmental entry	GEO1006S, GEO2004S (co-requisite)
GEO3001S	STRATIGRAPHY & ECONOMIC GEOLOGY	2 M to F	Two pracs per week Tu and Th 14h00-17h00	GEO2004S, DP in GEO3005F
GEO3005F	PETROLOGY & STRUCTURAL GEOLOGY	2 M to F	Two pracs per week Tu and Th 14h00-17h00	GEO2001F, GEO2004S,
HUB2019F	INTRODUCTION TO HUMAN BIOLOGY	1 M to F	M or Tu	CEM1000W (or equivalent), BIO1000F
HUB2021S	HUMAN BIOLOGY : MAINTENANCE & INTEGRATION	1 M to F	M or Tu, 14h00-17h00	HUB2019F, CEM1000W or equivalent
HUB3006F	GENERAL & APPLIED PHYSIOLOGY	1 M to F	W or Th, 14h00-17h00	HUB2021S
HUB3007S	BIOPHYSICS & NEUROPHYSIOLOGY	1 M to F	W or Th, 14h00-17h00	HUB2021S
MAM1000W	MATHEMATICS 1000	1 or 3, M to F	One 2-hour tutorial per week	See departmental entry
MAM1004F	MATHEMATICS 1004	1 M to F	M or W 14h00-16h00	See departmental entry
MAM1004S	MATHEMATICS 1004	Three lectures per week, days to be arranged, in Meridian	By arrangement M or W	See departmental entry

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>LECTURE TIMES</b>	<b>PRACTICAL/TUTORIAL TIMES</b>	<b>COURSE ENTRY REQUIREMENTS</b>
MAM1005H	MATHEMATICS 1005	1 or 3 M to Th	F 8h00-9h00, M 14h00-16h00	See departmental entry
MAM1006H	MATHEMATICS 1006	1st, three days per week	1st, two days per week	See departmental entry
MAM1019H	FUNDAMENTALS OF MATHEMATICS	Meridian	W 13h00-14h00	See departmental entry
MAM1043H	MODELLING & APPLIED COMPUTING	See departmental entry	One hour per week	See departmental entry
MAM1044H	DYNAMICS	See departmental entry	Every second F 14h00-16h00	See departmental entry
MAM2000W	MATHEMATICS 2000	5 M to F with options in 4 <sup>th</sup>	Th or F 14h00-16h00	MAM1000W or equivalent
MAM2001H, MAM2004H, MAM2002S	MATHEMATICS 2001, 2004 & 2002	5 M to F with options in 4 <sup>th</sup>	Th or F 14h00-16h00	MAM1000W or equivalent
MAM2046W	APPLIED MATHEMATICS 2046	3 M to F	Th 14h00-16h00	See departmental entry
MAM2047H	APPLIED MATHEMATICS 2047	See departmental entry	Th 14h00-16h00	MAM1043H, MAM1044H and MAM1000W
MAM2048H	APPLIED MATHEMATICS 2048	3 M to F	Th 14h00-16h00	MAM2047H
MAM3000W	MATHEMATICS 3000	5 M to F with options in 4 <sup>th</sup>	F 14h00-17h00	MAM2000W
MAM3001W	MATHEMATICS 3001	5 M to F with options in 4 <sup>th</sup>	F 14h00-17h00	MAM2000W
MAM3002H and MAM3003S	MATHEMATICS 3002 & MATHEMATICS 3003	5 M to Th with options in 4 <sup>th</sup>	F 14h00-17h00	MAM2000W
MAM3040W	APPLIED MATHEMATICS 3040	3 M to F	Th 14h00-16h00	See departmental entry
MAM3041H	APPLIED MATHEMATICS 3041	3 M to F	Th 14h00-16h00	See departmental entry
MAM3048H	APPLIED MATHEMATICS 3048	3 M to F	Th 14h00-16h00	MAM3041H
MCB3012Z	RESEARCH PROJECT IN MOLECULAR & CELL BIOLOGY	None	Two afternoons per week	See departmental entry
MCB3019F	RECOMBINANT DNA, GENOMICS & PROTEOMICS	3 M to F	F 14h00 to 17h00	See departmental entry
MCB2020F	BIOLOGICAL INFORMATION TRANSFER	4 M to F	Th or F 14h00-17h00	CEM1000W or equivalent, BIO1000F and BIO1004F/S
MCB2021F	MOLECULAR BIOSCIENCE	5 M to F	M or Tu 14h00-17h00	CEM1000W or equivalent, BIO1000F and BIO1004F/S
MCB2022S	METABOLISM AND BIOENGINEERING	5 M to F	M or Tu 14h00-17h00	MCB2020F, MCB2021F
MCB2023S	FUNCTIONAL GENETICS	4 M to F		MCB2020F, MCB2021F
MCB3020F	PROTEIN STRUCTURE & FUNCTION	4 M to F	14h00-17h00 Th or F	See departmental entry

