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2025

FACULTY OF SCIENCE

Handbook 11 in this series of handbooks

UNIVERSITY OF CAPE TOWN

FACULTY OF SCIENCE

2025

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Dean's & Faculty Offices: Chris Hani Building, Level 6
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Upper Campus

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

Telephones:

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

Internet:

UCT's Home Page	http://www.uct.ac.za
Science Home Page	http://www.science.uct.ac.za
Dean's Office Faculty Office	sci-science@uct.ac.za
International Academic Programmes Office	iapo@uct.ac.za

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

This handbook is part of a series that consists of

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

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SCIENCE FACULTY GENERAL CODE OF CONDUCT

In keeping with UCT policy, the Science Faculty is dedicated to providing an environment that is inclusive and free of discrimination, violence, bullying and harassment for everyone, regardless of gender, race, sexual orientation, disability, country of origin, physical appearance, age, mental or physical health, HIV-status, political opinion or religion. We do not tolerate discrimination, violence, bullying and harassment, in any form, towards our academic and PASS staff, postdocs, students or visitors.

All communication should be professional and appropriate. This applies to general conduct in the Faculty, but also presentations and posters at conferences and in meetings, in laboratories, and in the field. Sexist, racist, and other exclusionary imagery and language – including "jokes" – are not appropriate and will not be tolerated.

Violations of this code may be reported to staff within individual departments, and/or the Faculty, and/or the UCT Office for Inclusivity and Change, which could lead to possible disciplinary actions. In those cases the UCT Office for Inclusivity and Change (OIC) will hear both parties involved on the shortest possible notice. Based on the outcome, further actions may be taken.

UCT Transformation plans and policies, including a statement of values, plans and policies around employment equity, anti-discrimination and inclusivity, can be found here:

https://www.uct.ac.za/main/explore-uct/transformation/plans-policies

The Science Faculty is mindful of the wide range of cultural backgrounds and expectations held by our academic and PASS staff, postdocs, students and visitors. Anyone who is uncertain about what is deemed appropriate behaviour should visit the above website and the resources and links therein.

CONTENTS

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 section 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.

GENERAL INFORMATION

Officers in the Faculty

Dean of the Faculty of Science:
Professor H Suleman, MSc *UDW* PhD *Virginia Tech*
Rm 6.03 Chris Hani Building
sci-dean@uct.ac.za

Deputy Dean, Transformation:
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Deputy Dean, Undergraduate Studies:
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Deputy Dean, Postgraduate Studies:
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Deputy Dean, Research:
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MSc *Natal* PhD *Cantab*
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Senior Administrative Officer, Undergraduate:
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Rm 6.07 Chris Hani Building
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Administrative Officer, Postgraduate:
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Administrative Assistant, Postgraduate:

Administrative Assistant/Receptionist:

Administrative Officer:
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Faculty Manager (Finance):
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Senior Student Advisors in the Faculty

Computer Science & Statistics
Mr A Safla
Rm 307 Computer Science Building
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Statistics
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Associate Professor A Sloan
Rm 301 Geological Science Building
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Chemical, Molecular & Cellular Sciences
Dr P Meyers
Rm 202 Molecular Biology Building
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Mathematics, Physics & Astronomy
Dr S Wheaton
Rm 4T4 RW James Building
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Extended Degree Programme (EDP)
Dr C Edmonds-Smith
Rm 6.08 PD Hahn Building
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Student Advisors in the Faculty

Computer Science & Statistics
Associate Professor S Berman (January – June)
Rm 310 Computer Science Building
sonia@cs.uct.ac.za

Dr J Chavula
Rm 305 Computer Science Building
josiah.chavula@uct.ac.za

Dr Z Mahlaza (July – December)
Rm 306.2 Computer Science Building
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Associate Professor P Marais	Rm. 309 Computer Science Building patrick@cs.uct.ac.za
Statistics	
Dr S Er	Rm 5.55 PD Hahn Building sebnem.er@uct.ac.za
Mr D Katshunga (Commerce students only)	Rm 5.49 PD Hahn Building dominique.katshunga@uct.ac.za
Biology, Earth & Environmental Sciences	
Associate Professor J Battersby	Rm 6.01 Environmental & Geographical Sciences Building jane.battersby@uct.ac.za
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Associate Professor R Thomson	Rm. 2.06 John Day Building robert.thomson@uct.ac.za
Chemical, Molecular & Cellular Sciences	
Dr F Dube	Rm 227B Molecular Biology Building felix.dube@uct.ac.za
Dr R Hurdayal (July – December)	Rm 402 Molecular Biology Building ramona.hurdayal@uct.ac.za
Dr S Ngubane	Rm 6.13 PD Hahn Building siyabonga.ngubane@uct.ac.za
Professor G Smith	Rm 7.08 PD Hahn Building gregory.smith@uct.ac.za
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Dr T Salagaram	Rm 5.11 RW James Building trisha.salagaram@uct.ac.za
Mr T van Heerden	Rm M1.01.6 Mathematics Building thomas.vanheerden@uct.ac.za

Departments in the Faculty

Department:	Location:	Telephone:
Archaeology	Beattie Building	(021) 650 2353
Astronomy	R W James Building	(021) 650 5830
Biological Sciences	H W Pearson Building & J Day Building	(021) 650 3603
Chemistry	P D Hahn Building	(021) 650 2525
Computer Science	Computer Science Building	(021) 650 2663
Environmental & Geographical Science	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

Query:	Whom to approach:	Telephone:
Academic transcripts/degree certificates, deferred examinations	Records Office, Masingene Building, Middle Campus	(021) 650 3595
Admission queries, curriculum matters, registration issues	Academic Administration, Science Faculty Office, Level 6, Chris Hani Building	(021) 650 2712
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 6, Room 6.76.1 and may be contacted via email: SSC@myuct.ac.za.

Postgraduates:
The Science Postgraduate Students' Council (SPGSC) is elected by the postgraduate students in the Faculty of Science. The SPGSC represents the postgraduate students on the executive committee of the University Postgraduate Students' Council. The Chairperson of the SPGSC 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 Master's and Doctoral students as well as postdoctoral research fellows. Postgraduates are encouraged to make full use of this centre, in particular, the Funding Office, which administers all postgraduate bursaries and scholarships. The Postgraduate Centre may be contacted at gradcentre@uct.ac.za.

Term dates for 2025

Please refer to the website: http://www.staff.uct.ac.za/staff/calendar/terms

Explanatory Notes on Course Codes

The curriculum for the Bachelor's 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's degree may be completed in one semester (i.e. a "half-course") or over two semesters (ie. a "full-course"). In this respect, the following codes are used:

F first-semester half-course
S second-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

CEM1000W *Chemistry 1000*
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

BIO3002F *Marine Ecosystems*
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's degree in the Faculty of Science.

Essential Terminology

Pre-requisite courses
Most courses at UCT (except some first-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; i.e. 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 G26
DP (Duly Performed certificate) and DPR (Duly Performed certificate Refused) - Refer to General Rules GB9

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 sub-minimum 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 a 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 FB4.1-4.2 and General Rules G23

Deferred examinations
Refer to General Rules G27 & 28

DEGREES OFFERED IN THE FACULTY

This is to confirm that by virtue of inclusion on the Institution's DHET approved Programme and Qualification Mix (PQM), all qualifications listed below are **accredited** by the Council on Higher Education's permanent sub-committee - the Higher Education Quality Committee. Where a SAQA ID is not listed, the qualification is awaiting the issue of this number. The higher education sector has undergone an extensive alignment to the Higher Education Qualification sub Framework and thus all institutions are awaiting the finalisation of the process and completion of the awarding of SAQA ID's.

Please consult Handbook 2 or the HEQsF Programme and Qualification Mix (PQM) on the Institutional Planning Department's website, as approved by the Department of Higher Education and Training, for a list of all UCT's accredited qualifications.

i) Bachelor of Science (BSc) degree [SAQA ID 117697]
ii) Bachelor of Science Honours (BSc Hons) degree [SAQA ID 116322]
iii) Master of Science (MSc) degree [SAQA ID 116422]
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:

(a) 72 NQF credits in each semester in the first academic year of study;

(b) 72 NQF credits 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 60% or more in all courses written in the most recent set of ordinary examinations and/or tests, (i.e. in June or November)

Note: 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's 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 108 credits.

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 MAM1031F, MAM1032S, MAM1033F, MAM1034S, MAM1019H, MAM1043H, MAM1044H and all MAM courses offered to other faculties, 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, the student 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 120 credits, of which only 72 may be at third-year level..

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, may be awarded a supplementary examination if the department concerned recommends it.
(d) Where a student is awarded supplementary examinations in more than 120 credits, or more than 72 third-year credits, the student must choose which supplementary examinations to write in terms of the restriction detailed in FB4.2 above.

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 (for students first registered from 2023)

Bachelor of Science degree (SB001)

FB5.1 Except by permission of Senate, a student who has registered for the Bachelor of Science degree (SB001), shall not be permitted to reregister in the Faculty unless the student has completed at least 72 credits in the preceding year of study, and the following number of credits overall:

(a) by the end of the first year of registration, 72 SCIENCE credits;
(b) By the end of the second year of registration, 144 credits, including all the first-year courses required for the majors;
(c) by the end of the third year of registration, 228 credits, including all the courses required to be able to complete the degree in one further year;
(d) by the end of the fourth year of registration, students are expected to complete all the requirements of the degree.

Extended Degree Programme (EDP) (SB016)

Extended Degree Programme (EDP)

FB5.2 Except by permission of Senate, a student who is registered on the EDP (SB016) shall not be permitted to reregister in the Faculty unless the student has completed 72 credits in the preceding year of study (unless that was the first year of

registration), and the following number of credits overall:

(a) by the end of the first year of registration, 54 SCIENCE credits;
(b) by the end of the second year of registration, 108 credits, including all the first-year courses required for one SCIENCE major;
(c) by the end of the third year of registration, 180 credits, of which at least 48 credits shall be at senior level;
(d) by the end of the fourth year of registration, 252 credits, including all the courses required to be able to complete the degree in one further year;
(e) by the end of the fifth year of registration, students are expected to complete all the requirements of the degree.

Refusal of readmission to the Faculty and related matters (for students first registered before 2023)

Bachelor of Science degree

FB5.1 a 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 the student has completed:

(a) by the end of the first year of registration, one and a half courses or the equivalent, specific to a major;
(b) by the end of the second year of registration, three and a half courses or the equivalent, including all required first-year courses;
(c) by the end of the third year of registration, five and a half courses or equivalent, including one and a half senior courses;
(d) by the end of the fourth year of registration, seven and a half courses, including the equivalent of three full-year senior courses;
(e) by the end of the fifth year of registration, students are expected to complete all the requirements of the degree.

Extended Degree Programme (EDP)

Extended Degree Programme (EDP)

FB5.2 a Except by permission of Senate, a student who is registered on the EDP shall not be permitted to reregister in the Faculty unless the student has completed:

(a) by the end of the first year of registration, one full-year course, or the equivalent in half courses;
(b) by the end of the second year of registration, three full-year courses or the equivalent, including two and a half courses specific to the majors;
(c) by the end of the third year of registration, five full-year courses or the equivalent, of which at least one shall be a senior course;
(d) by the end of the fourth year of registration, seven full-year courses, of which at least two and a half shall be senior courses.
(e) by the end of the fifth year of registration, students are expected to complete all the requirements of the degree.

FB5.3 In addition to the readmission requirements listed in FB5.1 and FB5.2 above, the fulfilment of other specific requirements may be required by individual majors. These requirements will be communicated to students.

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 72 credits 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 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 (have not been academically excluded).

Refer to the Faculty of Science website https://science.uct.ac.za/internal-transfers-science for detailed criteria and procedures.

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 FB7.5 and FB7.6 below. The general rules governing BSc curricula are rules FB7.1 to FB7.4 which stipulate the minimum number of credits required, and the range of choices possible.

All curricula can lead to postgraduate study.

Total number of credits

FB7.1 The curriculum shall include the equivalent of at least 360 NQF credits of which at least 180 must be Science credits.

Number of senior courses

FB7.2 The curriculum shall include at least 120 credits at level 7. This applies even where the curriculum includes only one major.

Mathematics

FB7.3 The curriculum shall include at least a Science Mathematics course of 18 NQF credits (level 5) plus a Science Statistics course of 18 NQF credits (level 5), or Science Mathematics courses totalling 36 NQF 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:

- If 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).
- If more than 72 Science credits 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.

Major(s)

FB7.5 The curriculum shall include at least one major from the following list:

Applied Mathematics	Genetics
Applied Statistics**	Geology
Archaeology	Human Anatomy & Physiology
Artificial Intelligence	
Astrophysics	Marine Biology
Biochemistry	Mathematical Statistics**
Biology	Mathematics
Business Computing*	Ocean & Atmosphere Science
Chemistry	Physics
Computer Science	Quantitative Biology
Computer Engineering*	Statistics & Data Science**
Environmental & Geographical Science	

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

**These majors may not be taken together

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 Biology, Biochemistry, Genetics, Geology and Human Anatomy & 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 Advisor regarding possible restrictions.*

FB7.6 **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 (MAM1031F+MAM1032S) or (MAM1033F+MAM1034S) or (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. 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 Anatomy & Physiology, the specific INF courses listed as compulsory for the major in Business Computing.

Major in Applied Mathematics [MAM01]

Students who major in Applied Mathematics and wish to progress to Applied Mathematics Honours are strongly recommended to complete the project course MAM3055Z: Project in Applied Mathematics

First Year Core Courses

Code	Course	NQF Credits	NQF Level
Either			
MAM1000W	Mathematics 1000	36	5
Or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
MAM1043H	Modelling & Applied Computing	18	5
MAM1044H	Dynamics	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
MAM2010F	Advanced Calculus (2AC)	12	6
MAM2011F	Linear Algebra (2LA)	12	6
And two of			
MAM2012S	Differential Equations (2DE)	12	6
MAM2013S	Introductory Algebra (2IA)	12	6
MAM2014S	Real Analysis (2RA)	12	6

Code	Course	NQF Credits	NQF Level
and			
MAM2040F	Ordinary Differential Equations (2OD)	12	6
MAM2041F	Numerical Analysis (2NA)	12	6
MAM2042S	Non-linear Dynamics (2ND)	12	6
MAM2043S	Boundary-Value Problems (2BP)	12	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
MAM3043F/S	Methods of Mathematical Physics (3MP)	18	7
Any three of			
MAM3012F/S	Discrete Mathematics (3DM)	18	7
MAM3042F/S	Advanced Numerical Methods (3AN)	18	7
MAM3044F/S	Functions of a Complex Variable (3CV)	18	7
MAM3045F/S	Introduction to General Relativity (3GR)	18	7
MAM3046F/S	Fluid Dynamics (3FD)	18	7

Major in Applied Statistics
[STA01]

Students who major in Applied Statistics and wish to progress to Statistics Honours must complete one semester of Computer Science 1

First Year Core Courses

Code	Course	NQF Credits	NQF Level
MAM1000W	Mathematics 1000 or equivalent	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
STA1007S	Introductory Statistics for Scientists	18	5
or			
STA1000F /S/P/L	Introductory Statistics	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
STA2007F/S/H	Study Design & Data Analysis for Scientists	24	6
or			
STA2020F/S	Applied Statistics	24	6
STA2030S	Statistical Theory	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
STA3030F	Statistical Inference & Modelling	36	7
STA3022F	Applied Multivariate Data Analysis	36	7
or			
STA3036S	Operational Research Techniques	36	7

Major in Archaeology
[AGE01]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
GEO1009F	Intro to Earth and Environmental Sciences	18	5
AGE1002S	The Human Planet: Prehistory to Present	18	5
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
or			
*MAM1004F	Mathematics 1004	18	5
and one of:			
STA1000F/S	Introductory Statistics	18	5
or			
STA1007S	Introductory Statistics for Scientists	18	5

Note: *MAM1004F/S can be replaced by MAM1031F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
AGE2011S	Human Evolution	24	6
AGE2012F	The First People	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
AGE3013H	Archaeology in Practice	36	7
One of:			
AGE3011F	The Roots of Recent African Identities	36	7
AGE3012S	Global Diasporas & the Archaeology of the Historical Past	36	7

Major in Artificial Intelligence
[CSC08]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC1015F/S	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
MAM1031F	Mathematics 1031 (or equivalent)	18	5
MAM1032S	Mathematics 1032 (or equivalent)	18	5
MAM1019H	Fundamentals of Mathematics	18	5
or			
STA100xF/S	Any 1000-level Science STA course	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC2001F	Computer Science 2001	24	6
CSC2041F	AI 1: Knowledge Representation	24	6

Code	Course	NQF Credits	NQF Level
CSC2042S	AI 2: Machine Learning	24	6
MAM2010F	Advanced Calculus (2AC)	12	6
MAM2011F	Linear Algebra (2LA)	12	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC3041F	Automated Planning and Control	18	7
CSC3042F	Deep Learning	18	7
CSC3043S	Reasoning in AI	18	7
CSC3044S	AI Systems	18	7

Major in Astrophysics
[AST02]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
PHY1004W	Matter & Interactions	36	5
Recommended:			
AST1000S	Introduction to Astronomy	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
AST2002H	Astrophysics	24	6
AST2003H	Astronomical Techniques	24	6
MAM2010F	Advanced Calculus (2AC)	12	6
MAM2011F	Linear Algebra (2LA)	12	6
and two of			
MAM2012S	Differential Equations (2DE)	12	6
MAM2013S	Introductory Algebra (2IA)	12	6
MAM2014S	Real Analysis (2RA)	12	6
or			
MAM2010F	Advanced Calculus (2AC)	12	6
and			
MAM2011F	Linear Algebra (2LA)	12	6
combined with			
MAM2040F	Ordinary Differential Equations (2OD)	12	6
and one of			
MAM2041F	Numerical Analysis (2NA)	12	6
MAM2042S	Non-linear Dynamics (2ND)	12	6
MAM2043S	Boundary-Value Problems (2BP)	12	6
and			
PHY2004W	Intermediate Physics	48	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
AST3002F	Stellar Astrophysics	36	7
AST3003S	Galactic & Extragalactic Astrophysics	36	7

Major in Biochemistry

[MCB01]

This major has limits on the number of students accepted into second year level courses

First Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO1000F	Cell Biology	18	5
BIO1004S	Biological Diversity	18	5
CEM1000W	Chemistry 1000	36	5
MAM1004F	Mathematics 1004	18	5
or			
MAM1031F	Mathematics 1031	18	5
STA1007S	Introductory Statistics for Scientists	18	5
or			
STA1000F/S	Introductory Statistics	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
MCB2020F	Biological Information Transfer	24	6
MCB2021F	Molecular Bioscience	24	6
MCB2022S	Metabolism and Bioengineering	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
MCB3012Z	Research Project in Molecular and Cell Biology	0	7
MCB3024S	Defence & Disease	36	7
MCB3025F	Structural and Chemical Biology	36	7

Major in Biology

[BIO12]

Students who major in Biology and wish to progress to Biological Sciences or Marine Biology Honours must complete STA2007

First Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO1000F	Cell Biology	18	5
BIO1004S	Biological Diversity	18	5
CEM1000W	Chemistry 1000	36	5
Either			
MAM1004F	Mathematics 1004	18	5
or			
MAM1031F	Mathematics 1031	18	5
STA1007S	Introductory Statistics for Scientists	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO2014F	Principles of Ecology & Evolution	24	6
Two of:			
BIO2015F/S	Vertebrate Diversity & Functional Biology	24	6
BIO2016S	Invertebrate Diversity & Functional Biology	24	6
BIO2017F/S	Plant Diversity & Functional Biology	24	6
Recommended:			
STA2007F/H/S	Study Design & Data Analysis for Scientists	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
Two of:			
BIO3013F	Global Change Ecology	36	7
BIO3014S	Conservation: Genes, Populations & Biodiversity	36	7
BIO3018F	Ecology & Evolution	36	7
BIO3019S	Quantitative Biology	36	7

Major in Business Computing
[CSC02]

Must be taken concurrently with a Computer Science major

First Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC1015F/S	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
MAM1008S	Introduction to Discrete Mathematics	18	5
or			
MAM1019H	Fundamentals of Mathematics	18	5
or			
STA100xF/S	Any 1000-level Science STA course	18	5
MAM1004F/S	Mathematics 1004	18	5
or			
MAM1000W	Mathematics 1000	36	5
or			
MAM1031F	Mathematics 1031 (or equivalent)	18	5
ACC1021F	Accounting for Business I	15	5
or			
FTX1005F/S	Managerial Finance	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
INF2009F	Systems Analysis	18	6
INF2006F	Business Intelligence Analysis	6	6

Code	Course	NQF Credits	NQF Level
INF2011S	System Design and Development	18	7

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
INF3011F	I.T. Project Management	18	7
INF3012S	BPM and Enterprise Systems	18	7
INF3014F	Electronic Commerce	18	7

Major in Chemistry
[CEM01]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
CEM1000W	Chemistry 1000	36	5
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
Either			
PHY1004W	Matter and Interactions	36	5
or both			
PHY1031F	General Physics A	18	5
and			
PHY1032S	General Physics B	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
CEM2005W	Intermediate Chemistry	48	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
CEM3005W	Chemistry 3005	72	7

Major in Computer Engineering
[CSC03]

Must be taken concurrently with a Computer Science major.

First Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC1015F/S	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
Either			
MAM1000W	Mathematics	36	5
or both			
MAM1031F	Mathematics 1031	18	5

Code	Course	NQF Credits	NQF Level
and			
MAM1032S	Mathematics 1032	18	5
Either			
*PHY1004W	Matter and Interactions	36	5
or both			
*PHY1031F	General Physics A	18	5
and			
*PHY1032S	General Physics B	18	5

Note: *PHY and MAM courses are not requirements of the major but pre-requisites of EEE2041F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
EEE2041F	Introduction to Electrical Engineering & Power Utilisation	16	6
EEE2042S	Introduction to Analogue & Digital Electronics	8	6
EEE2050F	Embedded Systems 1 for Science Students	18	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC3022F	C++ and Machine Learning	36	7
EEE3095S	Embedded Systems II for Science Students	18	7

Major in Computer Science [CSC05]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC1015F/S	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
MAM1008S	Introduction to Discrete Mathematics	18	5
or			
MAM1019H	Fundamentals of Mathematics	18	5
or			
STA100xF/S	Any 1000-level Science STA course	18	5
MAM1004F/S	Mathematics 1004	18	5
or			
MAM1000W	Mathematics 1000	36	5
or			
MAM1031F	Mathematics 1031 (or equivalent)	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC2001F	Computer Science 2001	24	6
CSC2002S	Computer Science 2002	24	6
CSC2004Z	Programming Assessment	0	6
INF2009F	Systems Analysis	18	6
And/or			
CSC2042S	AI 2: Machine Learning	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC3002F	Computer Science 3002	36	7

Code	Course	NQF Credits	NQF Level
CSC3003S	Computer Science 3003	36	7

Major in Environmental & Geographical Science [EGS02]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
EGS1007S	Human & Physical Systems	18	7
GEO1009F	Intro to Earth and Environmental Sciences	18	5
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
or			
*MAM1004F	Mathematics 1004	18	5
and one of:			
STA1000F/S	Introductory Statistics	18	5
or			
STA1007S	Introductory Statistics for Scientists	18	5

Note: *MAM1004F/S can be replaced by MAM1031F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
EGS2013F	The Physical Environment	24	6
EGS2015S	Society & Space	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
Two of:			
EGS3012S	Atmospheric Sciences	36	7
EGS3021F	Sustainability & Environment	36	7
EGS3022S	Geographic Thought	36	7
EGS3023F	Anthropocene Environments In Perspective	36	7

Major in Genetics [MCB04]

This major has limits on the number of students accepted into second year level courses

First Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO1000F	Cell Biology	18	5
BIO1004S	Biological Diversity	18	5
CEM1000W	Chemistry 1000	36	5
MAM1004F	Mathematics 1004	18	5
or			

Code	Course	NQF Credits	NQF Level
MAM1031F	Mathematics 1031	18	5
STA1007S	Introductory Statistics for Scientists	18	5
or			
STA1000F/S	Introductory Statistics	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
MCB2020F	Biological Information transfer	24	6
MCB2021F	Molecular Bioscience	24	6
MCB2023S	Functional Genetics	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
MCB3012Z	Research Project in Molecular & Cell Biology	0	7
MCB3023S	Molecular Evolutionary Genetics & Development	36	7
MCB3026F	Molecular Genetics & Genomics	36	7

Major in Geology
[GEO02]

This major has limits on the number of students accepted into second year level courses

First Year Core Courses

Code	Course	NQF Credits	NQF Level
GEO1009F	Intro to Earth and Environmental Sciences	18	5
GEO1006S	Intro to Minerals, Rocks & Structure	18	5
CEM1000W	Chemistry 1000	36	5
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
or			
*MAM1004F	Mathematics 1004	18	5
and one of:	the STA courses		
STA1000F/S	Introductory Statistics /	18	5
or			
STA1007S	Introductory Statistics for Scientists	18	5
PHY1031F	General Physics A	18	5

Note: *MAM1004F/S can be replaced by MAM1031F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
GEO2001F	Mineral, Crystall & Petrography	24	6
GEO2004S	Physical Geology	24	6
GEO2005X*	Field Geology and Geological Mapping	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
GEO3005F	Petrology & Structural Geology	36	7
GEO3001S	Stratigraphy & Economic Geology	36	7
GEO2005X*	Field Geology and Geological Mapping	24	6

* fieldwork half-course to be taken over second and third years of study

Major in Human Anatomy & Physiology
[HUB17]

This major has limits on the number of students accepted into second year level courses

First Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO1000F	Cell Biology	18	5
BIO1004S	Biological Diversity	18	5
CEM1000W	Chemistry 1000	36	5
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
or			
*MAM1004F	Mathematics 1004	18	5
and			
STA1007S	Introductory Statistics for Scientists	18	5
Recommended:	1000-level Physics		

Note: *MAM1004F/S can be replaced by MAM1031F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
HUB2019F	Integrated Anat & Physio Sciences A	24	6
HUB2021S	Integrated Anat & Physio Sciences B	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
HUB3006F	Applied Human Biology	36	7
HUB3007S	Human Neurosciences	36	7

Major in Marine Biology
[BIO05]

Students who major in Marine Biology and wish to progress to Biology or Marine Biology Honours must complete STA2007S

First Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO1000F	Cell Biology	18	5
BIO1004S	Biological Diversity	18	5
CEM1000W	Chemistry 1000	36	5
Either			
MAM1004F	Mathematics 1004	18	5
or			
MAM1031F	Mathematics 1031	18	5
STA1007S	Introductory Statistics for Scientists	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO2014F	Principles of Ecology & Evolution	24	6

Code	Course	NQF Credits	NQF Level
SEA2004F	Principles of Oceanography	24	6
One of:			
BIO2015F/S	Vertebrate Diversity & Functional Biology	24	6
BIO2016S	Invertebrate Diversity & Functional Biology	24	6
BIO2017F/S	Plant Diversity & Functional Biology	24	6
Recommended:			
STA2007F/H/S	Study Design & Data Analysis for Scientists	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO3002F	Marine Ecosystems	36	7
BIO3017S	Marine Resources	36	7

Major in Mathematical Statistics

[STA02]

Students who major in Mathematical Statistics and wish to progress to Statistics Honours must complete one semester of Computer Science 1

First Year Core Courses

Code	Course	NQF Credits	NQF Level
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
STA1006S	Mathematical Statistics I	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
STA2004F	Statistical Theory & Inference	24	6
STA2005S	Linear Models	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
STA3041F	Markov Processes & Time Series	36	7
STA3043S	Statistical Modelling, Machine Learning and Bayesian Analysis	36	7

Major in Mathematics

[MAM02]

Students who major in Mathematics and wish to progress to Mathematics Honours are strongly recommended to complete the project course MAM3006Z: Project in Mathematics

First Year Core Courses

Code	Course	NQF Credits	NQF Level
Either			
MAM1000W	Mathematics 1000	36	5
Or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
MAM1019H	Fundamentals of Mathematics	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
MAM2010F	Advanced Calculus (2AC)	12	6
MAM2011F	Linear Algebra (2LA)	12	6
MAM2013S	Introductory Algebra (2IA)	12	6
MAM2014S	Real Analysis (2RA)	12	6

Third Year Core Courses

Any four of the courses below, including one or both of MAM3010F and MAM3011F

Code	Course	NQF Credits	NQF Level
MAM3010F	Metric Spaces (3MS)	18	7
MAM3011F	Modern Abstract Algebra (3AL)	18	7
MAM3012F/S	Discrete Mathematics (3DM)	18	7
MAM3013S	Topics in Algebra (3TA)	18	7
MAM3014S	Topics in Analysis (3TN)	18	7
MAM3015F/S	Complex Analysis (3CA)	18	7

Major in Ocean & Atmosphere Science [SEA03]

Students who major in Ocean & Atmosphere Science and wish to progress to Ocean & Atmosphere Science Honours are strongly recommended to complete both STA2007F/S/H and CSC1015F/S

First Year Core Courses

Code	Course	NQF Credits	NQF Level
GEO1009F	Intro to Earth & Environmental Sciences	18	5
CEM1000W	Chemistry 1000	36	5
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
or			
*MAM1004F	Mathematics 1004	18	5
and one of:			
STA1000F/S	Introductory Statistics	18	5
or			
STA1007S	Introductory Statistics for Scientists	18	5
PHY1031F	General Physics A (or equivalent)	18	5

Note: *MAM1004F/S can be replaced by MAM1031F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
SEA2004F	Principles of Oceanography	24	6
SEA2005S	Marine Systems	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
SEA3004F	Ocean & Atmosphere Dynamics	36	7
EGS3012S	Atmospheric Science	36	7

Major in Physics
[PHY01]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
Either			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5
PHY1004W	Matter and Interactions	36	5
Recommended:			
MAM1043H	Modelling & Applied Computing	18	5
and			
MAM1044H	Dynamics	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
MAM2010F	Advanced Calculus (2AC)	12	6
MAM2011F	Linear Algebra (2LA)	12	6
and two of			
MAM2012S	Differential Equations (2DE)	12	6
MAM2013S	Introductory Algebra (2IA)	12	6
MAM2014S	Real Analysis (2RA)	12	6
or			
MAM2010F	Advanced Calculus (2AC)	12	6
and			
MAM2011F	Linear Algebra (2LA)	12	6
combined with			
MAM2040F	Ordinary Differential Equations (2OD)	12	6
and one of			
MAM2041F	Numerical Analysis (2NA)	12	6
MAM2042S	Non-linear Dynamics (2ND)	12	6
MAM2043S	Boundary-Value Problems (2BP)	12	6
and			
PHY2004W	Intermediate Physics	48	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
PHY3004W	Advanced Physics	72	7

Major in Quantitative Biology
[BIO13]

First Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO1000F	Cell Biology	18	5
BIO1004S	Biological Diversity	18	5
STA100xF/S	Any 1000-level Science STA course	18	5
Either			

Code	Course	NQF Credits	NQF Level
*MAM1004F	Mathematics 1004	18	5
and			
MAM1008S	Introduction to Discrete Mathematics	18	5
or			
MAM1000W	Mathematics 1000	36	5
or both			
MAM1031F	Mathematics 1031	18	5
and			
MAM1032S	Mathematics 1032	18	5

Note: *MAM1004F/S can be replaced by MAM1031F

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO2014F	Principles of Ecology & Evolution	24	6
One of:			
BIO2015F/S	Vertebrate Diversity & Functional Biology	24	6
BIO2016S	Invertebrate Diversity & Functional Biology	24	6
BIO2017F/S	Plant Diversity & Functional Biology	24	6
Either			
*MAM2040F	Ordinary Differential Equations (2OD)	12	6
*MAM2041F	Numerical Analysis (2NA)	12	6
*MAM2042S	Non-linear Dynamics (2ND)	12	6
and			
*MAM2043S	Boundary-Value Problems (2BP)	12	6
or			
*STA20xxF/S/H	Any 2000-level Science STA course	24	6

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
BIO3019S	Quantitative Biology	36	7
Either			
*MAM304xF/S	Any two 3000-level Applied MAM courses	36	7
or			
*STA30xxF/S	Any 3000-level Science STA course	36	7

** Note: Registration for these courses is conditional on pre-requisites having been met, and this should be checked.*

Major in Statistics & Data Science
[STA13]

Students will need to choose between the Mathematical and Applied Statistics streams. Only one of the STA01, STA02, STA13 majors can be taken towards the BSc degree.

First Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC1015F/S	Computer Science 1015	18	5
CSC1016S	Computer Science 1016	18	5
MAM1031F	Mathematics 1031 (or equivalent)	18	5
MAM1032S	Mathematics 1032 (or equivalent)	18	5
STA100xF/S	Any 1000-level Science STA course	18	5

Second Year Core Courses

Code	Course	NQF Credits	NQF Level
CSC2001F	Computer Science 2001	24	6
CSC2002S	Computer Science 2002	24	6
or			
CSC2042S	Introduction to AI 2: Machine Learning	24	6
MAM2010F	Advanced Calculus (2AC)*	12	6
MAM2011F	Linear Algebra (2LA)*	12	6
STA2004F	Statistical Theory & Inference	24	6
or			
STA2030S	Statistical Theory	24	6
One of:			
STA2005S	Linear Models	24	6
STA2007F/S	Study Design & Data Analysis for Scientists	24	6
STA2020F/S	Applied Statistics	24	6

* *MAM2012S/MAM2013S/MAM2014S highly recommended*

Third Year Core Courses

Code	Course	NQF Credits	NQF Level
STA3030F	Statistical Inference & Modelling	36	7
or			
STA3041F	Markov Processes & Time Series	36	7
One of:			
STA3022F	Applied Multivariate Data Analysis	36	7
STA3036S	Operational Research Techniques	36	7
STA3043S	Statistical Modelling, Machine Learning & Bayesian Analysis	36	7

Note: Registration for these courses is conditional on pre-requisites having been met

Distinction

The Bachelor of Science (BSc) degree may be awarded with distinction, and with distinction in one or more majors.

FB8.1

(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 Mathematics:	MAM2046W or (MAM2040F, MAM2041F, MAM2042S and MAM2043S) and MAM3040W or any four of MAM3042F/S, MAM3043F/S, MAM3044F/S, MAM3045F/S and MAM3046F/S)
Applied Statistics:	STA2007H/STA2020S, STA2030S,STA3030F, STA3022F/STA3036S
Archaeology:	Four senior half-courses in Archaeology
Artificial Intelligence:	CSC2041F, CSC2042S, three of (CSC3041F, CSC3042F, CSC3043S, CSC3044S)
Astrophysics:	AST2002H, AST2003H, AST3002F, AST3003S

Biochemistry:	MCB2021F, MCB2022S, MCB3024S, MCB3025F
Biology:	BIO2014F, any one of BIO2015F/S, BIO2016S and BIO2017F/S; any two of BIO3013F, BIO3014S, BIO3018F and BIO3019S
Business Computing:	INF2009F, INF2011S; any two of INF3011F, INF3012S and INF3014F
Chemistry:	CEM2005W, CEM3005W
Computer Engineering:	EEE2049W (or EEE2041F and EEE2042S), EEE2050F, EEE3095S, CSC3022F
Computer Science:	CSC2001F, CSC2002S, CSC3002F, CSC3003S
Environmental & Geographical Science:	EGS2013F and EGS2015S; any two of EGS3012S, EGS3020F, EGS3021F, EGS3022S, EGS3023F
Genetics:	MCB2020F, MCB2023S, MCB3023S, MCB3026F
Geology:	GEO2001F, GEO2004S, GEO3005F, GEO3001S
Human Anatomy & Physiology:	HUB2019F, HUB2021S, HUB3006F, HUB3007S
Marine Biology:	Any one of BIO2014F, BIO2015F/S, BIO2016S and BIO2017F/S; SEA2004F, BIO3002F, BIO3017S
Mathematics:	MAM2000W or (MAM2010F, MAM2011F, MAM2014S and one of (MAM2012S or MAM2013S)) and MAM3000W or (any four of (MAM3010F/S, MAM3011F/S, MAM3012F/S, MAM3014F/S and MAM3015F/S) including at least one of MAM3010F/S and MAM3011F/S)
Mathematical Statistics:	STA2004F, STA2005S, STA3041F, STA3043S
Ocean & Atmosphere Science:	SEA2004F, SEA2005S, SEA3004F, EGS3012S
Physics:	PHY2004W, PHY3004W
Quantitative Biology:	Any one of BIO2014F, BIO2015F/S, BIO2016S and BIO2017F/S; STA20xxF/S or MAM2046W; BIO3019S; STA30xxF/S or MAM3040W
Statistics & Data Science	STA2004F, STA2005S, STA2007F/S, STA2020F/S, STA2030S, STA3022F, STA3030F, STA3036S, STA3041F, STA3043S

(b) If a student obtains a first and an upper second class in two 24 credit courses at second-year level listed in (a) above, the marks obtained in these 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 courses. The same applies at the third-year level, but with two 36 credit courses.

Similarly, if a student obtains firsts and upper seconds in four 12 credit courses at second-year level listed in (a) above, the marks obtained in these 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 all these courses.

(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).

FB8.2 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 264 credits, including at least 192 senior credits or obtain an aggregate of at least 75% for each of six 18 credit courses, six 24 credit courses and four 36 credit 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.

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

Admission

FH1 A person shall not be admitted as a candidate for the degree unless they

(a) are a graduate of the Faculty of Science who has been awarded a Bachelor's degree in the discipline in which they propose to proceed to Honours, or have subsequently met the conditions which would have enabled them to be awarded the degree in the Faculty with that subject as a discipline; or

(b) are 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

(c) are 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, they may, with permission of the Head of Department, register as an occasional student to complete preparatory courses. On satisfactory completion of such courses, a candidate 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.

The Bachelor of Science Honours degree (BSc Hons) has a total NQF credit value of 160 at HEQSF level 8.

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

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	SH001EGS07	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	SH001BIO05	Marine Biology
BSc Hons	SH001MAM02	Mathematics
BSc Hons	SH001MCB02	Molecular & Cell Biology
BSc Hons	SH001SEA03	Ocean & Atmosphere Science
BSc Hons	SH001PHY01	Physics
BSc Hons	SH001STA13	Statistics & Data Science

Refer to the appropriate Department sections in this handbook for detailed course outlines.

Restriction on registration

FH4 A student may not take any course(s) other than those prescribed by the Honours programme for which they are registered.

Award of the degree

FH5 The degree of BSc Hons may be conferred

(a) 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

(b) subject to both the research project and the balance of the course (class work plus examination) being passed separately with a minimum of 50%.

Curriculum structure for the Bachelor of Science Honours, specialising in Computer Science [CSC05]

Prescribed curriculum

The curriculum comprises three compulsory core courses, at least five elective courses and a research project.

Compulsory (core) courses:

Code	Course	NQF Credits	NQF Level
CSC4019Z	Research and Innovation	16	8
CSC4020Z	Functional Programming	12	8
CSC4021Z	Compilers 1	12	8
CSC4002W	Computer Science Honours Project	60	8

Students must choose 60 credits of elective courses from the remaining Computer Science courses at the Honours level; or electives from other departments (with prior approval of the Honours convener).

Elective courses:

Code	Course	NQF Credits	NQF Level
CSC4007Z	Selected Honours module in Computer Science	12	8
CSC4010Z	Advanced Topics in Computer Science Honours 2	12	8
CSC4013Z	Visualisation	12	8
CSC4022Z	Compilers 2	12	8
CSC4023Z	Big Data Management and Analysis	12	8
CSC4024Z	Human Computer Interaction	12	8
CSC4025Z	Artificial Intelligence	12	8
CSC4026Z	Network and Internetwork Security	12	8
CSC4027Z	Computer Game Design	12	8
CSC4028Z	High Performance Computing	12	8
CSC4029Z	Introduction to Computer Graphics	12	8
STA4026S	Analytics	18	8

The handbook outlining the current year's Honours programme is available from the Department (http://www.cs.uct.ac.za).

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 they

(a) hold an Honours degree or four year equivalent of the University or of any other university recognised by Senate for the purpose; or

(b) are 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 they have reached the current level in the subject or discipline equivalent to an Honours degree; or

(c) have 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 they are

(a) an Honours graduate in the Faculty of Science, or a graduate of another faculty or another university who holds a degree recognised by the Senate as being equivalent to an Honours degree in the Faculty of Science; or

(b) 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 they have 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. 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 (MoU), 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 more detailed 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.

FM3 The Master of Philosophy degree (MPhil) has a total NQF credit value of 180 at HEQSF level 9. This degree may be offered as a full research dissertation of 180 NQF credits; or as a coursework and minor dissertation of 90 NQF credits each; or as a coursework and minor dissertation of 120 NQF credits coursework and 60 NQF credits minor dissertation.

The Master of Science degree (MSc) has a total NQF credit value of 180 at HEQSF level 9. This degree may be offered as a full research dissertation of 180 NQF

credits, or as a coursework and minor dissertation of 90 NQF credits each; or as a coursework and minor dissertation of 120 NQF credits coursework and 60 NQF credits minor dissertation.

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

Qualification	Degree and Plan Code	Specialisations
MSc/MPhil	SM001/2 MAM01	Applied Mathematics
MSc/MPhil	SM001/2 AGE01	Archaeology
MSc/MPhil	SM001/2 AST01	Astronomy
MSc/MPhil	SM001/2 BIO07	Biological Sciences
MSc/MPhil	SM001/2 CEM01	Chemistry
MSc/MPhil	SM001/2 CSC05	Computer Science
MSc/MPhil	SM001/2 CEM03	Computational Science
MSc/MPhil	SM001/2 BIO09	Conservation Biology
MSc/MPhil	SM001/2 EGS02	Environmental & Geographical Science
MSc/MPhil	SM001/2 GEO01	Geochemistry
MSc/MPhil	SM001/2 GEO02	Geology
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	SM001/2 STA03	Operational Research
MSc/MPhil	SM001/2 SEA05	Physical Oceanography
MSc/MPhil	SM001/2 PHY01	Physics
MSc/MPhil	SM001/2 STA09	Statistical Ecology
MSc/MPhil	SM001/2 PHY02	Theoretical Physics
MSc/MPhil	SM001/2 CEM02	Tertiary Chemistry Education
MSc/MPhil	SM001/2 MAM07	Tertiary Mathematics Education
MSc/MPhil	SM001/2 PHY03	Tertiary Physics Education
MSc/MPhil	SM004/5 BIO11	Applied Ocean Sciences (Marine Biology)
MSc/MPhil	SM004/5 SEA07	Applied Ocean Sciences (Operational Oceanography)
MSc/MPhil	SM004/5 CSC08	Artificial Intelligence
MSc/MPhil	SM004/5 AST03	Astrophysics & Space Science
MSc/MPhil	SM004/5 STA10	Biostatistics
MSc/MPhil	SM004/5 EGS06	Climate Change & Sustainable Development
MSc/MPhil	SM004/5 CSC05	Computer Science
MSc/MPhil	SM004/5 BIO09	Conservation Biology
MSc/MPhil	SM004/5 STA11	Data Science
MSc/MPhil	SM004/5 EGS05	Environment, Society & Sustainability
MSc/MPhil	SM004/5 CSC06	Information Technology
MSc/MPhil	SM004/5 STA13	Statistics & Data Science
MSc/MPhil	SM007/8 STA11	Data Science
MSc/MPhil	SM009 MAM06	Mathematical Sciences

Refer to the appropriate Department sections in this handbook for detailed course outlines.

NOTE: SM001/SM002 refers to the MSc/MPhil by full research dissertation (180 NQF credit dissertation).

SM004/SM005 refers to the MSc/MPhil by coursework and minor dissertation (90 NQF credit coursework, 90 NQF credit dissertation).
SM007/SM008/SM009 refers to the MSc/MPhil by coursework and minor dissertation (120 NQF credit coursework, 60 NQF credit dissertation).

Students undertaking any Master's degree by coursework and minor dissertation will register for a 90 NQF credit coursework component followed by a 90 NQF credit minor dissertation component; or a 120 NQF credit coursework component followed by a 60 NQF credit dissertation component.

NOTE: For the coursework component of the Master's degree, where the same course is offered for both the Honours (HEQSF level 8, 4000 level) and Master's (HEQSF level 9, 5000 level) degrees, students must register for the course appropriate to their current qualification level. Students who have completed the 4000-level version of a course are excluded from enrolling on the 5000-level version of the same course and vice versa.

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Computer Science [CSC05]

Prescribed curriculum
The curriculum comprises one compulsory course, at least six elective courses and a minor dissertation.

Compulsory courses:

Code	Course	NQF Credits	NQF Level
CSC5020Z	Research Methods in Computer Science	18	9
CSC5002W	Computer Science Minor Dissertation	90	9

Students must choose 72 credits of elective courses from the remaining Computer Science courses at the Master's level; or electives from other departments (with prior approval of the convener).

Elective courses:

Code	Course	NQF Credits	NQF Level
CSC5008Z	Data Visualisation	12	9
CSC5021Z	Computational Geometry for 3D Printing	12	9
CSC5022Z	Distributed Scientific Computing	12	9
CSC5023Z	Meta-Heuristics	12	9
CSC5024Z	Information Retrieval	12	9
CSC5025Z	Intelligent Systems	12	9
CSC5026Z	Introduction to ICT for Development	12	9
CSC5027Z	Logics for Artificial Intelligence	12	9
CSC5028Z	Ontology Engineering	12	9
CSC5029Z	Introduction to image processing and computer vision	12	9
CSC5030Z	Advanced Topics in Computer Science Masters 1	12	9
CSC5031Z	Advanced Topics in Computer Science Masters 2	12	9
CSC5032Z	Network and Internet Systems	12	9
CSC5033Z	Human Computer Interaction	12	9
CSC5034Z	Machine Learning	12	9
CSC5035Z	Natural Language Processing	12	9
CSC5036Z	Virtual Reality	12	9
CSC5038Z	Artificial Life	12	9
CSC5039Z	Non-Monotonic Reasoning	12	9
CSC5042Z	Natural Language Generation	12	9

With prior approval of the course convenor, students may also take: CSC5012Z MIT Human Computer Interaction (12 credits); CSC5007Z Database Systems (12 credits).

The handbook outlining the current year's Master's programme is available from the Department (http://www.sit.uct.ac.za/).

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Information Technology [CSC06]

Prescribed curriculum
The curriculum comprises eight compulsory courses and a minor dissertation.

The coursework component covers the basic information technology curriculum and is offered online, with no lectures, although students will be required to be in Cape Town for exams. Normally these are completed in one year (four per semester), but students working full-time are advised to take only four modules per year.

Compulsory courses:

Code	Course	NQF Credits	NQF Level
CSC5007Z	Database Systems	12	9
CSC5010Z	MIT: Computer Networks	12	9
CSC5011Z	MIT: Object-Orientated Programming in Python	12	9
CSC5012Z	MIT: Human Computer Interaction	12	9
INF5007Z	Social Issues and Professional Practice	12	9
INF5008Z	Systems security	12	9
INF5009Z	Software Engineering	12	9
CSC5017Z	MIT: Research Methods	12	9

Elective courses:
With the permission of the programme convenor, one elective may be taken in place of CSC5011Z in the case of students with a prior background in python programming. Electives may be selected from the remaining Computer Science courses offered at the Master's level, and in some cases IT-related coursework offered in other departments. Please note that some of these courses may not be offered online.