MCB3021F	MOLECULAR MICROBIAL GENETICS	5 M to F	M to Tu 14h00-17h00	See departmental entry
MCB3022S	ADVANCED BIOTECHNOLOGY	2 M to F	M or Tu 14h00-17h00	See departmental entry
MCB3023S	MOLECULAR EVOLUTIONARY GENETICS & DEVELOPMENT	3 M to F	One per week by arrangement	See departmental entry
MCB3024S	DEFENCE & DISEASE	5 M to F	One tutorial per week	See departmental entry
PHY1004W	MATTER & INTERACTIONS	3 M to F	Tu 14h00-17h00	See departmental entry
PHY1023H	PRINCIPLES OF PHYSICS A	3 M to F	Tu 14h00-17h00	See departmental entry
PHY1032F	GENERAL PHYSICS B	3 M to F	W 14h00-17h00	PHY1023H or PHY1031F
PHY1031F	GENERAL PHYSICS A	3 M to F	M or W or Th, 14h00-17h00	See departmental entry
PHY1032S	GENERAL PHYSICS B	3 M to F	M or W or Th, 14h00-17h00	PHY1031F or PHY1023H
PHY2014F	WAVES & ELECTROMAGNETISM	4 M to F	M 14h00-17h00 Tu 14h00-16h00	See departmental entry
PHY2015S	CLASSICAL & QUANTUM MECHANICS	4 M to F	M 14h00-17h00 Tu 14h00-16h00	As for PHY2014F
PHY3021F	ADVANCED PHYSICS A	4 M to F	M 14h00-17h00	See departmental entry
PHY3022S	ADVANCED PHYSICS B	4 M to F	M 14h00-17h00	See departmental entry
SEA2004F	PRINCIPLES OF OCEANOGRAPHY	4 M to F	Tu 14h00-17h00	See departmental entry
SEA2005S	MARINE SYSTEMS	4 M to F	Tu 14h00-17h00	See departmental entry
SEA3004S	OCEAN & ATMOSPHERE DYNAMICS	4 M to F	M 14h00-17h00	See departmental entry
STA1000F AND STA1000S	INTRODUCTORY STATISTICS	1st Sem: 1 M to F 2nd Sem: 1,2,3 or 4 M to F	One per week by arrangement	See departmental entry
STA1006S	MATHEMATICAL STATISTICS I	1 and 4 M to F	One per week by arrangement	See departmental entry
STA1007S	BIONUMERACY	1 M to Th	One per week by arrangement	See departmental entry
STA2004F	STATISTICAL THEORY & INFERENCE	1 M to F	One per week by arrangement	MAM1000W and STA1006S
STA2005S	LINEAR MODELS	1 M to F	One per week by arrangement	DP for STA2004F
STA2007F	APPLIED STATISTICAL MODELLING	2 M to F	One per week by arrangement	See departmental entry
STA2020F/S	BUSINESS STATISTICS	1 <sup>st</sup> Sem: 1 or 5 M to F. 2 <sup>nd</sup> Sem: 7 M to F	By arrangement	See departmental entry
STA3041F	MARKOV PROCESSES & TIME SERIES	1 M to F	Tutorials and practicals by arrangement	See departmental entry
STA3043S	DECISION THEORY & GLM	1 M to F	Two per week by arrangement	See departmental entry
STA3045F	ADVANCED STOCHASTIC PROCESSES	2 M to F	Two per week, by arrangement	See departmental entry

## SCIENCE FACULTY COURSES ARRANGED BY LECTURE PERIOD

COURSE CODE	COURSE TITLE	LECTURE PERIOD	PRACTICAL/TUTORIAL TIMES
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### First period, first semester

BIO2010F	PRINCIPLES OF ECOLOGY & EVOLUTION	1	M 14h00-17h00
BIO3002F	MARINE ECOSYSTEMS	1	W 14h00-17h00
HUB2019F	INTRODUCTION TO HUMAN BIOLOGY	1	M or Tu, 14h00-17h00
HUB3006F	GENERAL & APPLIED PHYSIOLOGY	1	W or Th, 14h00-17h00
MAM1000W	MATHEMATICS 1000	1	One 2-hour tutorial per week
MAM1004F	MATHEMATICS 1004	1	M or W, 14h00-16h00
MAM1005H	MATHEMATICS 1005	1/3	M 14h00-17h00 F 08h00-09h00
MAM1006H	MATHEMATICS 1006	1	One hour per week
STA1000F	INTRODUCTORY STATISTICS	1	One per week by arrangement
STA2004F	STATISTICAL THEORY & INFERENCE	1	One per week by arrangement
STA2020F	BUSINESS STATISTICS	1	By arrangement
STA3041F	MARKOV PROCESSES & TIME SERIES	1	By arrangement

### First period, second semester

EGS3012S	ATMOSPHERIC SCIENCE	1	Tu or W, 14h00-17h00
HUB2021S	HUMAN BIOLOGY : MAINTENANCE & INTEGRATION	1	M or Tu, 14h00-17h00
HUB3007S	BIOPHYSICS & NEUROPHYSIOLOGY	1	W or Th, 14h00-17h00
STA1000S	INTRODUCTORY STATISTICS	1	One per week by arrangement
STA1006S	MATHEMATICAL STATISTICS I	1	One per week by arrangement
STA1007S	BIONUMERACY	1	One per week by arrangement
STA2005S	LINEAR MODELS	1	One per week by arrangement
STA3043S	DECISION THEORY & GLM	1	Two tutorials per week by arrangement



**Second period, first semester**

AGE1004H	INTRO TO EARTH & ENVIRONMENTAL SCIENCES	2	F 14h00-17h00
AGE2012F	SOUTHERN AFRICAN HUNTERS & HERDERS	2	One per week by arrangement
AST2002H	ASTROPHYSICS	2	W 14h00-16h30
AST2003H	ASTRONOMICAL TECHNIQUES	2	W 14h00-16h30
AST3002F	STELLAR ASTROPHYSICS	2	W 14h00-16h30
BIO3013F	GLOBAL CHANGE ECOLOGY	2	M 14h00-17h00
CEM1000W	CHEMISTRY 1000	2/4	Tu, Th or F 14h00-17h00
CSC2001F	COMPUTER SCIENCE 2001	2	M to F, 14h00-18h00
CSC3002F	COMPUTER SCIENCE 3002	2	By arrangement
GEO1009F	INTRO TO EARTH & ENVIRONMENTAL SCIENCES	2	M, Tu, Th or F 14h00-17h00
GEO2001F	MINERALOGY & CRYSTALLOGRAPHY	2	W 14h00-17h00
GEO3005F	PETROLOGY & STRUCTURAL GEOLOGY	2	Tu and Th, 14h00-17h00
MAM1043H	MODELLING & APPLIED COMPUTING	2	By arrangement
MAM1044H	DYNAMICS	2	F 14h00-17h00
STA2007F	APPLIED STATISTICAL MODELLING	2	By arrangement
STA3045F	MARKOV PROCESSES & ADVANCED TIME SERIES	2	By arrangement