The dissertation component (CSC5004W or INF5010W) can be started once the coursework is complete. Students should register for the dissertation in the department of their primary supervisor.

Dissertation courses:

Code	Course	NQF Credits	NQF Level
CSC5004W	Information Technology Minor Dissertation	90	9
INF5010W	Information Technology Minor Dissertation	90	9

The handbook outlining the current year's Master's programme is available from the Department (http://www.sit.uct.ac.za/).

Curriculum structure for the Master of Science by coursework and minor dissertation, specialising in Artificial Intelligence (AI) [CSC08]

Prescribed curriculum

The curriculum comprises one compulsory course, at least six elective courses and an AI dissertation (minor dissertation in a research area broadly related to AI).

Compulsory courses:

Code	Course	NQF Credits	NQF Level
CSC5020Z	Research Methods in Computer Science	18	9
CSC5037W	Artificial Intelligence Minor Dissertation	90	9

Students must choose 72 credits of elective courses from the remaining Computer Science courses at the Master's level; or other electives from Computer Science and other departments (with prior approval of the course convener).

Elective courses:

Code	Course	NQF Credits	NQF Level
CSC5023Z	Meta-Heuristics	12	9
CSC5025Z	Intelligent Systems	12	9
CSC5027Z	Logics for Artificial Intelligence	12	9
CSC5028Z	Ontology Engineering	12	9
CSC5029Z	Introduction to Image Processing and Computer Vision	12	9
CSC5030Z	Advanced Topics in Computer Science Masters 1	12	9
CSC5031Z	Advanced Topics in Computer Science Masters 2	12	9
CSC5034Z	Machine Learning	12	9
CSC5035Z	Natural Language Processing	12	9
CSC5036Z	Virtual Reality	12	9
CSC5038Z	Artificial Life	12	9
CSC5039Z	Non-Monotonic Reasoning	12	9
CSC5042Z	Natural Language Generation	12	9

CSC5034Z is a first semester module that is offered as an introductory Machine Learning module and will be recommended for those who have not done CSC3022F or equivalent.

The handbook outlining the current year's Master's programme is available from the Department (http://www.sit.uct.ac.za/).

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Biostatistics [STA10]

The Biostatistics specialization trains students in the more advanced statistical methodology needed for the analysis of data from the Health and Biological Sciences.

Entry Requirements: A mark of at least 65% for an honours degree in Statistics equivalent to the UCT honours degree in Statistical Sciences or a mark of at least 65% for an honours degree in a Biological or Medical discipline that involved a substantial component of quantitative training, as assessed by Head of Statistical Sciences Department, plus successful completion of pre-courses including, introductory calculus, linear algebra and statistical inference, and R programming, as deemed necessary.

Prescribed curriculum
The curriculum comprises four compulsory core courses, elective courses and a minor dissertation.

Compulsory courses:

Code	Course	NQF Credits	NQF Level
STA5063Z	Design of Clinical Trials	15	9
STA5067Z	Longitudinal Data Analysis	15	9
STA5069Z	Multivariate Statistics	15	9
STA5072Z	Survival Analysis	15	9

Students will choose elective courses to bring the total number of coursework credits to a minimum of 90 NQF credits. Students may choose to take electives from other departments with prior approval of the Programme Convener.

Elective courses:

Code	Course	NQF Credits	NQF Level
STA4029Z	Advanced Probability Theory	12	8
STA5061Z	Bayesian Decision Modelling	15	9
STA5064Z	Ecological Statistics	15	9
STA5066Z	Mathematical Modelling for Infectious Diseases	15	9
STA5068Z	Machine Learning	15	9
STA5071Z	Simulation and Optimisation	15	9
STA5073Z	Data Science for Industry	15	9
STA5090Z	Advanced Topics in Regression	15	9
ECO5069S	Applied Time Series Analysis	30	9
ECO5070S	Microeconometrics	30	9
IBS5004Z	Bioinformatics for high-throughput biology	15	9

Students who do not hold a qualification in Statistics at the Honours level will be required to take pre-courses (STA5014Z) before being allowed to register for the degree. These could include Introductory Calculus, Matrix Methods, Introductory Inference and R-programming. They will also be allowed to take honours level courses up to 30 credits.

The minor dissertation component (90 NQF credits) is a research project based on a selected research topic.

Minor dissertation

Code	Course	NQF Credits	NQF Level
STA5058W	Biostatistics Minor dissertation	90	9

Progression Rules:
Students are required to pass modules adding up to 90 credits to qualify for the course work component of the degree.
All core courses must be passed.
Students are allowed to repeat a failed module once.
Students should pass at least 3 modules in their first year of registration to be allowed to continue with the degree.
Students may not progress to elective modules unless they have passed at least 3 core modules.
By the end of their second year of registration, students should have passed at least 4 modules to be allowed to continue with the degree.
Students may take a maximum of three years to complete their coursework requirement.
Students may register for the dissertation components of the degree if they have passed 3 modules. They may, however, not submit their dissertations for examination before they have passed all required modules.

Distinction Rules:
Unless otherwise specified, the degree will be awarded with distinction if the candidate obtains: 75% or higher in the credit-weighted average of coursework marks; marks of 75% or higher for at least 4 modules taken in Statistical Sciences; and a mark of 75% or higher in the dissertation.

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Data Science [STA11]

Refer to page 48 for the details of this course, which are included under the section of interdisciplinary programmes.

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Statistics & Data Science [STA13]

Entry Requirements: A honours degree in Statistics or a four-year Bachelor's degree that includes a substantial research component equivalent to the UCT honours degree in Statistical Sciences with a mark of at least 65% in the 4th year of study at first attempt.

Prescribed curriculum
The curriculum comprises three compulsory core courses, elective courses and a minor dissertation.

Compulsory courses:

Code	Course	NQF Credits	NQF Level
STA5071Z	Simulation and Optimisation	15	9
STA5090Z	Advanced Topics Regression	15	9
STA5069Z	Multivariate Statistics	15	9

Students will choose elective courses to bring the total number of coursework credits to a minimum of 90 NQF credits. Students may choose to take electives from other departments with prior approval of the Programme Convener.

Elective courses:

Code	Course	NQF Credits	NQF Level
STA4027Z	Bayesian Computational Methods	12	8
STA4028Z	Portfolio Theory	12	8
STA4029Z	Advanced Probability Theory	12	8
ECO5069S	Applied Time Series Analysis	30	9
ECO5070S	Microeconometrics	30	9
STA5086Z	Advanced Portfolio Theory	15	9
STA5068Z	Machine Learning	15	9
STA5061Z	Bayesian Decision Modelling	15	9
STA5063Z	Design of Clinical Trials	15	9
STA5064Z	Ecological Statistics	15	9
STA5066Z	Mathematical Modelling for Infectious Diseases	15	9
STA5067Z	Longitudinal Data Analysis	15	9
STA5072Z	Survival Analysis	15	9
STA5073Z	Data Science for Industry	15	9
STA5091Z	Data Analysis for High Frequency Trading	15	9
CSC5007Z	Database Systems	12	9
CSC5008Z	Data Visualisation	12	9
IBS5004Z	Bioinformatics for high-throughput biology	15	9

The minor dissertation component (90 NQF credits) is a research project based on a selected research topic.

Minor dissertation

Code	Course	NQF Credits	NQF Level
STA5004W	Advanced Analytics Minor dissertation	90	9

Progression Rules:
Students are required to pass modules adding up to 90 credits to qualify for the course work component of the degree.
All core courses must be passed.
Students are allowed to repeat a failed module once.
Students should pass at least 3 modules in their first year of registration to be allowed to continue with the degree.
Students may not progress to elective modules unless they have passed at least 3 core modules.
By the end of their second year of registration, students should have passed at least 4 modules to be allowed to continue with the degree.
Students may take a maximum of three years to complete their coursework requirement.
Students may register for the dissertation components of the degree if they have passed 3 modules. They may, however, not submit their dissertations for examination before they have passed all required modules.

Distinction Rules:
Unless otherwise specified, the degree will be awarded with distinction if the candidate obtains: 75% or higher in the credit-weighted average of coursework marks; marks of 75% or higher for at least 4 modules taken in Statistical Sciences; and a mark of 75% or higher in the dissertation.

The Faculty offers the following interdisciplinary Master's programmes. The details of the structure of these curricula are given below.

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Climate Change & Sustainable Development [EGS06]

The **interdisciplinary Master's course with a specialisation in Climate Change & Sustainable Development, offered by the African Climate & Development Initiative (ACDI)**, has the following curriculum structure:

Prescribed curriculum
The curriculum comprises two compulsory core courses, at least two elective courses and a minor dissertation.

Compulsory courses:

Code	Course	NQF Credits	NQF Level
EGS5031F	Introduction to Climate Change & Sustainable Development	23	9
EGS5032F/S	Climate Change Adaptation & Mitigation	23	9

(Refer to the Department of Environmental & Geographical Sciences section in this handbook for detailed course outlines).

Students will choose at least two elective courses, totalling a minimum of 45 NQF credits, chosen from a range of courses which offer the student the opportunity to explore new areas, or look at climate and development through existing disciplinary backgrounds.

Elective courses (A partial list includes):

Code	Course	NQF Credits	NQF Level
ASL5205F	Rethinking Africa's Development	24	9
BIO5003Z	Biodiversity and climate change	15	9
EGS5016F	Capital, Politics and Nature	23	9
EGS5023F	Research Methods for Natural Scientists	23	9
EGS5024F	Managing Complex Human Ecological Systems	23	9
EGS5030S	Climate Modelling	23	9
EGS5038F	Climate Change and Predictability	23	9
EGS5039F	Urban Food Security	23	9
EGS5040F	Topics in Human and Environment Interaction	23	9
EGS5043F	Living with Global Change	23	9
EGS5044F/S	Urban Ecology	23	9
EGS5045F	Geomorphology	23	9
EGS5046F	Water Resource Management	23	9
EGS5047F/S	Policy and Governance	23	9
EGS5056F/S	Imagining Southern Cities	23	9
EGS5058F/S	Bio-economy	23	9
EGS5059S	Environmental Governance	23	9
EGS5066F/S	Geographies of Sexualities	23	9
EGS5067F/S	Air quality	23	9
EGS5068F/S	Disaster Risk Science	23	9
MEC5075Z	New and Renewable Technologies	20	9
MEC5088Z	Energy, Poverty & Development	20	9
PBL5045S	Environmental Law for Non-Lawyers	15	9
PBL5046S	Climate, Law and Governance	15	9

(Details of these courses are available from the ACDI handbook or the relevant Faculty handbook. Additional elective options exist and may be added or withdrawn according to circumstances each year).

NOTE: The code EGS5012W represents the overall coursework component; the overall coursework result will be reflected against this code.

The minor dissertation component (90 NQF credits) is based on a three- to six-month research project, to be submitted at the end of January, with the possibility of extension to June. 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 [Refer to relevant Faculty Handbooks]. Students registering for the dissertation component in a Faculty other than the host Faculty (which administers the course) will be subject to the examination criteria of that Faculty.

Minor dissertation options include:

Code	Course	NQF Credits	NQF Level
ECO5024W	Minor dissertation (Commerce)	90	9
EGS5029H	Minor Dissertation (Science)	90	9
GEO5005H	Minor Dissertation (Science)	90	9
END5069W	Minor Dissertation (Engineering & Built Environment)	90	9

Curriculum structure for the Master of Science/Master of Philosophy by coursework and minor dissertation, specialising in Data Science [STA11]

The interdisciplinary Master's course with a specialisation in Data Science, is offered in collaboration with the Departments of Statistical Sciences, Computer Science, Astronomy, the Computation Biology Group (Faculty of Health Sciences) and the departments of Finance and Tax, Information Systems, Economics and AIFMRM (Commerce Faculty).

Entry requirements: A mark of at least 65% for a HEQSF level 8 qualification (equivalent in standard to that of a UCT degree) in any discipline that included a substantial research component and at least a first year Statistics course and a first year Computing Course. Students may be required to register for and pass STA1000P (the summer term offering of STA1000) before being allowed to register for the degree. Academic transcripts of applicants will be assessed by a selection committee made up of representatives from the participating departments. Applicants may be called for an interview to assess whether they meet entrance requirements.

Prescribed curriculum

The degree has two structures. Student can elect to register for core courses adding to 66 credits, and either elective courses adding to at least 24 credits and a minor dissertation counting 90 credits, or elective courses adding to at least 66 credits and a minor dissertation counting 60 credits.

Compulsory courses:

List from which core courses should be selected subject to meeting entrance requirements and consent of Program convener:

Code	Course	NQF Credits	NQF Level
CSC5007Z	Database Systems	12	9
CSC5008Z	Visualization	12	9
CSC5011Z	MIT: Programming in Python	12	9
STA5068Z	Machine Learning	15	9
STA5071Z	Simulation & Optimization	15	9
STA5075Z	Statistical and High Performance Computing	12	9
STA5076Z	Supervised Learning	18	9
STA5077Z	Unsupervised Learning	12	9
STA5092Z	Exploratory Data Analysis	12	9
STA5073Z	Data Science for Industry	15	9
STA5069Z	Multivariate Analysis	15	9

Elective courses:

Students will choose a minimum of 4 elective courses to bring the total number of elective coursework credits to a minimum of 54 NQF credits. Available electives will depend on staff availability and not all electives will be offered each year. Students may choose to take electives from the list of core courses above, or from the list of elective courses below subject to satisfying the entrance requirements for the chosen courses and consent of course and program convener, or from courses from other departments subject to consent of the programme and course conveners.

Code	Course	NQF Credits	NQF Level
AST5004Z	Data Science for Astronomy	12	9
PHY5007Z	Data Science for Particle Physics	12	9
IBS5004Z	Bioinformatics for high-throughput biology	15	9
STA5061Z	Bayesian Decision Modelling	15	9
STA5073Z	Data Science for Industry	15	9
STA5074Z	Decision Modelling for Prescriptive Analytics	12	9
STA5091Z	Data Analysis for High Frequency Trading	15	9
STA5090Z	Advanced Regression	15	9

Code	Course	NQF Credits	NQF Level
STA5068Z	Machine Learning	15	9
STA5086Z	Advanced Portfolio Theory	15	9
STA5071Z	Simulation & Optimization	15	9
STA5067Z	Longitudinal Data Analysis	15	9
STA5072Z	Survival Analysis	15	9
FTX5040F	South African Financial Markets	15	9
FTX5051S	Risk Management of Financial Instruments	15	9
FTX5028W	Topics in Financial Management	30	9
FTX5043F	Capital Markets and Financial Instruments	30	9
FTX5044H	Empirical Finance	30	9
ECO5037S	Fintech and Cryptocurrencies	24	9
INF5006S	Financial Systems Design	15	9
ECO5069S	Applied Time Series Analysis	30	9
ECO5070S	Microeconomics	30	9
ECO5046F	Advanced Econometrics	30	9
CSC5008Z	Data Visualisation	12	9
CSC5011Z	MIT: Python Program	12	9

The minor dissertation component (90 or 60 NQF credits) is a research project based on a selected research topic. Students may register for a minor dissertation from the available options listed below. Students registering for the dissertation component in a Faculty other than the host Faculty (which administers the course) will be subject to the examination criteria of that Faculty.

Minor dissertation options include:

Code	Course	NQF Credits	NQF Level
AST5005W	Data Science in Astronomy	90	9
IBS5005W	Data Science in Bioinformatics	90	9
CSC5009W	Data Science in Computer Science	90	9
PHY5008W	Data Science in Physics	90	9
STA5079W	Data Science in Statistical Sciences	90	9
FTX5003W	Minor Dissertation in Finance	90	9
INF5005W	Minor Dissertation in IS	90	9
FTX5029W	Minor Dissertation in Financial Management	60	9
ECO5023W	Minor Dissertation	60	9
STA5093W	Data Science Minor Dissertation	60	9

Progression Rules:

Students are required to pass courses adding up to 90/120 credits to qualify for the course work component of the degree.
All core courses must be passed.
Students are allowed to repeat a failed course once.
Students should pass at least 3 courses in their first year of registration to be allowed to continue with the degree.
Students may not progress to elective courses unless they have passed at least 3 core courses.
By the end of their second year of registration, students should have passed at least 4 courses to be allowed to continue with the degree.
Students may take a maximum of three years to complete their coursework requirement.
Students may register for the dissertation components of the degree if they have passed 3 courses. They may, however, not submit their dissertations for examination before they have passed all required courses.

Distinction Rules:
Unless otherwise specified, the degree will be awarded with distinction if the candidate obtains: 75% or higher in the credit-weighted average of coursework marks; marks of 75% or higher for at least 4 modules in Statistical Sciences or Computer Science; and a mark of 75% or higher in the dissertation.

Rules for the degree of Master of Philosophy/Science continued

Registration and candidacy

FM4 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.

Part-time studies

FM5 On the recommendation of the Head of Department, Senate may permit a candidate who is unable to complete the course within the minimum period, to complete the course 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

FM6 The Senate may accept, in lieu of, part or all of the required 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 of Cape Town is assured.

Guidelines for candidates
Prior to registration the candidate must complete the Memorandum of Understanding (MoU) to be agreed in the first year of registration by both supervisor(s) and candidate, clarifying issues relating to respective roles and responsibilities, frequency of access to supervisor, sabbatical leave planned by supervisor, timing of annual leave by supervisor and student, expected working hours for student, timeframes, funding (if appropriate) and intellectual property. It is essential that students and supervisors apply their minds carefully to proposed timelines, skills, equipment and resources required to achieve the goals stated in the research proposal. The MoU is subject to approval by the Head of Department and Dean. Before the start of the second and subsequent years of registration, a Progress & Planned Activity (PPA) form needs to be completed and agreed by both the candidate and supervisor(s). This process represents an annual review of progress and should be seen as an extension to the initial MoU. If in the opinion of the supervisor, adequate progress is not being made the PPA form should clearly lay down criteria (such as submission dates and milestones) against which further progress shall be measured.

In November of each year supervisors are required to provide the Faculty Examinations Committee (FEC) with a statement as to the progress (satisfactory or unsatisfactory) of their Master's and PhD students. Progress is relative to the stated objectives within the MoU or PPA and takes into consideration factors that may have impeded progress that are not within the control of either the student or supervisor. In all cases where progress is considered to be unsatisfactory, despite mitigating factors, the student will be given a chance to respond and appeal against the supervisor's statement. The FEC will deliberate on the report submitted by the supervisor together with the response from the student, as well as the MoU or PPA.

If the appeal is upheld, the student will be allowed to reregister and will be assigned a progress of *'FEC concession to continue'*. A new PPA form will be required to be completed with the supervisor, before registration, in which the objectives for the following year are clearly stipulated.

If the student's 'unsatisfactory' progress is upheld by the FEC, the student will be coded *'academically ineligible to continue'* and may not reregister. Appeals against this decision can be submitted to the Vice Chancellor's nominee via the Deputy Registrar by research students, or to the Faculty Readmission Appeals Committee (RAC) by students registered for the coursework component of a Master's degree.

The student may decide not to continue with their studies in which case they must complete a 'Cancellation of Registration' form and submit it to the Faculty Office for processing.

In select circumstances, the FEC may award a probation period to a student until reregistration commences. The student will be assigned a *'status pending final FEC decision'*. The student will be informed of this decision in writing and will be required to immediately meet with the supervisor(s) and prepare a new PPA form within a specified period. Here the student and supervisor must devise a new work schedule for the stated period during which clear objectives must be agreed upon for reassessment of progress. At the end of this probation period the supervisor will again be required to provide the FEC with a statement as to the progress (satisfactory or unsatisfactory) of the student. Should the progress during this "pending" period be satisfactory, the student will be assigned the progress of *'FEC concession to continue'* and will be allowed to reregister for that year. If progress is again considered to be unsatisfactory and the FEC supports this decision, then the student will be coded as *'academically ineligible to continue'* and will not be permitted to register. Students have the right to appeal this decision if there are relevant extenuating circumstances that might have impeded progress. Appeals against this decision can be submitted to the Vice Chancellor's nominee via the Deputy Registrar by research students, or to the Faculty Readmission Appeals Committee (RAC) by students registered for the coursework component of a Master's degree.

In appropriate cases, the supervisor(s) and Head may propose to Faculty that a candidate's registration be converted to a PhD. This should take place at the end of the first year/beginning of the second year of MSc/MPhil registration.

The dissertation

FM7.1 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 Student Information Handbook).

FM7.2

(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.

FM7.3 A candidate required to submit a dissertation shall:

(a) Inform the Head of Department and Faculty Office of his or her intention to submit the dissertation for examination within 6-8 weeks of the intended submission date.

(b) Submit for examination a digital copy in the format specified. It is recommended that the dissertation be submitted for examination five months before the graduation ceremony to allow time for the examination process to run its course. The University does not however undertake to reach a decision on the award of the degree by any specific date. Should an examiner/s request a hard copy, the candidate will be asked to provide this to the Faculty Office.

(c) Submit a digital copy of the final corrected version of the dissertation in the format specified, for the Library.

NOTE: 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 constitutes 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 30 000 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. Minor dissertations completed as part of a Master's by coursework and minor dissertation should be shorter than full dissertations; on the order of 50 pages or 17, 000 – 25,000 words. For further details, refer to the "Faculty Postgraduate Student Information Handbook", section 12, *Submission of a dissertation/thesis*.

A candidate who contemplates including published papers in their 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. If a candidate contemplates doing this, they must note this in their MoU with their supervisor each year. In addition, the candidate and supervisor are advised to seek the advice of the Faculty's Higher Degrees Committee about their plan to do so at an early stage. A request to include publications in a dissertation should generally include the following:

1. Title of dissertation.
2. A brief overview of the dissertation structure (it must include a general introduction and a discussion chapter that pulls the various chapters in the dissertation together).
3. A list of publications that will be included as self-standing chapters, with the authors, title and journal information, together with a comment on the student's contribution to each article.
4. Declaration from each co-author and supervisor(s) that they agree that the article may be included in the dissertation, and what their individual contributions were.
5. Declaration from any student co-author that the work will not be used for their higher degree purposes.

Award of the degree

FM8.1 The degree of MSc/MPhil may be conferred

(a) after acceptance by the 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). The dissertation must be presented for formal examination;
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). The coursework and minor dissertation must each be passed separately for the award of the degree. The minor dissertation must be presented for formal examination.

FM8.2 The degree may be awarded with distinction. In the case of a Master's by coursework and minor dissertation, a distinction must be obtained in both components for the award of the degree with distinction. Where this is not achieved, a distinction may be awarded and recorded in one of the components.
Where the coursework requires registration for individual courses, the following distinction rules apply: Unless otherwise specified, the Master's degree will be awarded with distinction if the candidate obtains: 75% or higher in the credit-weighted average of coursework marks; marks of 75% or higher in at least 75% of the coursework credits; and a mark of 75% or higher in the dissertation.

FM8.3 Supplementary examinations are not awarded to candidates for the degree of Master.

Rules for the degree of Doctor of Philosophy (PhD)

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 their thesis for examination, they must inform the Doctoral Degrees Board (DDB) Office in writing of their intention to do so 6-8 weeks prior to the intended submission date. It is recommended that the thesis be submitted for examination five months before the graduation ceremony to allow time for the examination process to run its course. 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 DDB 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 DDB for approval. For further details, refer to the "Faculty Postgraduate Student Information Handbook", section 12, *Submission of a dissertation/thesis*.

A candidate who contemplates including published papers in their 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 DDB or Faculty Office. If a candidate contemplates doing this, they must note this in their MoU with their supervisor each year. In addition, the candidate and supervisor are advised to seek the advice of the Faculty's Higher Degrees Committee about their plan to do so at an early stage. While the Faculty committee will not be able to give a binding answer, it will be able to indicate to the candidate and their supervisor whether:

• It is likely to support the proposal. Where published papers are included, the thesis must nonetheless show acceptable academic style, scholarly content and coherence as a connected account with a satisfactory introduction, statement of thesis and conclusion.

• It is unlikely to support submission according to the plan outlined. A binding decision can only be given by the DDB. It is accepted that this may not be possible until sometime into the work.

A request to include publications in a thesis should generally include the following:

1. Title of thesis.
2. A brief overview of the thesis structure (it must include a general introduction and a discussion chapter that pulls the various chapters in the thesis together).
3. A list of publications that will be included as self-standing chapters, with the authors, title and journal information, together with a comment on the student's contribution to each article.
4. Declaration from each co-author and supervisor(s) that they agree that the article may be included in the thesis, and what their individual contributions were.
5. Declaration from any student co-author that the work will not be used for their higher degree purposes.

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

Qualification	Degree and Plan Code	Specialisations
PhD	SD001MAM01	Applied Mathematics
PhD	SD001AGE01	Archaeology
PhD	SD001AST01	Astronomy
PhD	SD001BIO07	Biological Sciences
PhD	SD001CEM01	Chemistry
PhD	SD001CSC05	Computer Science
PhD	SD001CEM03	Computational Science
PhD	SD001BIO09	Conservation Biology
PhD	SD001EGS02	Environmental & Geographical Science
PhD	SD001GEO01	Geochemistry
PhD	SD001GEO02	Geology
PhD	SD001MAM02	Mathematics
PhD	SD001MCB02	Molecular & Cell Biology
PhD	SD001SEA03	Ocean & Atmosphere Science
PhD	SD001PHY01	Physics
PhD	SD001STA09	Statistical Ecology
PhD	SD001STA04	Statistical Sciences
PhD	SD001CEM02	Tertiary Chemistry Education
PhD	SD001MAM07	Tertairy Mathematics Education
PhD	SD001PHY03	Tertiary Physics Education

Refer to the appropriate Department sections in this handbook for detailed course outlines.

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 they have 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 their fitness for the degree;

(c) must submit a formal application and register for the degree, should the Faculty Committee of Assessors accept the nomination.

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 themself 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 the publications they wish 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 constitutes a substantial, original and important contribution to learning in some branch of science in the sense that*
   (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.*

DEPARTMENTS IN THE FACULTY

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.

Associate Professor and Head of Department:
D D Stynder, MA PhD *Cape Town*
Professor and South African Research Chair in Stable Isotopes in Archaeology and Paleo-environmental Studies:
J C Sealy, MSc PhD *Cape Town*
Senior Scholars:
S L Hall, MA *Witwatersrand* DPhil *Stell*
J E Parkington, MA PhD *Cantab*
Professor:
R R Ackermann, MA *Arizona* PhD *Wash U St Louis*
Adjunct Professor:
S Chirikure, MA PhD *UCL*
Associate Professor:
A Esterhuysen PhD *Witwatersrand* HdipEd *U South Africa*
Senior Lecturers:
V J Hare, MSc PhD *Oxford*
Y Sahle, MA *Addis Ababa* PhD *Cape Town*
Lecturer:
V Lupuwana, MA PhD *Cape Town*
Senior Research Officer:
J Luyt, MSc PhD *Cape Town*
Chief Scientific Officer:
L Hutten, BSc Hons MSc *Pret*
Administrative Officer:
L J Cable
Laboratory Assistant:
M Januarie
Departmental Assistant:
M Kanye

RESEARCH IN ARCHAEOLOGY
The Department of Archaeology investigates how people have changed through time, in order to gain insight into why we are the way we are today. We study the cultural and biological records of the past and present in order to do this. South Africa is endowed with a rich and unique archaeological, fossil and ethnographic record, giving us considerable advantage in this respect. Within this broad theme, our researchers are especially interested in the dynamics of human change over the Quaternary Period, and indeed change, process, innovation, complexity, and adaptation are core ideas that thread throughout all of our work. This time period spans a large part of our evolutionary history, and incorporates the record of early ape-like hominins, the first members of our genus *Homo*, modern human origins, hunter-gatherer societies, farming communities, and colonists. Our specific areas of focus include but are not limited to: technological change and innovation; study of past diets and environments; understanding and reconstructing palaeoecology, the dynamics of complex social landscapes; evolutionary process and the shaping of diversity.

Undergraduate Courses

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

First-Year Courses

AGE1002S THE HUMAN PLANET: PREHISTORY TO PRESENT
18 NQF credits at NQF level 5
Convener: Dr V J Hare
Course entry requirements: None
Course outline:
This aim of this course is to introduce the study of archaeology, and the study of human origins. Archaeology is defined as the study of the human past through material culture. Over the second semester, this course presents an overview of prehistory leading up to the modern day, as well as the broader climatic, geographic, ecological, social, and cultural contexts which made modern humans. In particular, it looks at the past through the lens of what people leave behind - the archaeological record.
What you can expect to take away from this course:
•A broad understanding of the timescales of human prehistory, and our interactions with the Earth System, from the Early Pleistocene through to the Historical period, and the emergence of present day societies (the "Anthropocene").
•An understanding of current concepts in archaeological thought, and the complexities of relationships between archaeologists, science, and society today.
•Familiarity with the foundational skills and terminology necessary for present-day archaeological research and investigation.
This broad course is suitable for all undergraduate students in the sciences and humanities; but particularly for those wishing to major in Archaeology, Environmental & Geographical Science, or cognate subjects.
Lecture times: Monday - Thursday, 5th period
DP requirements: Attendance at lectures and tutorials and completion of assignments.
Assessment: Assignments and class tests count 50% towards the final mark and one 3-hour examination written in November counts 50%. A sub-minimum of 40% is required for the examination.

AGE1005L TOWARDS A DECOLONISED SCIENCE IN SOUTH AFRICA
(offered during winter term)
18 NQF credits at NQF level 5
Convener: Professor R Ackermann
Course outline:
This course addresses some key topics relevant to the decolonization of science in South Africa. Course objectives are as follows: (1) to contrast the science behind human diversity (e.g. skin colour variation, sex) with socially-constructed categories (e.g. race, gender binary); (2) to demonstrate how the history of racism and gender bias has limited the focus of scientific enquiry; (3) to highlight the importance of diversity and diverse voices in the production of scientific knowledge, (4) to show how African voices in particular have shaped and are continuing to shape the trajectory of science. The approach is a blended learning environment which combines online lectures, tutorials, tasks, and assessments. Guests both within UCT and from further afield will be brought in to supplement material through lectures, interviews and/or short case studies.
Assessment: Class participation (workshops/tutorials and online discussions) 20%, online tests 20%, final exam 30%, final project 30%. NOTE: The allocation of 30% to the final exam breaks with the traditional 50% threshold. Given the format and intense interactive nature of the courses, the decision has been made that a large component of student assessment should be a course project

which allows them to engage with and reflect on their changing understanding of decolonisation and race in the course. This project will be equal weight to the exam, and will be externally examined.

Second-Year Courses

AGE2011S HUMAN EVOLUTION

24 NQF credits at NQF level 6
Convener: Professor R Ackermann
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 human evolution, showing how fossil skeletons and artefacts are interpreted in terms of human behaviour and evolutionary processes. We also consider genetic and other comparative evidence that are increasingly providing insight into the origin of our lineage. We answer questions such as: Why did our ancestors evolve in Africa? How did we evolve such large and complex brains? What advantage does bipedalism provide? When do humans begin to make tools? Why is human skin colour so variable? What makes humans unique? The syllabus for AGE2011S includes practical sessions for the study of primate and human, fossil and recent skeletal material and the artefacts associated with our ancestors.
Lecture times: Monday - Thursday, 3rd period, Practicals: One 2-hour practical per week, at times to be arranged
DP requirements: Attendance at lectures and practicals and completion of assignments.
Assessment: Assignments and tests count 50%; one 3-hour examination in October/November counts 50%. A sub-minimum of 40% is required for the examination.

AGE2012F THE FIRST PEOPLE

24 NQF credits at NQF level 6
Convener: Dr Y Sahle
Course entry requirements: Any first-year Science course; or any one of AXL1400F (was SAN1015F,) or AGE1002S or equivalent first-year semesters; or AGE2011S; or any first-year Humanities course from cognate disciplines such as Anthropology, Historical Studies, Sociology; or by permission of the Head of Department.
Course outline:
All humans living today have a common African origin. The first humans were hunter-gatherers, as were their descendants. Indeed, our ancestors were hunter-gatherers for at least 99% of our evolutionary history, which means that our physical, psychological and social selves have been shaped by this way of life. We learn about the origin and evolution of our hunter-gatherer ancestors from genetic, fossil, archaeological and ethnographic evidence. Studies of Khoesan peoples of southern Africa have contributed significantly to our understanding of such societies. In this course we focus on the hunter-gatherer way of life over the past few hundreds of thousands of years. Specific topics covered include modern human origins, the Middle and Later Stone Age, ethnographic studies of Khoesan, the origins of pastoralism, coastal vs. arid environment adaptations, rock art and symbolic interpretation, genetics and biology, revisionism, and contemporary socio-politics and identity. In the weekly practical sessions, students will conduct hands-on, problem-solving exercises with archaeological materials.
Lecture times: Monday - Thursday, 3rd period, 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 a one-day museum trip.
Assessment: Assignments and practical tests count 50% towards the final mark and one 3-hour examination written in June counts 50%. A sub-minimum of 40% is required for the examination.

Third-Year Courses

AGE3006H DIRECTED READING & RESEARCH

36 NQF credits at NQF level 7
Course entry requirements: Only 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.
Lecture times: By arrangement
DP requirements: Completion of assignments.
Assessment: Assignments count 20%; a long paper counts 40%; one 3-hour examination in November counts 40%.

AGE3011F THE ROOTS OF RECENT AFRICAN IDENTITIES

36 NQF credits at NQF level 7
Convener: Associate Professor A Esterhuysen
Course entry requirements: AGE2011S or AGE2012F, or by permission of the Head of Department.
Course outline:
In this course we explore the history of Africa's people over the past 2000 years with special reference to southern Africa. Why are southern African populations so diverse? What lies behind the linguistic map that we see today? What social, technological and palaeoenvironmental systems shaped the evolution of societies? Did Africa have any civilisations? Who did Africa interact with? We discuss the archaeological record of artefacts, settlement systems, food waste, environmental contexts and human skeletons. We deploy historical, material science, molecular science, anthropological and palaeoclimatic techniques to explore this rich and diverse heritage of the last two thousand years.
Lecture times: Monday - Thursday, 4th period, Practicals: One 2-hour practical per week, at times to be arranged
DP requirements: Attendance at lectures and practicals, completion of assignments.
Assessment: Assignments and class tests count 50% towards the final mark and one 3-hour examination written in June counts 50%. A sub-minimum of 40% is required for the examination.

AGE3012S ARCHAEOLOGIES OF DOMINANCE AND RESISTANCE IN THE LAST-500 YEARS

36 NQF credits at NQF level 7
Convener: Dr V Lupuwana
Course entry requirements: AGE2011S or AGE2012F, or by permission of the Head of Department.
Course outline:
The period of the last-500 years greatly impacted the social lives and economies of indigenous communities in southern Africa. Preceding this period, the importance of the African continent and its products had led to increased movements and travel from both the East and the West, and from the 16th century, these movements and trade routes led to the trade in African people and increased interest in the exploitation of resources and labour on the continent. This period of interaction, domination and colonisation led to the development of new orders of power, control and trade, greatly impacting indigenous societies who were subjected to slavery, genocide and eventually, apartheid. In this course, we explore the impact of these interactions and the subsequent influence and impact of the creation of a European diaspora in southern Africa. We explore the concept of frontier as a central theme that impacts racial, gender and social relations. While being a period of intense contestation and competition for resources, this is also a period of indigenous agency and resistance. In order to examine these relations, this course explores the archaeological evidence,

written sources and oral history to understand the multiple lived experiences and perspectives emblematic of the period.
Lecture times: Monday - Thursday, 4th period, Practicals: One 2-hour practical per week, at times to be arranged
DP requirements: Attendance at lectures and practicals, completion of assignments.
Assessment: Assignments and class tests count 50% towards the final mark and one 3-hour exam written in November counts 50%. A sub-minimum of 40% is required for the examination.

AGE3013H ARCHAEOLOGY IN PRACTICE
Please note that this course requires you to make yourselves available for field excursions during the first (March/April) and second (June/July) vacations of the academic year. While the majority of field excursions are likely to be day trips, there will be a four-week residential field-school during the second vacation. It is mandatory to participate fully in all field excursions.
36 NQF credits at NQF level 7
Convener: Associate Professor D Stynder
Course entry requirements: AGE2011S and AGE2012F, or by permission of the Head of Department.
Course outline:
The course will run throughout the academic year. The lecture programme (campus and field) will be flexible and a schedule will be decided upon in consultation with participating students. The curriculum covers 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, spread sheet use, preliminary conservation and accessioning of materials, preliminary analyses and report writing.
DP requirements: Participation in all field excursions and completion of all assignments.
Assessment: Assignments 30%; Research paper 20%; Practical examination 25%; Theory examination 25%.

Postgraduate Courses

AGE4000W ARCHAEOLOGY HONOURS
Since the code AGE4000W will not carry a NQF credit value, students will be concurrently registered for AGE4003W (coursework component of 112 NQF credits) and AGE4004W (research project of 48 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Dr Y Sahle
Course entry requirements: A Bachelor's 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 fieldwork 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 participate in two weeks of fieldwork.
Assessment: On average the course work component counts 70% (this includes 50% from final examinations) and the research project counts 30%. A sub-minimum of 50% is required for the research project. These component parts of the course will be combined in a final overall mark which will be reflected against the course code AGE4000W, with PA (pass) entered against the

coursework and project codes; each of these components must be passed separately for the award of the degree.

AGE4001W ARCHAEOLOGY & ENVIRONMENTAL SCIENCE HONOURS

Since the code AGE4001W will not carry a NQF credit value, students will be concurrently registered for AGE4005W (coursework component of 112 NQF credits) and AGE4006W (research project of 48 NQF credits).

160 NQF credits at NQF level 8; the combined credit value of both components.

Convener: Dr Y Sahle

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 palaeoenvironmental 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 the course work component counts 70% (this includes 50% from final examinations) and the research project counts 30%. A sub-minimum of 50% is required for the research project. These component parts of the course will be combined in a final overall mark which will be reflected against the course code AGE4001W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

AGE5000W ARCHAEOLOGY DISSERTATION

180 NQF credits at NQF 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.

AGE6000W ARCHAEOLOGY THESIS

360 NQF credits at NQF 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.

DEPARTMENT OF ASTRONOMY

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

Associate Professor and Head of Department:
S-L Blyth, MSc PhD *Cape Town*
SKA South African Research Chair in Multi-wavelength Extragalactic Astronomy:
D J Pisano, MSc PhD *Madison*
SALT South African Research Chair in Fast Transients and Gravitational Wave Counterparts:
P J Groot, MSc PhD *Amsterdam*
Emeritus Professors:
C. Carignan, MSc *Montréal* PhD *Canberra* MASSAf
R C Kraan-Korteweg, Diplom (MSc) *Basle* PhD Phil II *Basle* FRSSAf, MASSAf
R Taylor, MSc PhD *Vancouver*
Honorary Professors:
W J G de Blok, MSc PhD *Groningen*
M. Vaccari, MSc PhD *Padova*
P A Whitelock, DIC PhD *London* Hon FRAS FRSSAf MASSAf
SKA Visiting Professor:
R Fender, PhD *OU Milton Keynes*
Professor:
P A Woudt, MSc *Groningen* PhD *Cape Town* MASSAf
Adjunct Associate Professor:
V McBride, MSc *Cape Town* PhD *Soton*
Senior Lecturers:
L Marchetti, MSc PhD *Padova*
I Monageng, MSc PhD *Cape Town*
Adjunct Senior Lecturer:
B Frank, PhD *Cape Town*
Lecturer:
J Delhaize, PhD *Perth*
Adjunct Lecturer:
M Mogotsi, MSc PhD *Cape Town*
Honorary Research Associates:
D A H Buckley, MSc *Canterbury* PhD *Canberra*
R Skelton, MSc *Cape Town* PhD *Heidelberg*
Computer System Manager:
S Funani
Technical Officer:
B Yotti
Administrative Officer:

NASSP Administrator:
R Fagodien
Administrative Assistant:
R Daniels

INTER-UNIVERSITY INSTITUTE FOR DATA INTENSIVE ASTRONOMY (IDIA)
The Institute, hosted in the Department of Astronomy, is a partnership between the University of Cape Town, the University of the Western Cape, and the University of Pretoria in close collaboration with the South African Radio Astronomy Observatory (SARAO). It involves

researchers in astronomy, physics, statistics and computer science at the four partner institutes and the UCT eResearch Centre. The Institute also houses the UCT-IDIA Visualisation Lab.

Director (Acting):
P A Woudt, MSc *Groningen* PhD *Cape Town* MASSAf
Associate Director:
R Simmonds (UCT CSC), PhD *Bath*
Operations Manager:
J Smith, MSc *Cape Town*
Project Manager:
K Kirkham, MSc *York* MPhil *Cape Town*
Senior Visualisation Developer:
A Comrie, PhD *Cape Town*
Visualisation Developer:
A Pinska, MSc *Cape Town*
Senior Data Scientist:
D Aikema, PhD *Calgary*
Senior Technical Specialists:
J-E Avenant
M Currin
Senior Technical Specialist Bioinformatics Support:
D Kennedy
Astronomy Support:
W Silima, MSc *Cape Town*
Data Analyst:
R Diretse
Administrative Manager:
N Walker

The overarching goal of IDIA is to build within the South African university research community the capacity and expertise in data intensive research to enable global leadership on MeerKAT large survey science projects and large projects on other SKA pathfinder telescopes, leading to leadership on SKA phase 1 Key Science programs. One of the first elements to reach this goal was for IDIA to set up a data-intensive research cloud facility to service its scientific community. Currently, IDIA is the primary platform to service five out of eight MeerKAT large survey projects.

For more information on IDIA and its activities, see https://www.idia.ac.za

RESEARCH IN ASTRONOMY
Research at the Astronomy Department covers a number of distinct themes, ranging from *Galactic Composition and Stellar Evolution* (Professor Whitelock) and *Accretion Physics in Compact Stellar Binaries* (Professors Woudt, Groot, and Fender, Adjunct Associate Professor McBride and Dr Monageng) to *Neutral Hydrogen and Dark Matter Content of Nearby Galaxies* (Professors Jarrett, de Blok, Pisano, Associate Professor Blyth and Dr Delhaize), *Star Formation and Galaxy Evolution* (Professors Kraan-Korteweg, Bershady, Pisano, Vaisanen, Associate Professor Blyth and Drs Delhaize and Marchetti), *Large-Scale Structures of Galaxies and the Zone of Avoidance* (Professors Kraan-Korteweg and Associate Professor Blyth), and *Cosmic Magnetism* (Em. Professor Taylor). The department hosts numerous postdoctoral fellows working in these research themes: Drs Barchiesi, Dutta, Kurapati, Khangale, Makwela, Mohapatra, Sivitilli, Tampo and Zabel.

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. Besides leading many

research projects on SALT, members of the Department of Astronomy lead four of the eight MeerKAT Large Survey Projects.

Undergraduate Courses

First-Year Courses

AST1000S INTRODUCTION TO ASTRONOMY

Two practical sessions are held in the Planetarium of Iziko Museums of Cape Town, plus one evening trip to the South African Astronomical Observatory, Cape Town, by arrangement.

18 NQF credits at NQF level 5

Convener: Associate Professor 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.

Lecture times: Monday - Friday, 5th period. Practicals: One compulsory practical or tutorial per week, Wednesday, 14h00 -17h00.

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

Assessment: Class record: 50%; final examination 2 hours: 50%. Sub-minimum: 40% for final examination.

Second-Year Courses

AST2002H ASTROPHYSICS

One fieldtrip to the South African Astronomical Observatory, Sutherland.

24 NQF credits at NQF level 6

Convener: Dr L Marchetti

Course entry requirements: PHY1004W, MAM1000W or both MAM1031F & MAM1032S (or equivalent).

Course outline:

This course presents an introduction to the theoretical aspects of modern astrophysics. The key objective is to illustrate the application of physical laws in an astronomical context and to explain how we know what we do about the universe and its constituents. Subject matter broached includes:

Celestial mechanics; radiation laws; blackbody radiation, Planck function and approximations; magnitudes; the hydrogen atom; stellar spectroscopy; stellar evolution and remnants; special relativity; the Earth-Moon system; the Solar system; extrasolar planets; stellar motions; the Milky Way and other galaxies; the extragalactic distance scale; large scale structure; Newtonian cosmology.

Lecture times: Monday - Friday, 2nd period, Term 2 and 4, Tutorials: 10 Compulsory tutorial/practical sessions over the year, Wednesday, 14h00 - 17h00.

DP requirements: Satisfactory attendance at lectures and tutorials; satisfactory completion levels of quizzes, tests and assignments and class mark of at least 35%.

Assessment: Three class tests count 25%; 4 compulsory tutorials/practicals count 20%. Regular quizzes count 5%. One 2-hour final examination in November counts for 50%; subminimum requirement of 40% for final examination.

AST2003H ASTRONOMICAL TECHNIQUES

One observational radio astronomy project and one observational optical astronomy project, by arrangement. One fieldtrip to South African Astronomical Observatory, Sutherland.

24 NQF credits at NQF level 6

Convener: Professor P A Woudt

Course entry requirements: PHY1004W and MAM1000W or both MAM1031F & MAM1032S (or equivalent) (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, co-ordinate 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.

Lecture times: Monday - Friday, 2nd period, Term 1 and 3, Tutorials: Five over the year, Wednesday, 14h00 - 17h00, by arrangement. Practicals: Evening observing practicals using the UCT teaching telescopes, by arrangement.

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

Assessment: Two class tests 15%; 6 tutorials over the year in which students will learn astronomical data analysis and statistical techniques count 20%. Observing projects, practicals and quizzes together count 40%. One 2-hour theoretical examination counts 25%.

Third-Year Courses

AST3002F STELLAR ASTROPHYSICS

Two evening observing sessions at the UCT teaching observatory, by prior arrangement.

36 NQF credits at NQF level 7

Convener: Dr I Monageng

Course entry requirements: AST2002H and AST2003H, PHY2004W, MAM2000W (or MAM2004H and MAM2047H or equivalent MAM 12 credit courses).

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.

Lecture times: Monday - Friday, 2nd period, Practicals: One practical or tutorial per week, Wednesday, 14h00 - 17h00.