**Second period, second semester**

AGE2011S	HUMAN EVOLUTION	2	By arrangement
AST3003S	GALACTIC & EXTRAGALACTIC ASTROPHYSICS	2	By arrangement
BIO2012S	LIFE ON LAND : PLANTS	2	Th 14h0-17h00
BIO3014S	CONSERVATION: GENES, POPULATIONS & BIODIVERSITY	2	M 14h00-17h00
CSC2002S	COMPUTER SCIENCE 2002	2	By arrangement
CSC3003S	COMPUTER SCIENCE 3003	2	By arrangement
EGS1003S	GEOGRAPHY, DEVELOPMENT & ENVIRONMENT	2	M, Tu or Th 14h00-17h00
GEO2004S	PHYSICAL GEOLOGY	2	W 14h00-17h00
GEO3001S	STRATIGRAPHY & ECONOMIC GEOLOGY	2	Tu and Th, 14h00-17h00
MCB3022S	ADVANCED BIOTECHNOLOGY	2	W 14h00-17h00
STA1000S	INTRODUCTORY STATISTICS	2	By arrangement

## 158 SCHEDULE OF COURSES

**Third period, first semester**

BIO2013F	LIFE IN THE SEA	3	Tu 14h00-17h00
CEM2007F	PHYSICAL CHEMISTRY & SPECTROSCOPY	3	M or Th, 14h00-17h00
CEM3005W	CHEMISTRY 3005	3	W and F, 14h00-17h00
CSC3020H	THREE DIMENSIONAL & DISTRIBUTED GAMES DESIGN	3	By arrangement
CSC3022H	C++ WITH APPLICATIONS	3	By arrangement
EGS3021F	SUSTAINABILITY & ENVIRONMENT	3	W 14h00-17h00
MAM1000W	MATHEMATICS 1000	3	By arrangement
MAM1005H	MATHEMATICS 1005	1/3	By arrangement
MAM2046W	APPLIED MATHEMATICS 2046	3	Th 14h00-16h00
MAM2047H	APPLIED MATHEMATICS 2047	3	Th 14h00-16h00
MAM2048H	APPLIED MATHEMATICS 2048	3	Th 14h00-16h00
MAM3040W	APPLIED MATHEMATICS 3040	3	Th 14h00-16h00
MAM3041H	APPLIED MATHEMATICS 3041	3	Th 14h00-16h00
MAM3048H	APPLIED MATHEMATICS 3048	3	Th 14h00-16h00
MCB3019F	RECOMBINANT DNA, GENOMICS & PROTEOMICS	3	F 14h00-17h00
PHY1004W	MATTER & INTERACTIONS	3	Tu 14h00 to 17h00
PHY1023H	PRINCIPLES OF PHYSICS A	3	Tu 14h00-17h00
PHY1031F	GENERAL PHYSICS A	3	W 14h00-17h00
PHY1032F	GENERAL PHYSICS B	3	W 14h00-17h00

**Third period, second semester**

BIO3017S	MARINE RESOURCES	3	F 14h00-17h00
CEM2008S	ORGANIC & INORGANIC CHEMISTRY	3	M or Th, 14h00-17h00
CSC2003S	COMPUTER GAMES	3	By arrangement
MCB3023S	MOLECULAR EVOLUTIONARY GENETICS & DEVELOPMENT	3	None
PHY1032S	GENERAL PHYSICS B	3	M, W or Th 14h00-17h00