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

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

AST3003S GALACTIC & EXTRAGALACTIC ASTROPHYSICS
36 NQF credits at NQF level 7
Convener: Dr J Delhaize
Course entry requirements: AST2002H and AST2003H, PHY2004W, MAM2000W (or MAM2004H and MAM2047H or equivalent MAM 12 credit courses).
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 fieldtrip 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.
Lecture times: Monday - Friday, 2nd period, Tutorials/Practicals: One practical or tutorial per week, Wednesday, 14h00 - 17h00; one observing practical extending over several days/nights in Term 4.
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 ASTROPHYSICS & SPACE SCIENCE HONOURS
Since the code AST4007W will not carry a NQF credit value, students will be concurrently registered for AST4008W (coursework component of 128 NQF credits) and AST4009W (research project of 32 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: To be advised
Course entry requirements: AST3002F and AST3003S or PHY3004W or MAM3040W or equivalent. Candidates with an Engineering background will also be considered. Enrolments are limited to 20 students. Candidates must satisfy the Steering Committee that they have sufficient background in Mathematics and Physics. Admission is subject to the approval of the Steering Committee and an application must be made before 31 August of the preceding year. Late applications will also be considered.
Course outline:
The Honours course in Astrophysics & 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 fieldtrips to the national facilities.
DP requirements: Satisfactory lecture attendance (minimum 50%); class record of at least 40%.
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 examination. Examinations count 40%, class record 40% and research project 20% of the final result. The project component must be passed at 50%. These component parts of the course will be combined in a final overall mark which will be reflected against the course code AST4007W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

AST5000W ASTRONOMY DISSERTATION
180 NQF credits at NQF 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.

AST5001W ASTROPHYSICS & SPACE SCIENCE MINOR DISSERTATION
(National Astrophysics & Space Science Programme (NASSP))
90 NQF credits at NQF level 9
Course entry requirements: AST5003F
Course outline:
This course consists of an investigation of 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.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

AST5003F ASTROPHYSICS & SPACE SCIENCE COURSEWORK
(National Astrophysics & Space Science Programme (NASSP). All students on the National Astrophysics & Space Science Programme (NASSP) will enrol (and pay fees) for the coursework component (AST5003F) at the start of their first year of registration. Those who choose to remain at UCT to complete the minor dissertation component (AST5001W, MAM5005W or PHY5003W) will be required to enrol (and pay fees) for the minor dissertation component in July. Where the minor dissertation is not submitted by the February deadline of the subsequent year, the student will be required to enrol (and pay fees) for the minor dissertation component in the subsequent year/s.
90 NQF credits at NQF level 9
Convener: To be advised
Course entry requirements: This course 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. Admission is subject to the approval of the Steering Committee and an application must be made before 30 June of the preceding year.
Course outline:
This course consists of 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%.

AST5004Z DATA SCIENCE FOR ASTRONOMY
12 NQF credits at NQF level 9
Convener: To be advised
Course entry requirements: Core modules of the Master's in Data Science course.
Course outline:
This course introduces students to various aspects of data intensive astrophysics, ranging from data visualisation and complex databases, to advanced statistical tools for astronomical data analysis and computational astrophysics. At the core of this module are examples in modern data-intensive astrophysics derived from the global data challenges around MeerKAT, the Square Kilometre Array (SKA), associated projects in radio astronomy, and other large multi-wavelength surveys. Students will be introduced to the use of Bayesian statistics in astronomy, the complexity of visualising large data cubes, optimising database operations in the presence of multi-dimensional data, data mining and discovery tools, and the role of large-scale simulations to interpret the significance of astronomical observations.
DP requirements: 50% average for the two projects.
Assessment: Two projects: 25% each. Practical 'take-home' data science examination: 50%. A sub-minimum of 50% for each of the projects, and examination component will be required.

AST5005W DATA SCIENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Dr S Er
Course entry requirements: Successful completion of the coursework component of the Masters course in Data Science.
Course outline:
The research component of the degree is based on a 90 credit dissertation. The topic of the research will be based on an analysis of large data sets from Astronomy.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

AST6000W ASTRONOMY THESIS
360 NQF credits at NQF 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.

DEPARTMENT OF BIOLOGICAL SCIENCES

The Department is housed in the John Day Building, 20 University Avenue Telephone (021) 650-3604 and the H W Pearson Building, 8 University Avenue.
The FitzPatrick Institute of African Ornithology may be reached on telephone (021) 650-3291.
The Departmental abbreviation for Biological Sciences is BIO.

Associate Professor and Head of Department:
C G Attwood, BSc Hons PhD *Cape Town*
Leslie Hill Professor of Plant Conservation:
A Pauw, BSc Hons PhD *Cape Town*
Pola Pasvolsky Chair of Conservation Biology:
C Spottiswoode, BSc Hons *Cape Town* PhD *Cantab*
H W Pearson Honorary Professor of Botany:
J C Manning, BSC Hons PhD *Natal*
Professors:
A Chinsamy-Turan, BSc Hons PhD *Witwatersrand*
M D Cramer, MSc *Witwatersrand* PhD *Cape Town*
P W Froneman, BSc Hons PhD *Rhodes*
T A Hedderson, MSc *Memorial* PhD *Reading*
A M Muasya, MPhil *Moi* PhD *Reading*
M J O'Riain, BSc Hons PhD *Cape Town*
A G West, MSc *Cape Town* PhD *Utah*
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L Shannon, BSc Hons MSc PhD *Cape Town*
Senior Scholars:
J J Bolton, BSc Hons PhD *Liverpool*
G M Branch, BSc Hons PhD *Cape Town* FRSSAf
G Gäde, MSc PhD rer nat. Habil *Műnster Germany*
C L Griffiths, BSc Hons *Soton* PhD *Cape Town*
M T Hoffman, BSc Hons PhD *Cape Town*
J J Midgley, BSc Hons PhD *Cape Town*
P G Ryan, MSc PhD *Cape Town*
L G Underhill, MSc PhD *Cape Town*
Emeritus Professors:
W J Bond, BSc Hons *Exeter* MSc *Cape Town* PhD *UCLA*
T M Crowe, MSc *Chicago* PhD *Cape Town*
L Gillson, MSc *Imperial* DPhil *Oxon*
W R Siegfried, PhD *Cape Town*
Honorary Professor:
D H M Cumming, BSc Hons PhD *Rhodes*
Associate Professors:
A D Amar, BSc Hons *Newcastle* PhD *Aberdeen*
J M Bishop, BSc Hons *King's College London* PhD *Cape Town*
S B M Chimphango, MSc *Malawi* PhD *Cape Town*
S J Cunningham, BSc *Victoria* PhD *Massey*
D Pillay, BSc Hons PhD *UKZN*
R L Thomson, MSc PhD *Oulu*
Emeritus Associate Professors:
J A Day, BSc Hons PhD *Cape Town*
E C February, BA Hons PhD *Cape Town*
J H Hoffmann, MSc PhD *Rhodes*
A Jarre, MSc *Kiel* PhD *Bremen*

D S Jacobs, BSc Hons *Cape Town* PhD *Hawaii*
J U M Jarvis, MSc *Cape Town* PhD *East Africa* FRSSAf
C L Moloney, BSc Hons PhD *Cape Town*
M D Picker, BSc Hons PhD *Witwatersrand*

Honorary Associate Professors:
S E Kerwath, MSc *Erlangen* PhD *Rhodes*
J C Marugan Lobon, PhD *Autonoma de Madrid*

Senior Lecturers:
C Janion-Scheepers, MSc PhD *Stell*
N Karenyi, MSc *Cape Town* PhD *NMMU*
J A Slingsby, BSc Hons PhD *Cape Town*

Lecturers:
C A Ngcamphalala, MSc PhD *Pret*
M M Reddy, PhD *Cape Town*
L D Vorsatz, PhD *Rhodes*
S Welman, BSc Hons MSc *NMMU* PhD *UKZN*

Honorary Research Associates:
R J Anderson, BSc Hons *Witwatersrand* PhD *Cape Town*
L J Atkinson, PhD *Cape Town*
A Cardoso, PhD *Oxford*
M Cyrus, PhD *Cape Town*
H Dallas, PhD *Cape Town*
R Govender, PhD *Witwatersrand*
H J Hawkins, BSc Hons MSc *Cape Town* PhD *Germany*
J A Huggett, PhD *Cape Town*
K Hutchings, PhD *Cape Town*
C Klak, BSc Hons PhD *Cape Town*
P H Linder, BSc Hons PhD *Cape Town*
K Ludynia, PhD *Germany*
C L Lyons, PhD *Stellenbosch*
B M Macey, PhD *Cape Town*
H G Marco, PhD *Cape Town*
H D Oschadleus, PhD *Cape Town*
D Parker, PhD *Rhodes*
M Pfaff, PhD *Cape Town*
M D Rothman, PhD *Cape Town*
T Samaai, PhD *UWC*
A L Skowno, PhD *Rhodes*
C H Stirton, PhD *Cape Town*
H Van der Merwe, PhD *Pret*
S van Noort, PhD *Rhodes*
G A Verboom, BSc Hons PhD *Cape Town*

Honorary Research Affiliates:
M Carpenter, PhD *Cape Town*
O E Curtis-Scott, PhD *Cape Town*
T Elliott, PhD *Montreal*
D A Zhigila, PhD *Cape Town*

Postdoctoral Fellows:
M Brink-Hull, PhD *Stell*
J Chassain, *PhD Paris*
B Du Preez, *PhD Cape Town*
C H Faseyi, *PhD Cape Coast Ghana*
G J Humphrey, *PhD Cape Town*
G R M Leighton, *PhD Cape Town*

D Mac Alister, *PhD Cape Town*
A T Mpala, *PhD Witwatersrand*
K-M Middleton, PhD *Cape Town*
S D Musker, PhD *Bayreuth*
M Pereyra, *PhD Beunos Aires*
S Prader, *PhD Hamburg*
J J Van Blerk, *PhD Cape Town*
J E M van der Wal, PhD *St Andrews*
S Viana De Figueiredo Lisher, *PhD Brazil*
R Watson, *PhD Rhodes*
S Zuluaga, PhD *Comahue*
Director: Organisation for Tropical Studies South Africa Programmes
L M Kruger, MSc PhD *Cape Town*
Principal Scientific Officers:
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L V Phigeland, BSc *Cape Town*
Principal Technical Officer:
A Plos, BSc *Cape Town*
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T Jabaar
Technical Officers:
C J Hartnick
I Gongota
Departmental Manager:
C Khai
Administrative Assistants:
S Abrahams
N Jodamus
Procurement Officer:
C N Anthony
Senior Secretary:
R Rayner
Senior Lab Assistants:
S Daniels
B B R Tom
Departmental Assistant:
F A Stellenboom

BOLUS HERBARIUM
Director:
C G Attwood, BSc Hons PhD *Cape Town*
Keeper:
A M Muasya, MPhil *Moi* PhD *Reading*
Curator/Principal Scientific Officer:
C Klak, BSc Hons PhD *Cape Town*
Scientific Officer:
D P Philips, MSc *UKZN*
Principal Library Assistant:
J Lucas
Herbarium Operations Assistant:
C J Christians

THE FITZPATRICK INSTITUTE OF AFRICAN ORNITHOLOGY
Associate Professor and Director:
S J Cunningham, BSc Hons PhD *Massey*
Pola Pasvolsky Chair of Conservation Biology:
C N Spottiswoode, BSc Hon *Cape Town* PhD *Cantab*
Emeritus Professors:
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P G Ryan, MSc PhD *Cape Town*
W R Siegfried, PhD *Cape Town*
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R L Thomson, MSc PhD *Oulu*
Lecturer:
G Jamie, PhD *Cantab*
Junior Research Fellow:
C Nwaogu, PhD *Groningen and St Andrews*
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G S Cumming, BSc Hon *Rhodes* PhD *Oxon*
W Foden, MSc *Cape Town* PhD *Witwatersrand*
D Grémillet, PhD *Kiel*
A Makhado, BSc Hon *Venda* PhD *Cape Town*
A R Ridley, PhD *Cantab*
A Santangeli, MSc *UEA* PhD *Helsinki*
C L Seymour, MSc PhD *Cape Town*
R Simmons, MSc *Acadia* PhD *Witwatersrand*
Honorary Research Affiliate:
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B Ashton, PhD *Western Australia*
R C K Bowie, PhD *Cape Town*
R S Boyes, PhD *UKZN*
C W Brink, PhD *Cape Town*
U Bryson, PhD *LMU Munich*
E Bussière, PhD *Cape Town*
C Cohen, PhD *Cape Town*
M Connan, PhD *Pierre et Marie Curie*
T Cook, PhD *La Rochelle*
C Craig, PhD *Cape Town*
T Dixit, PhD *Cantab*
C Doutrelant, PhD *Montpellier*
R Flood, PhD *London*
A Jenkins, PhD *Cape Town*
M G W Jones, PhD *Cape Town*
G Joseph, PhD *Cape Town*
A T K Lee, PhD *Manchester*
I T Little, PhD *Cape Town*
A Lowney, PhD *Cape Town*
K Maciejewski, PhD *NMU*
R O Martin, PhD *Sheffield*
A McKechnie, PhD *Natal*

M Melo, PhD *Edinburgh*
A Milewski, PhD *Murdoch*
M S L Mills, MSc *Cape Town*
S J Milton, PhD *Cape Town*
R Navarro, PhD, *Cape Town*
S T Osinubi, PhD *Cape Town*
L Pichegru, PhD *Strasbourg*
P Pistorius, PhD *NMMU*
S Rahlao, PhD *Stell*
C Reynolds, PhD *Cape Town*
D Rollinson, PhD *Cape Town*
Y Ropert-Coudert, PhD *Tokyo*
J M Shaw, PhD *Cape Town*
R Sherley, PhD *Cape Town*
A Steinfurth, PhD *Kiel*
P Sumasgutner, PhD *Vienna*
G Tate, PhD *Cape Town*
J K Turpie, PhD *Cape Town*
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Principal Scientific Officer:
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M Brooks, Nat Dipl Conservation *Cape Tech*
Librarian:
J Dunlop, Hons LibSci *Cape Town* MInfoTech *Pret*
Administrative Assistants:
A Links
N Hlekwayo

PLANT CONSERVATION UNIT
Professor and Director and Leslie Hill Chair of Plant Conservation:
A Pauw, BSc Hon PhD *Cape Town*
Professor and Deputy Director:

Honorary Research Associates:
P J Carrick, PhD *Cambridge*
H van der Merwe, PhD *Pretoria*

INSTITUTE FOR COMMUNITIES AND WILDLIFE IN AFRICA
Professor and Director:
M J O'Riain, PhD *Cape Town*
Professor and Co-Director:
N Nattrass, PhD *Oxford*
Associate Professor:
J M Bishop, BSc Hons *King's College London* PhD *Cape Town*
Honorary Research Associate:
G N Bronner, BSc Hons MSc PhD *Natal*
Honorary Research Affiliates:

SEAWEED RESEARCH UNIT
DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT (DFFE)
Oceanographic Researcher and Head:
M D Rothman, BSc Hons *UWC* MSc PhD *Cape Town*

Senior Marine Research Assistants:
C J T Boothroyd
F A Kemp

RESEARCH IN THE BIOLOGICAL SCIENCES
The mission of the Department of Biological Sciences 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: Associate Professor SBM Chimphango (nitrogen fixation and agriculture), Professor MD Cramer (carbon-nitrogen interactions, nutritional physiology), Emeritus Associate Professor EC February (plant water relations, anthropogenic impacts), Professor AG West (impacts of climate change, drought), Emeritus Professor G Gäde (invertebrates, neuropeptides), Dr C Janion-Scheepers (invertebrate thermal physiology), Dr CA Ngcamphalala (vertebrate stress physiology, climate change effects), Dr S Welman (vertebrate energetics, thermoregulation, climate change effects).
Evolution and Systematics: Associate Professor JM Bishop (conservation genetics, evolutionary genetics, phylogeography), Professor A Chinsamy-Turan (palaeobiology, vertebrate bone & teeth histology), Professor TA Hedderson (molecular ecology, bryophytes), Professor AM Muasya (wetlands and Cyperaceae, Fabaceae, rhizobia) and Dr JA Jasper (evolutionary ecology, biogeography, Cape flora), Dr C Janion-Scheepers (invertebrate DNA barcoding), Professor Anton Pauw (speciation in the Cape Flora).
Ecology and Behaviour: Emeritus Associate Professor JA Day (fresh water ecology & conservation), Emeritus Associate Professor EC February (savannas, Cape flora), Emeritus Professor L Gillson (long-term ecology, conservation), Emeritus Associate Professor JH Hoffmann (bio-control, plant-insect interactions), Dr JA Slingsby (plant ecology, global change, remote sensing , ecological forecasting), Emeritus Professor MT Hoffman (historical ecology, rangelands), Emeritus Professor JJ Midgley (ecosystem dynamics, plant-animal interactions), Professor MJ O'Riain (behavioural ecology, human-wildlife conflict solutions), Emeritus Associate Professor JUM Jarvis (small mammal biology, mole-rats), Dr C Janion-Scheepers (invertebrates, bio-indicators), Dr S Welman (small mammal biology), Professor Anton Pauw (plant-pollinator interactions, conservation of the Cape Flora).
Marine Biology: Associate Professor CG Attwood (fish biology and fisheries), Emeritus Professor CL Griffiths (coastal ecology, taxonomy), Associate Professor A Jarre (ecosystem modelling, ecosystem approach to fisheries management), Associate Professor D Pillay (estuarine and intertidal ecology), Emeritus Professor GM Branch (rocky shore & coastal ecology), Professor PW Froneman (plankton food webs, rocky shore ecology and cetacean ecology), Dr LD Vorsatz (nearshore community ecology and conservation, ecophysiology, marine plastics), Dr MM Reddy (marine biodiversity and conservation, ecology and evolution of kelp forests and coral reefs).
Ornithology: Associate Professor AD Amar (conservation and raptor biology), Associate Professor SJ Cunningham (ecophysiology, climate change, chemo-tactile reception, Professor C Spottiswoode (evolution, ecology and conservation), Associate Professor RL Thomson (behavioural ecology). Emeritus Professor PG Ryan (seabird ecology and conservation, marine plastics, island conservation). Dr S Welman (penguin conservation physiology), Professor Anton Pauw (nectar-feeding birds and their conservation).

The department is also home to the following research entities:
The Bolus Herbarium: Taxonomy of the Cape Flora (Curator: Dr C Klak)
The Institute for Communities and Wildlife in Africa (Director: Prof MJ O'Riain)
The FitzPatrick Institute of African Ornithology (Director: A/Prof S J Cunningham)
Marine and Antarctic Research centre for Innovation and Sustainability (Director: Prof M Vichi)
The Plant Conservation Unit: Plant conservation, palaeoecology and historical ecology (Director: Prof Anton Pauw)

The Seaweed Research Unit of the Department of Agriculture, Forestry & Fisheries (Head: Dr MD Rothman)

Undergraduate Courses

First-Year Courses

BIO1000F CELL BIOLOGY
18 NQF credits at NQF level 5
Convener: Associate Professor J M Bishop
Course entry requirements: Admission will be restricted to students who have passed either NSC Physical Science or Life Science with at least 60%. *NOTE: Preference will be given to students registered in the Science Faculty. Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to BIO1000H from week 7.*
Course outline:
Basic biological principles and processes at a cellular level provide an essential grounding for future study in the life sciences. The structure and function of cell components is introduced, followed by an introduction to chemistry, including the structure and functions of biological macro-molecules. Cell division and the role of genetics in inheritance and the control of biological systems is then considered. This leads into an introduction to membrane physiology, metabolism and its regulation. Cellular processes that are considered in detail include the functioning of photosynthesis and cellular respiration, and how these relate to organismal physiology. Cellular communication and the immune system of animals complete the organismal physiology.
Lecture times: Monday - Friday, 5th period, Tutorials: One per week, by arrangement, Practicals: One afternoon per week, Monday, Tuesday, Wednesday or Thursday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 80% of deliverables (tests, practicals, tutorials), including at least one class test and at least one practical test, and attendance of practicals; minimum of 40% for the class record.
Assessment: Class record counts 40% (two class tests count 27%; two practical tests count 5%; and a practical bookmark counts 8%). One 2-hour examination paper (Theory) written in June counts 40%; a subminimum of 40% is required for this paper. One 1.5-hour examination paper (Practical) in June counts 20%.

BIO1000H CELL BIOLOGY
18 NQF credits at NQF level 5
Convener: Dr M Vaaltyn
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. *NOTES: 1) Preference will be given to students registered in the Science Faculty. 2) 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 forBIO1000F). 3) The course 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. 4) BIO1000H is equivalent to BIO1000F in level, credit value towards the degree and as prerequisite for certain other courses.*
Course outline:
Basic biological principles and processes at a cellular level provide an essential grounding for future study in the life sciences. The structure and function of cell components is introduced, followed by an introduction to chemistry, including the structure and functions of biological macro-molecules. Cell division and the role of genetics in inheritance and the control of biological systems is then

considered. This leads into an introduction to membrane physiology, metabolism and its regulation. Cellular processes that are considered in detail include the functioning of photosynthesis and cellular respiration, and how these relate to organismal physiology. Cellular communication and the immune system of animals complete the organismal physiology.
Lecture times: Monday - Friday, 2nd period, Tutorials: One per week, by arrangement, Practicals: One afternoon per week, Friday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 80% of deliverables (tests, practicals, tutorials), including at least one class test and at least one practical test; attendance of practicals; minimum of 40% for the class record.
Assessment: Class record counts 40% (three class tests count 27%; two practical tests count 5%; and a practical bookmark counts 8%). One 2-hour examination paper (Theory) written in November counts 40%; a subminimum of 40% is required for this paper. One 1.5-hour examination paper (Practical) in November counts 20%.

BIO1004S BIOLOGICAL DIVERSITY
Preference will be given to students registered in the Science Faculty. Fieldwork: A compulsory one-day excursion will be held over a weekend.
18 NQF credits at NQF level 5
Convener: Dr S Welman
Course entry requirements: A pass at 60% in NSC Life Sciences or Physical Sciences or by permission of the Head of Department.
Course outline:
This course aims to illustrate the diversity and complexity of living organisms, from viruses to humans. Topics include: evolution as a means of interpreting change with time; modern theories on the mechanisms of evolution; the origin of species, including humans; structure and functioning of the simplest microbial life forms; structure and life cycles of fungi; the evolution of aquatic and terrestrial plants; the diversity and adaptations of invertebrate animals; the development and adaptations of chordate groups; primate diversity and evolution; conservation and biodiversity issues in relation to South African biomes and global change. The course includes a strong practical component which further examines biodiversity and related concepts.
Lecture times: Monday - Friday, 5th period, Tutorials: One per week, by arrangement, Practicals: one practical per week, Monday, Tuesday, Wednesday, or Thursday 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 80% of deliverables (tests, practicals, tutorials, field trip report), including at least one class test, the practical test, and the field trip report; attendance of practicals and field trip; minimum average of 50% for practicals; minimum of 40% for the class record.
Assessment: Coursework 40%. Theory test 1 (7%), theory test 2 (7%), practical test (10%), practicals (10%), field trip report (group mark, 6%). Examinations 60%. One 2-hour theory examination written in November counts 40% (subminimum of 40% applies); one 1.5-hour practical examination written in November counts 20%.

Second-Year Courses

BIO2014F PRINCIPLES OF ECOLOGY & EVOLUTION
Includes a compulsory weekend field camp.
24 NQF credits at NQF level 6
Convener: Dr C Janion-Scheepers
Course entry requirements: BIO1000F/H, BIO1004F/S, DP in STA1007S
Course outline:
This course begins with an exploration of the mechanisms by which populations evolve and ultimately give rise to the entities that we term species. Building on this, it then explores the nature of the genealogical relationships between species (phylogeny), and the manner in which these are

estimated in practice. The focus then shifts to abiotic and biotic controls on the distribution of species and higher taxa in nature, as viewed through the lens of niche theory, as well as constraints on the adaptability of populations or species to changing selective conditions. Finally, the course explores life history variation amongst organisms, including the factors that regulate its evolution and its demographic consequences. The latter provides context for a brief introduction to population ecology. Lectures provide theoretical background, while practicals and the compulsory field trip provide hands-on experience of material taught in lectures, as well as training in basic research techniques.

Lecture times: Monday-Friday, 2nd period, Practicals: One per week, Monday, 14h00-17h00. Attendance is compulsory for all lectures and practicals.

DP requirements: Completion of at least 70% of deliverables (tests, practicals, field trip report), including at least one class test and the field trip report; attendance of practicals and field trip; minimum of 40% for the class record.

Assessment: A 3-hour examination, written in June, with a subminimum of 40%, counts 50% of the course mark. The class record, which counts for the balance, is made up as follows: practicals count 15%, the field camp report counts 15% and two class tests count 20%.

BIO2015S VERTEBRATE DIVERSITY & FUNCTIONAL BIOLOGY

Includes a compulsory field camp.

24 NQF credits at NQF level 6

Convener: Dr C A Ngcamphalala

Course entry requirements: BIO1000F/H, BIO1004S

Course outline:

This course begins with an overview of the evolution, characteristics, diversity, morphology, and life histories of the different craniate classes, paying particular attention to adaptations underlying the success of the vertebrates. Distinctive or advanced biological features of each group are highlighted, and their ecological/economic importance briefly considered. The rest of the course comprises integrative, cross-taxonomic modules on the functional biology of vertebrates, notably locomotion, sensory systems, metabolism, homeostasis and behaviour. The course includes a strong practical component to demonstrate the links between form and function; as well as a 4-day compulsory field camp during which students will be trained in methods for studying the diversity, ecology and behaviour of selected vertebrate groups.

Lecture times: Monday – Friday, 2nd period, Practicals: One per week, Thursday, 14h00-17h00. Attendance is compulsory for all lectures and practicals.

DP requirements: Completion of at least 70% of deliverables (tests, practicals, project report), including at least one class test and the project report; attendance of practicals; minimum of 40% for the class record

Assessment: A 3-hour theory examination written in November, with subminimum of 40%, will count 50% of the course mark. Coursework marks will be allocated as follows: practical tests (two deliverables) count 10%, project report based on projects counts 20%, two class tests together count 20%.

BIO2016S INVERTEBRATE DIVERSITY & FUNCTIONAL BIOLOGY

Includes a compulsory four-day field camp.

24 NQF credits at NQF level 6

Convener: Associate Professor D Pillay

Course entry requirements: BIO1000F/H, BIO1004S

Course outline:

The course exposes students to the diversity of invertebrates and their functional biologies. Topics will be presented within an evolutionary framework to emphasise past and contemporary selective pressures driving diversification. Students will be exposed to key topics in functional biology across the major invertebrate groups and will include cellular to organism level processes. The course begins with an introduction to the evolution of the invertebrates and the major phyla. This leads to an exploration of invertebrate functional biology, with an emphasis on key adaptations across the

aquatic–terrestrial gradient. Lectures, practicals and field trips will expose students to contemporary philosophical, methodological and conceptual approaches used in the field of invertebrate functional biology and diversity.
Lecture times: Monday – Friday, 3rd period, Practicals: One per week, Wednesday, 14h00-17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 70% of deliverables (tests, practicals, field trip report), including at least one class test and the field trip report; attendance of practicals and field trip; minimum of 40% for the class record.
Assessment: A 3-hour examination, written in November, with a subminimum of 40%, counts for 50% of the course mark. Coursework marks will be allocated as follows: practicals count 15%, the field camp report counts 15% and two class tests count 20%.

BIO2017F PLANT DIVERSITY AND FUNCTIONAL BIOLOGY
Includes a compulsory four-day field camp.
24 NQF credits at NQF level 6
Convener: Professor M D Cramer
Course entry requirements: BIO1000F/H, BIO1004S
Course outline:
The course begins with a discussion on the nature and origin of plants that includes an overview of major autotrophic eukaryote lineages. The benefits and challenges of life in water and on land are also presented. Diversity and evolution of life histories and reproductive systems in plants and consequences of the diversity of major plant lineages are studied. The functional biology of the major organs of the plant including roots, stems and leaves in relation to strategies for resource acquisition and utilisation, mineral nutrition, plant water relations and carbon metabolism are considered. This entails studying variations in root, stem and leaf morphologies in various plant lineages and unique terrestrial and aquatic environments and their function in water, nutrients, and carbon metabolism. There is a strong focus on African plants, and a particular emphasis on the Cape Floristic region. The course practicals are compulsory and complements the theory with hands-on experience on working with different lineages of plants, data collection and analysis from scientific studies and experiments, and scientific writing. A compulsory 4-day field camp is undertaken for students to study the relationship between ecology and plant morphology, function, and diversity.
Lecture times: Monday – Friday, 3rd period, Practicals: One per week, Wednesday, 14h00-17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 70% of deliverables (tests, practicals, field trip report), including at least one class test and the field trip report; attendance of practicals and field trip; minimum of 40% for the class record.
Assessment: A 3 hour examination written in June, with a subminimum of 40%, counts 50% of the course. Coursework marks will be allocated as follows: Practical classes count 20%, project based on field camp counts 10%, two class tests count 20%.

Third-Year Courses

BIO3002F MARINE ECOSYSTEMS
Includes a compulsory three-day field camp during first semester
36 NQF credits at NQF level 7
Convener: Professor P W Froneman
Course entry requirements: A pass or permission to write a SUPP exam in BIO2014F, SEA2004F (or concurrent registration for SEA2004F).
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 (e.g., SEA2004F; BIO2014F; 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.
Lecture times: Monday - Friday, 1st period, Practicals: One per week, Wednesday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 70% of deliverables (tests, practicals, project report), including at least one class test and the project report; attendance of practicals and field trip; minimum of 40% for the class record.
Assessment: A 3-hour examination written in June, with a sub-minimum of 40% will count for 50% of the course. Class mark will count 50% of the course mark (breakdown: 2 tests count 40% of the class mark, project write up 30% and the practicals 30%).

BIO3013F GLOBAL CHANGE ECOLOGY
36 NQF credits at NQF level 7
Convener: Professor A G West
Course entry requirements: BIO1000F/H, BIO1004F/S; approved 2000-level semester Science course.
Course outline:
How are organisms and ecosystems affected by the drivers of global environmental change? In this course we briefly explore the drivers of global change, both natural (e.g. Milankovitch cycles, tectonic drift) and anthropogenic (e.g. greenhouse gas emissions, pollution, land-use change), and then examine how these drivers influence (and are influenced by) terrestrial and marine biological systems. We cover a variety of topics, ranging from organismal and physiological responses to global change, biodiversity, global biogeochemical cycles, ecological function and ecosystem services. While the majority of the class is focussed on contemporary global change, this is contextualized relative to palaeohistorical environmental change. The course provides an integrated knowledge of contemporary environmental issues related to global change (e.g. carbon sequestration, climate change mitigation, land-use change) and its implications for biodiversity, ecosystem services and human wellbeing).
Lecture times: Monday - Friday, 2nd period, Practicals: One per week, Monday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 70% of deliverables (tests, practicals, project report), including at least one class test and the project report; attendance of practicals; minimum of 40% for the class record.
Assessment: A 3-hour examination written in June, with a sub-minimum of 40%, will count for 50% of the course. Coursework marks will be allocated as follows: Practical classes (assessed weekly) count 15%; research project counts 20%; class tests count 15%.

BIO3014S CONSERVATION: GENES, POPULATION & BIODIVERSITY
36 NQF credits at NQF level 7
Convener: Professor M J O'Riain
Course entry requirements: A pass or permission to write a SUPP exam in BIO2014F.
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 is explored at multiple levels, including the diversity of genes, species, populations and ecosystems. At the species and population levels, we consider the role of life history and behaviour in the management of populations in the real world. The conservation and management of ecosystems is considered in terms of important processes, such as disturbance, re-wilding and threats by alien species. This course includes consideration of conservation, society, landscapes and ecosystem services. Issues to be considered here include incentives, access, who benefits from conservation, legal aspects and management policies.
Lecture times: Monday - Friday, 2nd period, Tutorials, by arrangement, Practicals: One per week, Monday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.

DP requirements: Completion of at least 70% of deliverables (tests, practicals, project report), including at least one class test and the project report; attendance of practicals; minimum of 40% for the class record.
Assessment: A 3-hour examination written in November, with a sub-minimum of 40%, will count for 50% of the course. Coursework marks will be allocated as follows: Practical classes (assessed weekly) count 20%; project work counts 15%; two class tests count 15%.

BIO3017S MARINE RESOURCES

36 NQF credits at NQF level 7
Convener: Dr M M Reddy
Course entry requirements: A pass or permission to write a SUPP exam in BIO2014F; BIO3002F is recommended.
Course outline:
This course covers the science that supports renewable marine resource management. Topics include the diversity and life-history strategies of living marine resources, the diversity of fish and fisheries, surplus production, ecological responses to exploitation, monitoring and assessment techniques, regulatory strategies, resource economics, diversity and principles of marine aquaculture, and marine conservation.
Lecture times: Monday - Friday, 3rd period, Tutorials: By arrangement, Practicals: One per week, Thursday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 70% of deliverables (tests, practicals, project report), including at least one class test and the project report; attendance of practicals; minimum of 40% for the class record
Assessment: A 3-hour examination written in November, with a sub-minimum of 40%, will count for 50% of the course. Coursework marks will be allocated as follows: Practical classes count 10%; project work counts 20%; two class tests count 20%.

BIO3018F ECOLOGY & EVOLUTION

This course is a residential two-week field course, occurring before term starts. During term time tutorials and various assignments need to be completed.
36 NQF credits at NQF level 7
Convener: Dr J A Slingsby
Course entry requirements: A pass or permission to write a SUPP exam in BIO2014F.
Course outline:
Ecological and evolutionary processes together determine patterns of biodiversity. This African-centric ecology and evolution course utilises regional examples within the global context to illustrate plant and animal ecology and evolution. The course starts with community assembly and the mechanisms (e.g., functional traits) that contribute to species coexistence (e.g., niche construction) and turnover (competition/facilitation for resources) between communities and the results of this (e.g., succession and alternate states). The role of disturbance (e.g., fire, herbivory, predation) in structuring communities and the roles of adaptation versus exaptation are then considered. Alien invasions are considered in the context of the supposed "empty niche" and as current examples of dispersalism and mechanisms (e.g., traits) of coexistence and competition. This is followed by behavioural ecology, focusing on how competition and cooperation between and within species affects evolutionary fitness. This leads into analytical biogeography, considering the distribution of species and how this was established (i.e., vicariance versus dispersalism) before discussing the evolution and coexistence of species regionally and globally. The course is based on a two-week fieldtrip before the semester starts, with assignment hand-ins and tutorials during the semester.
Lecture times: All lectures and practicals occur during a residential two-week field course occurring before the start of the first semester**.** Tutorials: By arrangement in 5th period – typically one per practical. Practical slot: (used for prac, tutorials or tests) Tuesday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.

DP requirements: Completion of at least 70% of deliverables (tests, practicals, field trip seminar), including the class test and the field trip seminar; attendance of two-week field trip and subsequent practicals; minimum of 40% for the class record.
Assessment: An examination, written in June, with a subminimum of 40%, counts for 50% of the course mark. The class record, which counts for the balance, is made up as follows: practicals 35%, seminar 5%, class test 10%.

BIO3019S QUANTITATIVE BIOLOGY
36 NQF credits at NQF level 7
Convener: Professor T A Hedderson
Course entry requirements: A pass or permission to write a SUPP exam in BIO2014F, approved 2000-level Science STA or MAM course.
Course outline:
In an era of "big data", the ability to work with large amounts of numerical data is an important skill. Biological systems are notoriously complex across all levels of organisation and are often difficult to manipulate experimentally on meaningful temporal and spatial scales. Mathematical models provide a means of gaining insight into such systems, allowing us to disentangle complicated processes, focus on variables of interest to a particular research question, test alternative hypotheses, make predictions, and help present ideas in an unambiguous fashion. This course deals with the use, interpretation, and limits of modelling approaches in biology. In a series of modules exploring processes ranging from the behaviour of genes to understanding global scale distributions of species and communities, students will gain experience in question formulation, model development and parameterisation, interpretation of results, and model critique.
Lecture times: Monday - Friday, 5th period, Tutorials: By arrangement, Practicals: One per week, Tuesday, 14h00 - 17h00. Attendance is compulsory for all lectures and practicals.
DP requirements: Completion of at least 70% of deliverables (tests, practicals, project report), including at least one class test and the project report; attendance of practicals; minimum of 40% for the class record.
Assessment: A 3-hour examination written in November, with a subminimum of 40%, will count 50% of the course. The class record, which counts for the balance, is made up as follows: practicals and project work count 35%, two class tests count 15%.

Postgraduate Courses

BIO4000W BIOLOGICAL SCIENCES HONOURS
Since the code BIO4000W will not carry a NQF credit value, students will be concurrently registered for BIO4002W (coursework component of 88 NQF credits) and BIO4003W (research project of 72 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Professor A M Muasya
Course entry requirements: A BSc degree in Biology, with a pass in STA2007 F/S/H or an equivalent 2000-level semester statistics course. Students lacking this statistical prerequisite will be required to register concurrently for STA5014Z. 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. Enrolments are limited to 20.
Course outline:
The Honours course is designed to enrich the student's appreciation of theory through advanced coursework, essay writing, seminars, discussion groups and fieldwork. In addition to compulsory coursework modules, students are required to choose eight elective modules and complete an original research project.
DP requirements: Attendance of field camp and all lectures are required for the DP. The non-project component of the course carries a sub-minimum of 50% and the project component a sub-minimum of 50%.

Assessment: Two 3-hour examinations written in November count 20%; project and research seminar count 40%; compulsory coursework counts 20%; elective coursework counts 20%. These component parts of the course will be combined in a final overall mark which will be reflected against the course code BIO4000W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

BIO4001W MARINE BIOLOGY HONOURS

Since the code BIO4001W will not carry a NQF credit value, students will be concurrently registered for BIO4004W (coursework component of 88 NQF credits) and BIO4005W (research project of 72 NQF credits).

160 NQF credits at NQF level 8; the combined credit value of both components.

Convener: Professor A M Muasya

Course entry requirements: A BSc degree in Marine Biology, with a pass in STA2007 F/S/H or an equivalent 2000-level semester statistics course. Students lacking this statistical prerequisite will be required to register concurrently for STA5014Z. Enrolments are limited to 12. 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 fieldwork. In addition to compulsory coursework modules, students are required to choose eight elective modules, at least four of which must be marine topics, and complete an original research project.

DP requirements: Attendance of field camp and all lectures are required for the DP. The non-project component of the course carries a sub-minimum of 50% and the project component a sub-minimum of 50%.

Assessment: Two 3-hour examinations written in November count 20%; project and research seminar count 40%; compulsory coursework counts 20%; elective coursework counts 20%. These component parts of the course will be combined in a final overall mark which will be reflected against the course code BIO4001W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

BIO5007H CONSERVATION BIOLOGY COURSEWORK

Students will enrol (and pay fees) for both courses BIO5007H and BIO5008W in their first year of registration; where the minor dissertation is not submitted by the February deadline of the subsequent year, the student will be required to enrol (and pay fees) for the minor dissertation component in the subsequent year/s. A handbook of postgraduate studies is available from the Fitzpatrick Institute's website: https://science.uct.ac.za/fitzpatrick

90 NQF credits at NQF level 9

Convener: Dr G Jamie

Course entry requirements: A relevant honours degree or equivalent: students with an honours degree from another discipline may be required to register for an MPhil in Conservation Biology.

Course outline:

This course deals with the conservation and biologically sustainable use of biodiversity. It provides the education and training necessary to identify threatened species, ecosystems and ecological processes, and to develop appropriate measures to reduce the effects of threats to biodiversity. This course is intended for students concerned with both the theory and practise of conservation. The coursework consists of a series of compulsory modules that run from January to August and cover a range of fields of conservation biology: biodiversity basics, philosophy of science and conservation ethics, population ecology and viability analysis, conservation genetics, community ecology, ecosystem/aquatic ecology, invasive species, landscape ecology, GIS and conservation planning, climate change and conservation, resource economics, societies and natural resources, conservation leadership.

Assessment: Each student receives a mark for each of the modules, and the modules are examined in two examinations.

BIO5008W CONSERVATION BIOLOGY MINOR DISSERTATION

Students will enrol (and pay fees) for both courses BIO5007H and BIO5008W in their first year of registration; where the minor dissertation is not submitted by the February deadline of the subsequent year, the student will be required to enrol (and pay fees) for the minor dissertation component in the subsequent year/s. Those students already in possession of a Master's degree, or in exceptional cases those who wish to upgrade to a PhD, may expand a project in accordance with the normal pursuit of that degree at UCT.

90 NQF credits at NQF level 9

Convener: Dr G Jamie

Course entry requirements: BIO5007H

Course outline:

The research component must be submitted as a minor dissertation for formal examination. It should be completed by mid-February following first registration.

Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

BIO5009W CONSERVATION BIOLOGY DISSERTATION

180 NQF credits at NQF 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.

BIO5010W BIOLOGICAL SCIENCES DISSERTATION

180 NQF credits at NQF 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.

BIO5012W APPLIED OCEAN SCIENCES COURSEWORK

Students will enrol (and pay fees) for the coursework codes BIO5012W, BIO5013F, BIO5014F/SEA5011F and STA5014Z, as well as the minor dissertation course BIO5015W in their first year of registration; where the minor dissertation is not submitted by the February deadline of the subsequent year, the student will be required to enrol (and pay fees) for the minor dissertation component in the subsequent year/s.

0 NQF credits at NQF level 9
Convener: Professor M Vichi and Dr L C Gammage
Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.
Co-requisites: The relevant dissertation code from those proposed in the handbook.
Course outline:
This course is convened between the Departments of Biological Sciences and Oceanography. The code BIO5012W represents the overall coursework component and will reflect the overall coursework result. This full-time master with coursework and minor dissertation is offered over 13 months, beginning in January each year. It provides interdisciplinary vocational training in applied aspects of oceanography and marine biology for future ocean professionals. The course is designed for both recent graduates as well as those with several years' work experience and who wish to gain skills to operate in the ocean services sector, focusing on operational and conservational activities, food, water quality and recreation preservation and other aspects of the Blue Economy. The curriculum offers a choice of two streams: Applied Marine Biology (BIO5014F) and Operational Oceanography (SEA5011F), with a common course in Foundations of Applied Ocean Sciences (BIO5013F) and Statistical Methods (STA5014Z). In addition, students will choose at least two elective courses, chosen from a range of modules offered in both disciplinary streams. The list and details of the offered courses will be available at registration. Students can choose to register for the minor dissertation in a number of disciplines.
Assessment: Students must pass all coursework components with a subminimum of 40% for the fundamental course BIO5013F and the disciplinary courses (BIO5014F and SEA5011F); an aggregate coursework mark of 50% is required. A composite grade of the performance on the coursework component as a whole will be reflected against the assessment course code BIO5012W. The minor dissertation component is 50% of the degree. The choice of project for the minor dissertation will be determined by prior qualification with the course conveners and supervisors from other Departments. Students may register for a minor dissertation in a range of Departments across the University.

BIO5013F FUNDAMENTALS OF APPLIED OCEAN SCIENCES
40 NQF credits at NQF level 9
Convener: Professor M Vichi and Dr L C Gammage
Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.
Co-requisites: STA5014Z and BIO5014F or SEA5011F depending on the chosen stream. A minor dissertation code chosen from the ones described in the handbook.
Course outline:
The course is composed of the following modules covering the foundational aspects of applied ocean sciences: 1) Introduction to Applied Ocean Sciences, which combines introduction to system-based marine sciences, basics of ecological and physical oceanography, ocean governance and project management; 2) Statistical Methods (STA5014Z), which provides an intermediate introduction to statistics and experimental design; 3) Scientific Computing and Data Management, which introduces to scientific programming and data analysis for the ocean sciences.
Assessment: Every module is assessed independently either with a class test or individual project assignments. The syllabus and the relative weight for each module are described in a handbook that will be made available on the BIO5012W website (hosted by the Marine and Antarctic Research Centre for Innovation and Sustainability).

BIO5014F APPLIED MARINE BIOLOGY
50 NQF credits at NQF level 9
Convener: Professor M Vichi and Dr L C Gammage
Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.

Co-requisites: This course is a component of the Applied Ocean Sciences Master's coursework (refer to BIO5012W). Co-requisites are BIO5012W, BIO5013F, STA5014Z and minor dissertation code chosen from the ones listed in the BIO5012W handbook. Changes in the dissertation code are allowed according to the student background and prior to consultation with the course conveners.
Course outline:
The course in Applied Marine Biology focuses on conservation, ecosystem-based management, sustainable utilization and alternative livelihoods such as aquaculture.
Assessment: Every module is assessed independently either with a class test or individual project assignments. The syllabus and the relative weight for each module are described in a handbook that will be made available on the BIO5012W website (hosted by the Marine and Antarctic Research Centre for Innovation and Sustainability).

BIO5015W APPLIED OCEAN SCIENCES MINOR DISSERTATION
Students will enrol (and pay fees) for coursework codes BIO5012W, BIO5013F, BIO5014F/SEA5011F and STA5014Z together with BIO5015W in their first year of registration; where the minor dissertation is not submitted by the February deadline of the subsequent year, the student will be required to enrol (and pay fees) for the minor dissertation component in the subsequent year/s.
90 NQF credits at NQF level 9
Convener: Professor M Vichi and Dr L C Gammage
Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.
Co-requisites: BIO5012W, BIO5013F, BIO5014F/SEA5011F, STA5014Z
Course outline:
The minor dissertation, which forms 50% of the overall degree, is based on a six-month supervised research project. The choice of project will be determined by the student's prior qualification and in agreement with the course conveners and supervisors. The dissertation should be submitted by mid-February of the following year.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

BIO6002W CONSERVATION BIOLOGY THESIS
360 NQF credits at NQF 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.

BIO6003W BIOLOGICAL SCIENCES THESIS
360 NQF credits at NQF 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.

DEPARTMENT OF CHEMISTRY

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Jamison Professor of Inorganic Chemistry:

Professor of Physical Chemistry:
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Laboratory Assistants:
V F Stuurman
T E Matundu, BSc Hons *Limpopo*
Sample Clerk:
T Mngxekeza
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S Winks, BSc Hons *Cape Town* PhD *Witwatersrand* MBA *MANCOSA*
Finance Manager H3D:
A Banderker, BCom *Cape Town* BCom Hons *UKZN* CA(SA)
Senior Finance Officer:
L Olivier, BCom Acc *UWC*
Project & Research Operations Manager:
J Akester, BSc Hons MSc *Cape Town*
Operations Manager:
C Foentjies, BCom Hons *Cape Town*
Administrative Officer:
M Geldenhuys, NDipl *Cape Town*
Administrative Assistant:
S Naicker

SCIENTIFIC COMPUTING RESEARCH UNIT (SCRU)
Director:
K J Naidoo, MSc *Cape Town* PhD *Michigan*
Academic Staff:
S Winberg, MSc *UTK* PhD *Cape Town*
Administrative Officer:
L A Dreyer

CENTRE FOR SUPRAMOLECULAR CHEMISTRY RESEARCH (CSCR)
Director:
S A Bourne, BSc Hons PhD *Cape Town* CChem FRSC FSACI
Academic Staff:
M W Mogodi, BSc Hons PhD *Witwatersrand*
C L Oliver, BSc Hons PhD *Cape Town* MSACI
Senior Research Scholars:
M R Caira, MSc PhD *Cape Town* Dr Hons Causa Univ Med Pharm 'Iuliu Hatieganu' *Romania*
L R Nassimbeni, MSc *Rhodes* PhD *Cape Town* CChem FRSC FRSSAf FSACI

The research activities of the Department reflect the wide range and scope of the traditional sub-disciplines of inorganic, organic and physical chemistry, sustained by analytical, spectroscopic and computational methodology. The Department has active research groups with strengths in catalysis, bioinorganic, biophysical and bioanalytical chemistry, synthetic chemistry, medicinal chemistry, supramolecular chemistry, scientific computing and chemical glycobiology. Programmes are devoted to fundamental and applied chemical research, and to interdisciplinary studies in which chemistry plays a key role. Synthetic studies are carried out in organic, organometallic and co-ordination chemistry, in order to develop and apply new methodology, and to prepare biologically active compounds, novel catalysts and components of new materials. These studies also provide tools for analytical and separation science, and models for advanced structural and conformational work. Molecular structure determination with the aid of spectroscopic and X-ray diffraction techniques are two areas of specialisation in the Department. Computational chemistry is a leading area of specialisation supported by several state-of-the-art clusters. Computer code development and modelling applications of biological and industrial problems play a key role in many of the Department's research programmes. There is also an active research thrust in the area of chemistry education, with a particular focus on student learning in tertiary level chemistry courses.