**Fourth period, first semester**

AGE3011F	ROOTS OF BLACK IDENTITY	4	By arrangement
CEM1000W	CHEMISTRY 1000	2/4	Tu, Th or F, 14h00-17h00
CEM1009H	CHEMISTRY 1009	4	M 14h00-17h00
CEM1010H	CHEMISTRY 1010	4	Th 14h00-17h00
CSC1011H	COMPUTER SCIENCE 1011	4	M 14h00-17h30
CSC1015F	COMPUTER SCIENCE 1015	4/5	M, Tu or W 14h00-17h30
MAM2001H	MATHEMATICS 2001	4	Th or F, 14h00-16h00
MCB2020F	BIOLOGICAL INFORMATION TRANSFER	4	Th or F 14h00-17h00
MCB3020F	PROTEIN STRUCTURE & FUNCTION	4	Th 14h00-17h00
PHY2014F	WAVES & ELECTROMAGNETISM	4	M 14h00-17h00 and Tu 14h00-16h00
PHY3021F	ADVANCED PHYSICS A	4	M 14h00-17h00
SEA2004F	PRINCIPLES OF OCEANOGRAPHY	4	Tu 14h00-17h00
SEA3004F	OCEAN & ATMOSPHERE DYNAMICS	4	M 14h00-17h00
STA1000F	INTRODUCTORY STATISTICS		By arrangement

**Fourth period, second semester**

AGE3012S	GLOBAL INTERACTION & THE TRANSFORMATION OF SOUTH AFRICAN SOCIETY	4	By arrangement
BIO2011S	LIFE ON LAND: ANIMALS	4	Tu 14h00-17h00
CSC1016S	COMPUTER SCIENCE 1016	4/5	M, Tu or W 14h00-17h00
EGS3022S	GEOGRAPHIC THOUGHT	4	W 14h00-17h00
MCB2023S	FUNCTIONAL GENETICS	4	
PHY2015S	CLASSICAL & QUANTUM MECHANICS	4	M 14h00-17h00 and T 14h00-16h00
PHY3022S	ADVANCED PHYSICS B	4	M 14h00-17h00
SEA2005S	MARINE SYSTEMS	4	Tu 14h00-17h00
STA1000S	INTRODUCTORY STATISTICS	4	By arrangement
STA1006S	MATHEMATICAL STATISTICS I		By arrangement

**160 SCHEDULE OF COURSES**

**Fifth period, first semester**

BIO1000F	CELL BIOLOGY	5	M, Tu, W or Th 14h00-17h00
BIO1000H	CELL BIOLOGY	5	M to F
BIO1004F	BIOLOGICAL DIVERSITY	5	M, Tu, W, Th or F 14h00-17h00
BIO3015F	ECOSYSTEM ECOLOGY	5	By arrangement
CSC1010H	COMPUTER SCIENCE 1010	5	Th 14h00-17h30
CSC1015F	COMPUTER SCIENCE 1015	4/5	M, Tu or W 14h00-17h30
EGS2013F	THE PHYSICAL ENVIRONMENT	5	F 14h00-17h00
EGS3020F	ENVIRONMENTAL CHANGE & CHALLENGE	5	Th 14h00-17h00
MAM2000W	MATHEMATICS 2000	5	Th or F, 14h00-16h00
MAM2004H	MATHEMATICS 2004	5	Th or F, 14h00-16h00
MAM3000W	MATHEMATICS 3000	5	F 14h00-17h00
MAM3001W	MATHEMATICS 3001	5	F 14h00-17h00
MAM3002H	MATHEMATICS 3002	5	F 14h00-17h00
MCB2021F	MOLECULAR BIOSCIENCE	5	M or Tu 14h00-17h00
MCB3021F	MOLECULAR MICROBIAL GENETICS	5	W 14h00-17h00
STA2020F	BUSINESS STATISTICS	5	By arrangement
STA1000F	INTRODUCTORY STATISTICS	5	W 14h00-17h00

**Fifth period, second semester**

AGE1002S	AFRICA & WORLD ARCHAEOLOGY	5	F 12h00-13h00
BIO1004S	BIOLOGICAL DIVERSITY	5	M, Tu, W, Th or F 14h00-17h00
BIO3016S	SYSTEMATICS AND MACROEVOLUTION	5	Tu 14h00-17h00
CSC1016S	COMPUTER SCIENCE 1016	4/5	M, Tu or W 14h00-17h31
EGS2014S	CONTEMPORARY URBAN CHALLENGES	5	F 14h00-17h00
GEO1006S	INTRODUCTION TO MINERALS, ROCKS & STRUCTURE	5	Th 14h00-17h00
MAM2002S	MATHEMATICS 2002	5	Th or F, 14h00-16h00
MAM3003S	MATHEMATICS 3003	5	F 14h00-17h00
MCB2022S	METABOLISM AND BIOENGINEERING	5	M or Tu 14h00-17h00
MCB3024S	DEFENCE & DISEASE	5	None

**Various**

AGE3006H	DIRECTED READING & RESEARCH	By arrangement	None
EGS1004S	INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES	none	F 14h00-17h00
MAM1019H	FUNDAMENTALS OF MATHEMATICS	Meridian	W 13h00-14h00
MAM1004S	MATHEMATICS 1004	Meridian	By arrangement

## ADDITIONAL INFORMATION

### 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 are Fellows in the Faculty of Science.

Professor I V Barashenkov	Professor C L Griffiths
Professor W J Bond	Professor G Janelidze
Professor S Bourne	Professor H-P Künzi
Professor M R Caira	Professor A P le Roex
Professor K Chibale	Professor B D Reddy
Professor A Chinsamy-Turan	Professor E Rybicki
Professor T J Egan	Professor J C Sealy
Professor J Farrant	

### Distinguished Teachers in the Faculty

The University makes a Distinguished Teacher Award in recognition of the importance of excellence in teaching at all levels in the University. Up to three awards are made annually. The following members (or past members) of the Faculty are recipients of this award (titles reflected as they were at the time of the award):

1983: Professor G M Branch (Zoology)  
 1984: Professor J H Webb (Mathematics)  
 1986: Associate Professor B R Davies (Zoology)  
 1990: Associate Professor H S T Driver (Physics)  
 1992: Dr J J Conradie (Mathematics)  
 1992: Professor J E Parkington (Archaeology)  
 1994: Professor J R Moss (Chemistry)  
 1996: Professor M J Hall (Archaeology)  
 1996: Dr M D Picker (Zoology)  
 1997: Dr N Morrison (Mathematics)  
 1998: Mr A N Rynhoud (Mathematics)  
 1998: Professor J A Thomson (Microbiology)  
 1998: Associate Professor I V Barashenkov (Mathematics)  
 1998: Professor J U M Jarvis (Zoology)  
 1999: Dr T Egan (Chemistry)  
 2000: Associate Professor D L Reid (Geological Sciences)  
 2001: Dr V Abratt (Molecular & Cell Biology)  
 2002: Professor J W Lutjeharms (Ocean & Atmosphere Science)  
 2002: Dr S Oldfield (Environmental & Geographical Science)  
 2002: Dr A Buffler (CHED/Physics)  
 2003: Dr D W Gammon (Chemistry)  
 2004: Dr B Davidowitz (CHED/Chemistry)  
 2004: Dr S Mundree (Molecular & Cell Biology)  
 2006: Dr R R Ackermann (Archaeology)  
 2008: Dr J O'Riain (Zoology)  
 2009: Associate Professor G Marsden (Computer Science)  
 2011: Dr G Smith (Chemistry)

## UCT Book Award

The University makes a Book Award in recognition of the publication of books, written by University staff, that brings credit to the University.