The Department of Chemistry is home to four UCT-accredited research units:

The *Centre for Supramolecular Chemistry Research, CSCR (Dir. Professor Susan Bourne)* studies the physical chemistry of supramolecular systems. Research projects include the synthesis and characterization of metal organic frameworks (MOFs) and large metal-containing supramolecular assemblies with the potential for guest uptake (gas storage, molecular sensing), the study of selectivity in organic host-guest systems, and the beneficiation of pharmaceutically relevant materials through the investigation of their polymorphs, solvates, cyclodextrin inclusion complexes and cocrystals. Solid phases are studied using powder and single crystal X-ray diffraction, thermal analysis (including TGA and DSC) and spectroscopy (FTIR and solid-state NMR techniques). The thermodynamics of inclusion and complexation processes in solution are investigated by high-resolution NMR spectroscopy and isothermal titration calorimetry.

The *MRC/UCT Drug Discovery & Development Research Unit (Dir. Professor Kelly Chibale)*. The mandate of this unit includes the development of infrastructural and operational systems for new drug discovery and development, with special reference to natural product-guided medicinal chemistry, as well as biological screening platforms against communicable and non-communicable diseases.

H3D Drug Discovery and Development Centre (Dir. Professor Kelly Chibale) aims to bridge the gap between basic and clinical studies, training a new generation of African scientists with key skills required for drug discovery and development – integrating medicinal chemistry, biology, pharmacology as well as drug metabolism and pharmacokinetics (DMPK) studies as reflected in the processes of Absorption, Distribution, Metabolism and Excretion (ADME). H3D also focuses on beneficiation of clinically used drugs, including generic medicines. Drug beneficiation, amongst other things, involves selection of the optimum form of a solid drug candidate for pharmaceutical development and (re)formulation.

The *Scientific Computing Research Unit, SCRU (Dir. Professor Kevin J. Naidoo)* develops state-of-the-art high performance computing (HPC) software as well as providing a modelling and informatics platform for applications in chemistry and chemical biology. SCRU's research activities include the development of software acceleration for life science applications. This aspect of the research is supported by hardware giant Nvidia Corporation. SCRU's specialised HPC facility houses South Africa's most sophisticated scientific computing servers and GPU clusters designed for chemical and chemical biology applications. The specific objectives of the unit are to trace gene-to-glycan biochemical schemes important in glycobiology as well as model enzyme-catalysed chemical reactions and ionic liquids.

The research enterprise of the Department of Chemistry is significantly enhanced by the appointment of two of its permanent staff members to DST/NRF South African National Research Chairs - Professor Kevin Naidoo in *Scientific Computing* and Professor Kelly Chibale in *Drug Discovery*. These highly prestigious appointments have raised the Department's international research profile significantly and contribute substantially to its research outputs.

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

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 G21 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.

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 & the Built Environment. CEM1009H and CEM1010H are half courses taken by students who transfer to 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. Details of these courses can be found in the relevant faculty student handbooks.

Undergraduate Courses

First-Year Courses

CEM1000W CHEMISTRY 1000
NOTES: Preference will be given to students registered in the Science Faculty. Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to CEM1009H from week 7.
36 NQF credits at NQF level 5
Convener: Professor G S Smith
Course entry requirements: Students wishing to register for CEM1000W will normally be expected to have passed NSC Physical Science with at least 60% and NSC Mathematics with at least 70%.
Course outline:
This course lays the foundation of chemistry in its context as a central science for scientists and engineers working in the chemical, biological or earth sciences or in chemical engineering.

Fundamental concepts in chemistry are covered to illustrate their application to understanding the molecular nature of the world around us. Topics include microscopic and macroscopic concepts, atomic structure, chemical bonding and molecular structure, the chemistry of the elements and inorganic chemistry, chemical equilibrium, acids and bases, solubility, phases of matter, thermochemistry and thermodynamics, colligative properties, oxidation and reduction, electrochemistry and chemical kinetics. The course continues with an introduction to the language of organic chemistry, including structure and reactivity in organic chemistry, describing and predicting organic reactivity and the properties and reactivity of biologically important molecules. Practicals aim to develop essential manipulative and technical laboratory skills, as well as to draw links to interpreting the physical world in terms of its molecular nature. A blended approach to learning may be used where academic activities will be delivered online and face-to-face, if feasible. This will be at the discretion of the course convener.
Lecture times: Monday to Wednesday and Friday, 2nd or 4th period. Tutorials: Thursday 2nd or 4th period. Practicals: Tuesday, Thursday or Friday, 14h00 - 17h00.
DP requirements: Attendance and completion of practicals, tests and tutorial exercises, and at least 35% for the class record.
Assessment: Class record (comprising tests, tutorials and practicals) counts 50%; one 3-hour examination written in November counts 50%. A subminimum of 40% is required in the final examination.

CEM1009H CHEMISTRY 1009

NOTES: 1) Preference will be given to students registered in the Science Faculty. 2) 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). 3) The course 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. 4) CEM1009H + CEM1010H is equivalent to CEM1000W in level, credit value towards the degree and as prerequisite for certain other courses.
18 NQF credits at NQF level 5
Convener: Dr C Edmonds-Smith
Course entry requirements: Admission will be restricted to students who have passed NSC Physical Science with at least 60%. The permission of the Dean or Head of Department is required prior to registration for this course.
Course outline:
This course lays the foundation of chemistry in its context as a central science for scientists working in the chemical, biological or earth sciences. 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.
Lecture times: Wednesday - Friday, 4th period. Tutorials: Monday and Tuesday, 4th period. Practicals: 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, tutorials and practicals) counts 50%; one 2-hour examination written in November counts 50%. A subminimum of 50% is required in the final examination.

CEM1010H CHEMISTRY 1010

NOTES: 1) This course follows on from CEM1009H and also 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. 2) CEM1009H + CEM1010H is equivalent to CEM1000W in level, credit value towards the degree and as prerequisite for certain other courses.

18 NQF credits at NQF level 5

Convener: Dr S Douman

Course entry requirements: CEM1009H

Course outline:

Topics covered at a more advanced level 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.

Lecture times: Monday - Wednesday and Friday, 4th period,. Tutorials: Thursday, 4th. Practicals: 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, tutorials and practicals) counts 50%; one 2-hour examination written in November counts 50%. A subminimum of 40% is required in the final examination.

Second-Year Courses

CEM2005W is required for students proceeding to a major in Chemistry.

CEM2005W INTERMEDIATE CHEMISTRY

48 NQF credits at NQF level 6

Convener: Dr G A Venter

Course entry requirements: For Science students: CEM1000W (or equivalent), 1000-level full course in Physics, 1000-level full or semester course in Mathematics. Concurrent registration for STA1000F/S (or equivalent) is highly recommended. For Chemical Engineering students: CEM1000W (or equivalent), PHY1012F/S, MAM1020F/S, CHE1005W

Course outline:

This course develops the foundations of a major in Chemistry at an intermediate level and allows continuation to third-year Chemistry for the completion of a major in Chemistry. The theory component features a set of intermediate topics, and the laboratory component develops both experimental and interpretative skills. The course includes the following topics: spectroscopy and modern analytical tools, introduction to inorganic chemistry, organic structure and reactivity, thermodynamics, thermodynamics of solutions, phase equilibria, chemical reaction kinetics and equilibria, reactions of organic molecules (patterns, predictions and preparation of new products), introduction to coordination chemistry, structures and energetics of inorganic solids and electrochemistry. The practical course covers the same topics and aims to develop manipulative and technical laboratory skills including the application of modern analytical methods to the elucidation of chemical structures.

Lecture times: Monday - Friday, 3rd period. Tutorials and problem sheets by arrangement. Practicals, EBE: Tuesday, 14h00 - 17h00; Science: Thursday, 14h00 - 17h00.

DP requirements: Attendance and completion of practicals, tests and tutorial exercises; at least 40% average for practical exams.

Assessment: The class record counts 50%; one 3-hour examination written in November counts 50%. The class record consists of class tests (20%), tutorials and problem sheets (10%), practical reports (10%) and practical exams (10%). A subminimum of 40% is required in the final examination.

Third-Year Courses

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

CEM3005W CHEMISTRY 3005

72 NQF credits at NQF level 7

Convener: Associate Professor C Veale

Course entry requirements: CEM2005W, 1000-level full course in Mathematics; completion of or concurrent registration for STA1000F/S is highly recommended.

Course outline:

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

Lecture times: Monday - Friday, 3rd period. Practicals: Wednesday and Friday, 14h00 - 17h00.

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

Assessment: Class record (comprising class tests [20%], tutorials [5%] and practicals [25%]) counts 50%; a 3-hour June examination counts 25%; and a 3-hour November examination counts 25% towards the final mark. A subminimum aggregate of 40% across the June and November examination paper, together with at least 50% overall is required to pass the course.

Postgraduate Courses

CEM4000W CHEMISTRY HONOURS

Since the code CEM4000W will not carry a NQF credit value, students will be concurrently registered for CEM4001W (coursework component of 94 NQF credits) and CEM4002W (research project of 66 NQF credits). Entrance is limited to 18 students.

160 NQF credits at NQF level 8; the combined credit value of both components.

Convener: Dr S Ngubane

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. UCT graduates 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 the 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 are taught through experiential workshops and lectures covering topics in NMR spectroscopy, X-ray methods of analysis, introduction to molecular modelling and separation methods. The coursework component provides the conceptual tools required in modern inorganic, organic and physical chemistry. Topics covered include inorganic spectroscopy, organometallic chemistry, bioinorganic chemistry and catalysis (inorganic chemistry), stereochemistry and FMO theory, p-block synthetic methodology, green

chemistry and natural products (organic chemistry), as well as statistical thermodynamics, quantum chemistry, solid-state chemistry and group theory (physical chemistry). A 4-week extended practical covering aspects of synthesis, spectroscopy and analysis is carried out in the first semester alongside the core course. A workshop on scientific writing is carried out during this period. In the second semester, after submission of a research proposal, the student engages in 10 weeks of full-time research work which culminates in the presentation of a short dissertation, research poster and an oral presentation to the Department. Training in oral communication is provided during this period.
Lecture times: By arrangement. Lectures, tutorials and practicals start at the end of January. Lectures and tutorials are daily in the first four periods and at other times arranged. The extended practical work occupies one afternoon 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, 45% for the Modern Instrumental Methods and Group Theory module, complete all practical work, tutorial assignments, generic skills course and any other compulsory activities. These component parts of the course will be combined in a final overall mark which will be reflected against the course code CEM4000W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

CEM5000W CHEMISTRY DISSERTATION
180 NQF credits at NQF 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.

CEM5002W COMPUTATIONAL SCIENCE DISSERTATION
180 NQF credits at NQF level 9
Course outline:
The academic disciplines of chemistry, chemical biology and biophysics have a critical dependence on computer simulation and large scale data analysis to understand observed phenomena and advance the frontiers of disciplinary knowledge. This course aims to prepare students to undertake research in computational science as applied to chemistry, chemical biology, biophysics and chemical physics. The two streams of focus are computation and informatics. The course will commence with project assignment followed by a combination of in-house and online short training (non-credit) courses in: Scientific Computing, High Performance Computing, Computational Methods for Data Analysis, Data Management, R Programming, Quantum Mechanics and Statistical Mechanics. The above short training courses are designed to prepare students to successfully complete a computational science project and dissertation.

CEM5004W TERTIARY CHEMISTRY EDUCATION DISSERTATION
180 NQF credits at NQF 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 CHEMISTRY THESIS
360 NQF credits at NQF 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.

CEM6001W TERTIARY CHEMISTRY EDUCATION THESIS
360 NQF credits at NQF 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.

CEM6002W COMPUTATIONAL SCIENCE THESIS
360 NQF credits at NQF 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.

DEPARTMENT OF COMPUTER SCIENCE

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

The Department of Computer Science forms part of the School of IT.
The School focuses on leveraging the excellent research and teaching of both departments to provide students with the relevant knowledge and skills to contribute to the international and South African Information Technology Communities.

For further detail and degree options, see www.sit.uct.ac.za

Professor and Head of Department:
M M Kuttel, MSc PhD *Cape Town*
CAIR-UCT Chair in Artificial Intelligence:
T A Meyer, MSc *RAU* PhD *Unisa*
DSI/NRF-UCT SARChI Chair in Artificial Intelligence (AI) Systems:
D Moodley, MSc *UNP* PhD *UKZN*
Professors:
J E Gain, MSc *Rhodes* PhD *Cantab*
M M Kuttel, MSc PhD *Cape Town*
T A Meyer, MSc *RAU* PhD *Unisa*
R Simmonds, BSc PhD *Bath*
Honorary Professor:
I J Varzinczak, PhD *Université Paul Sabatier*
Associate Professors:
S Berman, BSc *Rhodes* MSc PhD *Cape Town*
M Densmore, BA *Cornell* MSc *UCL* PhD *Berkeley*
C M Keet, BSc Hons *OU* MSc *Wageningen* MA *Limerick* PhD *Bozen-Bolzano*
P C Marais, MSc *Cape Town* DPhil *Oxon*
G Nitschke, BSc Hons *Curtin* PhD *VU Amsterdam*
Adjunct Associate Professor:
D Johnson, BEng *Cape Town* MEng *Pret* PhD *Santa Barbara*
Senior Lecturers:
J M Buys, MSc *Stell* DPhil *Oxon*
J Chavula, MSc *Lancaster* PhD *Cape Town*
A Safla, MSc *UKZN*
G Stewart, BSc Hons *Cape Town*
Adjunct Senior Lecturer:
G Casini, PhD *Pisa*
Lecturers:
Z Mahlaza, MSc PhD *Cape Town*
F R Meyer, BSc Hons *Stell* MSc *Amsterdam*
K Prag, MSc *Witwatersrand*
Adjunct Lecturer:
M Molapo, MSc PhD *Cape Town*
Honorary Research Associate:
J Heyninck, PhD *Ruhr*

Computer System Managers:
C Balfour, BSocSc *Cape Town* BA (SS) Hons *Unisa*
S Chetty, IT Management Cert *Cape Town*
Chief Scientific Officer:
S Jamieson, MSc *London*
Senior Scientific Officer:
L Poulo, MSc *Cape Town*
Administrative Officers
T Jenneker
T Potgieter, MSc *UP*
Administrative Assistant:
S Apollis
Senior Secretary:

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 on the Departmental web pages or by writing to the department.
ARTIFICIAL INTELLIGENCE RESEARCH UNIT (Director: Associate Professor Deshen Moodley, Deputy Director: Professor Tommie Meyer) AND CENTRE FOR ARTIFICIAL INTELLIGENCE RESEARCH (Co-Director: Professor Tommie Meyer, Co-Director: Associate Professor Deshen Moodley). The Artificial Intelligence Research Unit (AIRU) is an accredited research unit in the Department of Computer Science. Through its two research focus areas, Knowledge Representation and Reasoning, and Adaptive and Cognitive Systems, AIRU aims to harness blue sky research to explore innovative applications of Artificial Intelligence that can serve to advance social and economic development in South Africa and Africa. AIRU also hosts the Centre for Artificial Intelligence Research (CAIR). CAIR is a national distributed research centre with research groupings across eight South African universities. CAIR conducts research in both the foundational and applied aspects of Artificial Intelligence.
COLLABORATIVE VISUAL COMPUTING (Co-ordinator: Professor James Gain). Topics of research include: Collaborative Virtual Environments; Usability and Human-Computer Interaction; Computer Graphics; Computer vision and machine learning for 2D/3D scene analysis; and Virtual Reality. Special interests within the CVC lab include Virtual Environments, Modelling and Procedural Graphics.
DIGITAL LIBRARIES (Co-ordinator: Professor Hussein Suleman). Research areas covered within digital libraries include information retrieval; ontologies; natural language processing and generation; digital archives and repositories; interoperability and protocols and cultural heritage preservation.
EVOLUTIONARY MACHINE LEARNING (Co-ordinator: Associate Professor Geoff Nitschke). The main focus of the research group is to devise new methods using algorithmic techniques from a broad range of biologically inspired machine learning sub-fields such as evolutionary computation and artificial neural networks as well as statistical machine learning and apply such methods to adapt artificial brains on various experimental platforms, including: evolutionary-robotic, artificial life and agent-based systems.
HIGH PERFORMANCE COMPUTING (Co-ordinator: Professor Michelle Kuttel). This laboratory investigates aspects of high-performance computing and computational science, including: simulation, parallel algorithms and programming; molecular modelling; and scientific visualisation.
HUMAN-COMPUTER INTERACTION (Co-ordinator: Associate Professor Melissa Densmore). This laboratory takes a community-centred approach to the design and deployment of systems. Domains of research include design for mothers, design for community-health workers, local content creation for communities, media-based peer health education, and co-design across borders,

with a focus on the role of HCI in making effective, usable and sustainable systems to address problems of inequality and social justice.
KNOWLEDGE ENGINEERING (Co-ordinator: Associate Professor Maria Keet). The aim of the team's activities is to contribute computing theory, methods, and techniques to the knowledge society. The scope of the KEEN team is knowledge engineering in its broad sense. This includes ontology engineering, the Semantic Web, intelligent (logic-based, ontology-driven) conceptual modelling, and natural language generation.
NATURAL LANGUAGE PROCESSING (Co-ordinator: Dr Jan Buys). This research group investigates aspects of natural language processing through the development of data-driven machine learning methods. Research topics include: methods for automatic text generation, language modelling and machine translation; supervised and unsupervised models for discovering linguistic structure in text; and developing datasets and NLP models for low-resource languages, with a particular focus on African and South African languages.
NETWORKING FOR DEVELOPMENT (Co-ordinators: Dr Josiah Chavula and Associate Professor David L Johnson). The Net4D laboratory focuses on the design and implementation of network infrastructure suitable for developing regions, as well as methods for sharing information in resource-scarce areas using alternative technologies. Main areas of research include Network Measurements, Wireless Community Networks, Localised Cloud Services, Software Defined Networking (SDN), and AI-driven network engineering. Our work involves a mix of creating solutions using network theory and systems, combined with trial networks that provide tangible measurable results.

Undergraduate Courses

Credit will not be given for CSC1015F/S and CSC1016S together with CSC1010H and CSC1011H.

First-Year Courses

CSC1010H COMPUTER SCIENCE 1010
NOTE: 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). The course 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. CSC1010H is equivalent to CSC1015F in level, credit value towards the degree and as prerequisite for certain other courses.
18 NQF credits at NQF level 5
Convener: G Stewart
Course entry requirements: The permission of the Dean or Head of Department is required prior to registration for this course.
Course outline:
This course is an introduction to problem solving, algorithm development and programming in the Python language. It includes fundamental programming constructs and abstractions, sorting and searching techniques, and machine representations of data. The practical component covers input/output, conditionals, loops, strings, functions, arrays, lists, dictionaries, recursion, text files and exceptions in Python. Students are taught testing and debugging, as well as sorting and searching algorithms, algorithm complexity and equivalence classes. Number systems, binary arithmetic, boolean algebra and logic gates are also introduced
Lecture times: Monday - Friday, 5th period, Tutorials: One per week, replacing one lecture, Practicals: One per week, Thursday, 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 examination written in November counts 60%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

CSC1011H COMPUTER SCIENCE 1011

NOTE: 1) This course follows on from CSC1010H and also 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. 2) CSC1011H is equivalent to CSC1016S in level, credit value towards the degree and as prerequisite for certain other courses.

18 NQF credits at NQF level 5

Convener: G Stewart

Course entry requirements: CSC1010H

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, covering object-oriented design techniques and UML diagrams, as well as elementary data structures such as lists, stacks and queues, as well as introducing important considerations relating to Human Computer Interaction and interface design. The practical component includes use of inheritance, polymorphism, interfaces, generics and GUI programming in Java.

Lecture times: Monday - Thursday, 4th period, Tutorials: One per week, replacing one lecture, Practicals: One per week, Monday, 14h00 - 16h00

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

Assessment: Theory tests count 25%; practical tests and practical assignments count 25%; one 2-hour examination written in November counts 50%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

CSC1015F/S COMPUTER SCIENCE 1015

18 NQF credits at NQF level 5

Convener: A Safla and K Prag

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. The course is offered in a blended-learning format: students are provided with a set of online video lectures and contact time is in a tutorial/practical format aimed at reinforcing the principles introduced in the online lectures and giving students time to do exercises under the supervision of tutors.

Lecture times: 4th or 5th period once per week, Tutorials: One per week, replacing one lecture, Practicals: One per week, Monday, Tuesday, Wednesday or Thursday 14h00 - 16h00 or 16h00 - 18h00**DP requirements:** Minimum of 45% aggregate in practical work.

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

Assessment: Theory tests 15%; practical tests and practical assignments 25%; June examination 2 hours 60%. Subminima: 45% for practicals, 45% on weighted average of theory tests and examination.

CSC1016S COMPUTER SCIENCE 1016

18 NQF credits at NQF level 5

Convener: A Safla

Course entry requirements: CSC1015F (At least 45% for CSC1015F or at least 70% for CSC1017F)

Course outline:
This course builds on the foundation of CSC1015F/CSC1010H, with a focus on object-oriented design and programming in Java, as well as introducing important considerations relating to Human Computer Interaction and interface design. The Java component of the course covers object-oriented design techniques and UML diagrams, as well as elementary data structures such as lists, stacks and queues. The practical component includes use of inheritance, polymorphism, interfaces, generics and GUI programming in Java.
Lecture times: 4th or 5th period daily, Tutorials: One per week, replacing one lecture, Practicals: One per week, Monday, Tuesday or Wednesday, 14h00 - 16h00 or 16h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Theory tests count 15%; practical tests and practical assignments count 25%; one 2-hour exam written in November counts 60%. Subminima: 45% for practicals and 45% on weighted average of theory tests and examination.

Second-Year Courses

CSC2001F COMPUTER SCIENCE 2001

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at https://internal.cs.uct.ac.za/teaching/laptop_requirement.html (a tablet will not be suitable). The course convenor will provide details of additional software (open source) required.
24 NQF credits at NQF level 6
Convener: F Meyer
Course entry requirements: (CSC1015F and CSC1016S) or (CSC1010H and CSC1011H)
Course outline:
This course builds on the first year Computer Science foundation with an emphasis on data storage and manipulation. The course covers abstract data types and assertions, recursive algorithms, tree structures such as AVL and B-trees, graph traversals, minimum spanning trees, sets, hashing and priority queues. An introduction to conceptual modelling, database design and relational database manipulation is included. Practical programming in Java in a Unix environment is an important part of the course
Lecture times: Monday - Friday, 2nd period, Four or five lectures per week, Practicals: One 4-hour practical per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 20%; practicals and practical test 30%; exam 50%. Subminima: 45% on weighted average of theory tests and examination.