Professor G M Branch

*The Living Shores of South Africa* 1985

Professor G M Branch, Associate Professor C L

*Two Oceans - A guide to the Marine life of*

Griffiths, Mrs M L Branch and Dr L E Beckley

*Southern Africa* 1995

Professor B Warner

*Cataclysmic Variable Stars* 1997

Dr P Bruyns

*Stapeliads of Southern Africa & Madagascar*

2008

## Prizes

(Further information regarding the value of prizes may be obtained from the Faculty Office.)

### Chemistry Prize

Awarded to the best student in second-year Chemistry who will be proceeding to third-year Chemistry.

### Computer Science BSG Prizes

Awarded to the best student in each of Computer Science second and third year courses, the best student in the Honours course and for the best Honours project.

### Computer Science ENTELECT Prizes

Two prizes, one awarded for Social Responsiveness and another for Achievement

### Dick & Dorothy Borcherds Prize

Awarded to the student achieving the highest standard at the end of the second year in Biological Sciences or Astronomy.

### Frank Schweitzer Memorial Prize

Awarded to one or more outstanding senior students in Archaeology, at the discretion of the Head of Department.

### Gordon Percy Memorial Award

Awarded to the best student in Chemistry Honours.

### J Barry Hawthorne Centennial Prize

Awarded to the best student in third-year Geology who will be proceeding to Honours in the Department.

### Joseph Arenow Prize plus Science Faculty PhD medal

Awarded at the discretion of the Dean for outstanding, original postgraduate research.

### Merck Prize plus medal

Awarded to the best student in third-year Chemistry who will be proceeding to Honours in the Department.

### Merck Prize

Best student in Molecular & Cell Biology Honours

### Purcell Memorial Prize

Awarded for the best MSc or PhD dissertation dealing with a Zoological subject

### Steve Driver Prize

Awarded to the student producing the best laboratory work in a second year Physics course.

### The Mathematics & Applied Mathematics Webb-Ellis trophy

Awarded to the best student in first year with double majors in Applied Mathematics and Mathematics.

## Scholarships

(Further information regarding the value of scholarships may be obtained from the Faculty Office.)

### **Dr Jacob Burlak Memorial Scholarship** Tenure 1 year

Awarded to the best student in second-year Mathematics, registered in the Faculty of Science, who will be proceeding to third-year Mathematics.

### **Myer Levinson (Emdin) Scholarship** Tenure 2 years

Awarded every second year to a candidate who has obtained the BSc Hons degree in the first class and who proposes to pursue further study.

### **Twamley Undergraduate Scholarship** Tenure 1 year

Awarded for the most outstanding academic performance at the end of the first year of study.

## Class Medals

A class medal may be awarded to a student who has demonstrated special ability in a course, but an award shall not be made if there is no candidate of sufficient merit. Only one medal shall be awarded for each course. Students undertaking a course for a second time are not eligible.

## Dean's Merit List

Students who obtain consistently good results may be included on the Dean's Merit List, issued annually, in recognition of their academic achievements. To qualify for the Dean's Merit List in a particular year, a student must normally:

- (a) have taken the equivalent of the following minimum number of courses:  
*BSc degree:*  
 first year: four full courses  
 second year: three full courses, two of which must be senior courses  
 third year: two full courses, one of which must be a third-year course  
*[GEPS – Refer to 2012 Handbook]*
- (b) have passed all these courses in the year;
- (c) not be repeating courses;
- (d) have obtained a weighted average of over 70% for the courses taken.

## Minimum requirements for admission to an undergraduate degree

A candidate for the degree of bachelor must have obtained a National Senior Certificate endorsed by Umalusi to state that he or she has met the minimum admission requirements for degree study, or a matriculation certificate or have obtained a Senior Certificate endorsed to state that he or she has met the matriculation requirements or an exemption certificate issued by the Matriculation Board. Council and Senate may, in addition, prescribe, as a prerequisite for admission to any programme or course, the attaining of a specified standard in specified subjects at the matriculation or equivalent examination. (Where these have been prescribed, they are set out in the Admission Policy.) The Matriculation Board's website address is <http://hesa-enrol.ac.za/mb>

Further information on Faculty Course entry requirements can be found in Book 1, Information for Applicants for Undergraduate Degrees and Diplomas and in the Undergraduate Prospectus.



## Non-Science electives in the Bachelor of Science (BSc) degree

Courses from other Faculties may be taken as electives, but subject to the following constraints and approval by a Student Advisor or Deputy Dean:

- Only courses with an NQF credit value of 18 or more will be counted (a first year half course in the Science Faculty has an NQF credit value of 18). Courses are not summed.
- If the equivalent of two or less full Science courses (maximum 72 level 6 NQF credits) are replaced by courses from another Faculty, then any courses not specifically excluded by Science Faculty rules (see below) can be chosen.
- If more than two full year Science courses are replaced with electives from another Faculty, then the further electives must form part of a hierarchical sequence linked to those already completed.

### Specific exclusions

- AHS (Allied Health Services) courses do not count
- Architecture & Planning courses do not count (i.e. APG courses other than Geomatics)
- DOH1002F; DOH1004S; DOH1005F do not count
- DRM (Drama) courses do not count
- FIN (Fine Art) courses do not count
- HUB courses (other than those offered for Human Physiology major) do not count
- INF1002F/S/H; INF1003S do not count if credit is given for CSC1015F/1016S; nor do they give exemption from CSC1015/1016
- INF2004F, INF2008F and INF2010S do not count together with senior CSC courses
- STA1001F/S does not count
- CHE1004W/CHE1005W, CIV1004W, CON1004W, EEE1004W or MEC1004W counts as a half course for students transferring from the Faculty of EBE, but these courses may NOT be taken by students registered in the Science Faculty.
- Professional Communication courses do not count.

### Courses taught by the Science Faculty for students in other Faculties

Courses taught by the Faculty of Science for other Faculties may not be taken by students registered in Science. However, students transferring into Science from other Faculties may be able to count such courses towards their Science curriculum as Science courses, with the credit weighting and equivalence established by the Departments concerned – see below.

#### Transferring students

GEO1008F counts as a Science half credit, but credit will not be given for both GEO1008F and GEO1006S

MAM1010F/S counts as a half course credit (CX MAM1005H)

MAM1012F/S counts as a half course credit (CX MAM1006H)

MAM1017F/S counts as a half course if result is 70% or more (CX MAM1005H)

MAM1018F/S counts as a half course if result is 70% or more (CX MAM1006H)

MAM1017F/S plus MAM1018F/S count as full course credit if both are passed with an average mark for the two courses of 70% or more (CX MAM1000W)

MAM1017F/S plus MAM1018F/S count as a half course if the result is less than 70% (CX MAM1005H)

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MAM1017F/S plus MAM1018F/S plus MAM2083F/S count as a full course credit if the average result is less than 70% (CX MAM1000W)

MAM2083F/S plus MAM2084F/S counts as a senior half course. Neither MAM2083 nor MAM2084 counts on their own. (Entry to MAM3000W will be decided on an individual basis, and will require a pass in both MAM2083 and MAM2084 plus registration for one or two MAM2000W modules).

PHY1012F/S counts as a half course if result is 70% or more

PHY1013F/S counts as a half course if result is 70% or more

PHY1012F/S plus PHY1013F/S count as full course credit if both are passed with an average mark for the two courses of 75% or more (CX PHY1004W)

PHY1012F/S plus PHY1013F/S count as half course credit if both are passed with an average mark for the two courses of less than 75%

The following courses may be taken by Science students but count as non-science half courses:

STA2020F, STA2030S, STA3022F and STA3030F

Note: STA3036S counts as a Science half course.

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