CSC2002S COMPUTER SCIENCE 2002

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at https://internal.cs.uct.ac.za/teaching/laptop_requirement.html (a tablet will not be suitable). The course convenor will provide details of additional software (open source) required.
24 NQF credits at NQF level 6
Convener: Associate Professor S Berman
Course entry requirements: CSC2001F (At least 45% for CSC2001F)
Course outline:
The aim of this course is to build on the foundational concepts covered in CSC2001F, with further necessary core topics of an undergraduate Computer Science curriculum. These topics comprise: concurrent and parallel computing (including practical work in Java); computer architecture; an introduction to Society, Ethics, and the Profession (covering ethical issues such as property rights, freedom of expression and privacy, free and open source software); and Theory of Computing (including Turing Machines and the limits of computation).
Lecture times: Monday - Friday, 2nd period, Four lectures per week, Practicals: One 4-hour practical per week, Monday - Friday, 14h00 - 18h00

DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 20%; practicals and practical test 30%; exam 50%. Subminima: 45% on weighted average of theory tests and examination.

CSC2004Z PROGRAMMING ASSESSMENT

This is a required course for all students majoring in Computer Science and/or who wish to continue to any third year courses in Computer Science. It should be taken in the second year of study and will demonstrate competency in programming, which is assumed in all third year courses. It is a compulsory course in the Computer Science major CSC05.
0 NQF credits at NQF level 6
Convener: Associate Professor S Berman
Course entry requirements: (CSC1015F and CSC1016S) or (CSC1010H and CSC1011H)
Course outline:
All students who take advanced courses in Computer Science need to build on a foundation of strong programming skills. The aim of this course is to assess and confirm mastery in fundamental programming skills before students can proceed to advanced courses.
Lecture times: None
DP requirements: None
Assessment: Practical programming examination counts for 100%

CSC2005F/S INDEPENDENT RESEARCH IN COMPUTER SCIENCE

24 NQF credits at NQF level 7
Convener: Dr J Chavula
Course entry requirements: Academically strong students may apply for entrance. Selection will be made on the basis of final results in CSC1015F, CSC1016S and CSC2001F. The number of places will be limited depending on the availability of supervisors, and the final decision will be at the discretion of the Head of Department.
Course outline:
This course allows students to pursue a course of independent research in one of the areas of specialisation of the department, as listed on the department's website, under the direct supervision of one of the staff members. Students will learn research methods in Computer Science and apply these in a suitable project. They will also learn about research writing (proposal and report). Students will complete a research project and document this in a research report (mini-dissertation). An intermediate deliverable will be a project proposal and presentation to staff.
Lecture times: Regular meetings with supervisor, by arrangement
Assessment: Proposal 20%, Final research report 80%

CSC2041F INTRODUCTION TO AI 1: KNOWLEDGE REPRESENTATION

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at https://internal.cs.uct.ac.za/teaching/laptop_requirement.html (a tablet will not be suitable). The course convenor will provide details of additional software (open source) required.
24 NQF credits at NQF level 6
Convener: Dr Z Mahlaza
Course entry requirements: CSC1015F/S, CSC1016S, MAM1031F, MAM1032S, (MAM1019H or STA1000X or MAM1008S)
Course outline:
The course introduces the field of Artificial Intelligence and then covers the fundamentals of knowledge representation and reasoning as a paradigm for Artificial Intelligence. It includes relevant topics such as logical agents and the creation of symbolic and logical representations from problem statements. Inference in propositional and first-order logic are used to build upon the fundamentals of computational logic and automated reasoning. An overview of core algorithms for knowledge representation (e.g., tableau, case-based, constraints, SAT solving) is given. Approaches

to handling uncertainty in knowledge representation and reasoning are introduced through random variables, probabilistic inference, and the framework of utility functions for decision making.
Lecture times: Monday - Friday, 3rd period, Four lectures per week, Practicals: One 4-hour practical per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 25%; practicals and practical test 25%; examination 50%. Subminima: 45% on weighted average of theory tests and examination.

CSC2042S INTRODUCTION TO AI 2: MACHINE LEARNING
Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at https://internal.cs.uct.ac.za/teaching/laptop_requirement.html (a tablet will not be suitable). The course convenor will provide details of additional software (open source) required.
24 NQF credits at NQF level 6
Convener: Dr J Buys
Course entry requirements: CSC1015F/S, CSC1016S, MAM1031F or MAM1004F
Course outline:
Machine learning is introduced as a paradigm for Artificial Intelligence. Fundamental machine learning algorithms are introduced, and students implement a subset of those using the Python programming language and modern machine learning frameworks in Python. There is a focus on problem formulation, feature representations and evaluation.
Lecture times: Monday - Friday, 3rd period, Four lectures per week, Practicals: One 4-hour practical per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 25%; practicals and practical test 25%; examination 50%. Subminima: 45% on weighted average of theory tests and examination.

Third-Year Courses

CSC3002F COMPUTER SCIENCE 3002
Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at https://internal.cs.uct.ac.za/teaching/laptop_requirement.html (a tablet will not be suitable). The course convenor will provide details of additional software (open source) required.
36 NQF credits at NQF level 7
Convener: Associate Professor P Marais
Course entry requirements: CSC2001F, CSC2002S, CSC2004Z and ((MAM1004F+MAM1008S) or (MAM1000W) or (MAM1031F or equivalent)).
Course outline:
The course provides an introduction to the structure and organization of operating systems, and computer networks including various logical layers of the ISO OSI layers, focusing on the Internet Protocol suite.
Lecture times: Monday - Friday, 2nd period, Practicals: Two 4-hour practicals per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests count 15%; practical work counts 35%; one 3-hour paper written in June counts 50%. Subminima: 45% for practicals; 45% on weighted average of theory tests and examinations.

CSC3003S COMPUTER SCIENCE 3003
Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at https://internal.cs.uct.ac.za/teaching/laptop_requirement.html (a tablet will not be suitable). The course convenor will provide details of additional software (open source) required.

36 NQF credits at NQF level 7
Convener: Associate Professor P Marais
Course entry requirements: CSC2001F, CSC2002S, CSC2004Z and ((MAM1004F+MAM1008S) or (MAM1000W) or (MAM1031F or equivalent)).
Course outline:
This is a course on two advanced topics: (1) advanced software design is about turning requirements into effective and efficient implementations in a systematic manner; and (2) the algorithms module expands on a topic central to computing. This module describes how algorithms are categorised, and shows interesting algorithms in each category and analyses their complexity. It also touches on Turing machines and the limits of computation.
Lecture times: Monday - Friday, 2nd period, Practicals: Two 4-hour practicals per week, Monday - Friday, 14h00 - 18h00
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests count 15%; practical work counts 35%; one 3-hour paper written in November counts 50%. Subminima: 45% for practicals, 45% on weighted average of theory tests and 35% for the algorithms module (comprising Theory of Algorithms and Theory of Computation) in the final examination.

CSC3022F C++ AND MACHINE LEARNING

This course will not be offered after 2025.
36 NQF credits at NQF level 7
Convener: Dr J Buys
Course entry requirements: CSC2001F, CSC2002S, CSC2004Z and ((MAM1004F+MAM1008S) or (MAM1000W) or (MAM1031F or equivalent)).
Course outline:
This course introduces the C++ programming language, followed by an exploration of topics in machine learning. Students are exposed to different aspects of C++ including templates and functional programming and an in-depth study of the C++ memory model. A basic introduction to a widely used Python ML framework is then provided. A number of machine learning algorithms are introduced and students implement a subset of these using the Python framework. By the end of the course, students should understand how to write efficient object-oriented programs in C++, and also be familiar with major categories of learning algorithms, and be able to select and implement the most appropriate algorithm for a given problem in Python.
Lecture times: Monday – Friday, 3rd period, Practicals: Two 4-hour practicals 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.

CSC3041F AI: AUTOMATED PLANNING AND CONTROL

This course will only be offered from 2026.
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: (CSC2041F or CSC2042S), CSC2001F
Course outline:
This course provides an introduction to problem solving by searching: uninformed search, heuristic search, and adversarial search for games are covered. Introduction to reinforcement learning: Markov Decision Processes for sequential decision making, passive and active reinforcement learning, policy search and data-driven control techniques. The course also covers applications in game playing, planning in interactive environments, and robot navigation and control.
Lecture times: Monday – Friday, 3rd period, Practicals: One 4-hour practical per week, by arrangement
DP requirements: Minimum of 45% aggregate in practical work.

Assessment: Tests 25%; practical work 25%; examinations 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations.

CSC3042F AI: DEEP LEARNING

This course will only be offered from 2026.
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: CSC2001F, CSC2042S
Course outline:
The course builds on fundamental concepts in machine learning to introduce modern practical deep neural networks. Different neural network architectures are covered, including deep feedforward networks, convolutional and recurrent neural networks, and Transformers. There is a focus on the design and implementation of scalable deep learning systems. A selection of applications from Natural Language Processing and Computer Vision are included. Finally, ethics for machine learning is introduced through a number of case studies, covering issues such as dataset and algorithmic bias.
Lecture times: Monday – Friday, 3rd period, Practicals: One 4-hour practical per week, by arrangement
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 25%; practical work 25%; examinations 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations.

CSC3043S AI: REASONING IN AI

This course will only be offered from 2026.
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: CSC2041F, CSC2042S, CSC2001F
Course outline:
This course covers a selection of advanced topics in reasoning in Artificial Intelligence such as: reasoning through language with Large Language Models; visual reasoning with diffusion models; probabilistic reasoning with Bayesian networks; logic programming; and expert systems.
Lecture times: Monday – Friday, 3rd period, Practicals: One 4-hour practical per week, by arrangement
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 25%; practical work 25%; examinations 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations.

CSC3044S AI: AI SYSTEMS

This course will only be offered from 2026.
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: CSC2001F, CSC2041F, CSC2042S, (CSC3041F or CSC3042F)
Course outline:
This course provides an overview of agent architectures: cognitive architectures; software agents such as collaborative and information-gathering agents; as well as human-agent interaction and societal impacts of AI systems. Students will apply these concepts through a practical AI system development capstone project.
Lecture times: Monday – Friday, 3rd period, Practicals: One 4-hour practical per week, by arrangement
DP requirements: Minimum of 45% aggregate in practical work.
Assessment: Tests 25%; practical work 25%; examinations 50%. Subminima: 45% for practicals, 45% weighted average of theory tests and examinations.

Postgraduate Courses

Honours

BSc Hons specialising in Computer Science

Programme Convener: Associate Professor C M Keet
Entry requirements – BSc Hons (CS): A BSc degree majoring in Computer Science from UCT, with an average of at least 60% in both CSC3002F and CSC3003S, or permission from the Head of Department. There are limited places and acceptance is competitive.
Degree Rules and Structure: See General Rules for Honours Degrees in the front section of this book.
Laptop Requirement: Each student registered for Honours is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available *at* https://internal.cs.uct.ac.za/teaching/laptop_requirement.html *(a tablet will not be suitable).* The handbook outlining the current year's programme is available from the department.
Progression: While it is expected that all students will complete the degree in a single academic year, students may be allowed to complete missing credits in a second year, with permission from the Dean.

CSC4002W COMPUTER SCIENCE HONOURS PROJECT
60 NQF credits at NQF level 8
Convener: Associate Professor C M Keet
Course entry requirements: BSc degree with a major in Computer Science from UCT. An overall pass for the coursework component of this degree.
Course outline:
This course is the compulsory research project component of a Computer Science Honours degree. The research project comprises a large project run over the course of the year under academic supervision, with a final mini-dissertation and other project deliverables.

CSC4007Z SELECTED HONOURS MODULE IN COMPUTER SCIENCE
This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Associate Professor C M Keet
Course entry requirements: Permission from the course convener.
Course outline:
This course introduces advanced and cutting edge topics in Computer Science as they emerge with new areas of investigation or practice.
DP requirements: None
Assessment: Exam: 50% and Coursework: 50%

CSC4010Z ADVANCED TOPICS IN COMPUTER SCIENCE HONOURS 2
This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Associate Professor C M Keet
Course entry requirements: Permission from the course convener.
Course outline:
The course aims to introduce students to advanced and cutting edge topics in Computer Science as they emerge as new areas of investigation or practice, and expose students to new research specialisations in the department. Students will obtain an advanced theoretical understanding of the topic and the ability to apply practically skills learnt related to this specific topic.
DP requirements: None
Assessment: Exam: 50% and Coursework: 50%

CSC4013Z VISUALISATION

This course will not be offered every year.

12 NQF credits at NQF level 8

Convener: Professor M M Kuttel

Course entry requirements: Admission to BSc Hons specialising in Computer Science, or permission of the course convenor.

Course outline:

Visualisation is the graphical representation of data with the goal of improving comprehension, communication, hypothesis generation and decision making. This course aims to teach the principles of effective visualisation of large, multidimensional data sets. We cover the field of visual thinking, outlining current understanding of human perception and demonstrating how we can use this knowledge to create more effective data visualisations.

DP requirements: 40% for assignment component.

Assessment: Students will be assessed with assignments (50%) and an exam (50%). A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

CSC4019Z RESEARCH & INNOVATION

16 NQF credits at NQF level 8

Convener: F Meyer

Course entry requirements: Admission to BSc Hons specialising in Computer Science.

Course outline:

This course introduces students to knowledge essential for computer professionals and researchers. The course develops communication and writing skills and introduces basic research methodology. The first module of the course focusses on Professional Communications in general, including written and visual communication.

A second component teaches entrepreneurship as New Venture Planning: a critical element of economic development. This module introduces students to the ideas, theories and concepts associated with entrepreneurial ventures, with a focus on the elements needed to develop a viable business plan.

A third module teaches scientific writing and research methods for statistical analysis and evaluation of data.

DP requirements: None

Assessment: The practical aspects of the work will be evaluated through: a series of 4 NVP assignments (10%/15%/35%/40%), culminating in a business plan; a literature review for the project (35%) and the project proposal (40%). NVP and RM are equally weighted.

CSC4020Z FUNCTIONAL PROGRAMMING

12 NQF credits at NQF level 8

Convener: Associate Professor G Nitschke

Course entry requirements: Admission to BSc Hons specialising in Computer Science.

Course outline:

This course will expose students to the alternative functional programming paradigm, its theoretical underpinnings in the lambda calculus and its practical implementation in specific languages. Students' theoretical understanding of computability will be expanded from the introduction in the undergraduate theory of algorithms module where a Turing machine approach was used. Students will be introduced to the notion of "functions as rules".

Students will also learn how to use functional programming as a practical programming skill. Topics include side effect free programming and its benefits; first-class functions and higher-order functions; partial application and defining higher-order operations on aggregates, especially map, reduce/fold, and filter. Important new functional programming concepts including lazy evaluation and monads.

DP requirements: None

Assessment: Final examination: 50%; Practical assignments: 50%

CSC4021Z COMPILERS 1
12 NQF credits at NQF level 8
Convener: G Stewart
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology.
Course outline:
This course will introduce students to the inner mechanics of a modern programming language compiler or interpreter. Students will appreciate why programming languages are designed in particular ways and they will learn how to develop compilers and compiler-related tools. Course content will include: language classes, formal grammars, recursive descent parsing, tokenisers, parsing, and abstract syntax trees.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC4022Z COMPILERS 2
This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: To be advised
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology.
Course outline:
This course will introduce students to the inner mechanics of a modern programming language compiler or interpreter. Students will appreciate why programming languages are designed in particular ways and they will learn how to develop compilers and compiler-related tools. Course content will include: semantic analysis, activation records, intermediate code, optimisations, basic block analysis, instruction selection, liveness analysis and register allocation.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC4023Z BIG DATA MANAGEMENT & ANALYSIS
This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Associate Professor C M Keet
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology. A basic understanding of databases, similar to the CSC2001F database material, is expected.
Course outline:
This course will enable students to understand the challenges of designing and implementing database applications at very large scale. They will know the approaches taken by big data technologies such as relational databases, NoSQL, Hadoop and data mining tools, and have practice in applying this knowledge.
The focus of this course is on systems designed for big data storage and analysis. Topics covered include NoSQL, Hadoop, HBase, HIVE, YARN and Apache Spark, as well as an introduction to data mining techniques and tools. The course concludes with a series of short presentations on new developments in database technology such as spatial, temporal, mobile, multimedia, text and social network data management.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC4024Z HUMAN COMPUTER INTERACTION
This course will not be offered in 2025.
12 NQF credits at NQF level 8
Convener: Associate Professor M Densmore

Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology.
Course outline:
This course will introduce you to basic concepts and practice around user-centred design of digital systems.
This course covers how to design and evaluate interactive systems for real users both in the developed and developing worlds. We will look at both theory and practice of designing digital systems.
Topics include the design cycle, sketching and storyboarding, task analysis, contextual inquiry, conceptual models, usability inspection, human information processing, experience design, and qualitative and quantitative study design and evaluation. We may also invite guest speakers from industry and research to talk about their own experiences with user-centred design.
DP requirements: None
Assessment: Participation: 5% (measured by participation in user studies, in-class activities, in-class discussion/presentations, and pre-class quizzes online) Individual Practical Assessments: 15%. Group Project Assessments: 30% Final Exam: 50%

CSC4025Z ARTIFICIAL INTELLIGENCE

This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Dr J Buys
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology.
Course outline:
This course will expose students to foundational concepts and computational techniques in modern Artificial Intelligence and their theoretical underpinnings in logic, search, optimisation and mathematical statistics. Students will also learn how to select and implement these techniques to solve various real world problems. Core topics will include: problem solving, knowledge representation and reasoning, machine learning and dealing with uncertainty, with selected topics from: planning, agents and natural language processing.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC4026Z NETWORK & INTERNETWORK SECURITY

This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Dr J Chavula
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology. Computer Networking at third year level.
Course outline:
The objective of this course is to introduce cryptographic techniques and protocols for secure exchange of information on networks and internetworks, and to examine the deployment of these in emerging technologies.
The course will cover risk issues (ISO27000; PoPI act); security services; conventional encryption (classical encryption techniques, DES/AES, key distribution, key generation); public-key encryption (RSA algorithm, key management, certification hierarchies); authentication & digital signatures; authentication and key exchange (Kerberos, Diffie-Hellman); electronic messaging security (S-MIME/PGP/WhatsApp); HTTP security (S-HTTP, SSL, capabilities); secure electronic commerce (SET); web application security (OWASP); web-services security (WS-Security, SAML); cloud computing security (public vs private clouds); critical infrastructure security (Stuxnet etc); Security Information & Event Management (SIEM) and next generation Security Operation Centres.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC4027Z COMPUTER GAME DESIGN

This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Professor J Gain
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology. Computer Graphics at third year level.
Course outline:
This course will introduce students to the techniques and technologies used in designing and programming computer games and related applications.
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 and 3D games. The course content include: appropriate terminology, methods, and tools for computer game development are introduced; fundamental algorithms for 2D game development; design and development of simple 3D and networked games; uncertainty and constantly changing gaming environments; and techniques for multiuser and distributed games.
This is a practical course: students collaborate with designers and artists to produce a full games that builds on concepts covered in lectures.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC4028Z HIGH-PERFORMANCE COMPUTING

This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Professor M M Kuttel
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology.
Course outline:
High performance computing is high-speed computing - the use of parallel processing to run application programs efficiently, reliably and fast. It is an interdisciplinary field, encompassing computer architecture, programming languages, system software and benchmarking, as well as subject domains such as Physics, Astronomy, Chemistry, Finance etc. In this course, we cover the following topics. An introduction to and motivation for high performance computing (HPC), including typical applications; HPC architectures with a focus on current supercomputer design; programming interfaces for paralllel computing (OpenMP and MPI); parallel libraries; parallel algorithms; bench marking, profiling and debugging. We then examine case studies of papers from the annual SuperComputing conference.
DP requirements: None
Assessment: Final examination: 50%; Coursework: 50%; Subminima of 45% for both exam and the assignments.

CSC4029Z INTRODUCTION TO COMPUTER GRAPHICS

This course will not be offered every year.
12 NQF credits at NQF level 8
Convener: Associate Professor P Marais
Course entry requirements: Admission to BSc Hons specialising in Computer Science or Information Technology.
Course outline:
This course will expose students to the foundational theory of 3D computer graphics and provide a short introduction to OpenGL and GLSL shader programming. Theory will encompass the formal description of 3D models and how these can be lit and rendered to produce a desired representation of a 3D scene. On the practical side, a series of short assignments will introduce basic OpenGL and shader programming and allow students to apply the theory they have learned. Topics include: the rendering pipeline and rasterization; 3D mesh model representation;

homogeneous coordinates; modelling and viewing transformations; shading, lighting and texturing; GLSL shader programming; OpenGL/WebGL programming; advanced rendering - ray-tracing.
DP requirements: 40% in the practical assignments for the course.
Assessment: Assignment (40%), Exam (60%)

STA4026S ANALYTICS
18 NQF credits at NQF level 8
Convener: Dr E Pienaar
Course entry requirements: Undergraduate degree that included a substantial degree of training in quantitative subjects and programming, as assessed by the course convener.
Course outline:
This course covers various topics in the field of Analytics. Section A, Theory and Application of Supervised Learning, covers topics including but not limited to the bias-variance trade-off, model validation methods, linear and non-linear models for regression and classification, both under constrained and unconstrained optimisation (i.e., objective function regularisation), classification model evaluation metrics (accuracy, precision, recall, ROC curves etc.), and non-parametric heuristics. These include K-nearest neighbours, regression and classification trees, ensemble methods such as bagging, random forests, and gradient boosted trees (with variations). Section B, First Principles Neural Networks, develops the mathematics that underpins model construction and optimisation for the class from the original perceptron learning algorithm, logistic regression and polytomous regression to the famous backpropagation algorithm that is used during the implementation of gradient descent as a learning algorithm. As such, we will not be using the download-and-run-X-package approach but rather we will be coding all relevant machinery from first principles and use this code to conduct analysis. Finally, Section C, Theory and Application of Unsupervised Learning covers distance based clustering (K-means/medoids/modes and Hierarchical), density based clustering, probabilistic methods, and self-organising maps. Finally a brief digression into association rule mining is made. All coding is conducted in R and typesetting in LaTeX, R-Markdown, or equivalents. A large proportion of the coding is from first principles and is examined as such.
DP requirements: Satisfactory completion of assignments
Assessment: Assignments, a Computer-based Exam and a Theory Exam

Master's specialising in Computer Science by Dissertation

CSC5000W COMPUTER SCIENCE DISSERTATION
180 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Computer Science Honours from UCT prior to 2018, or permission from the Head of Department in exceptional cases. In the normal case, students will be expected to register for Master's specialising in Computer Science, by coursework and minor dissertation.
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. Students will be expected to attend a research methods course in the first year.

Master's specialising in Computer Science or Artificial Intelligence or Human-Computer Interaction, by Coursework and Minor dissertation

The Department offers two Master's streams: MSc specialising in Computer Science (CS) and MSc specialising in Artificial Intelligence (AI).

Programme Convener: Professor J Gain
Course structure: See General rules for Master's Degrees in the front section of this book.
Progression: In any given year, students must either be registered for or have passed at least six of the elective courses. Students get two attempts to pass each course. Should a student fail any course on the second attempt, they will not be allowed to continue with the degree. This applies to the Research Methods course as well. Students should pass a minimum of two elective courses per year. With the course convenor's permission, students who have passed the Research Methods course as well as four of the six elective courses may be permitted to register for CSC5002W/CSC5037W/CSC5041W. Students are not eligible to register for CSC5002W/CSC5037W/CSC5041W until they have completed the Research Methods course and at least four (out of six) elective courses.

CSC5002W COMPUTER SCIENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Completion of all coursework, or permission of the convener.
Course outline:
Upon successful completion of the coursework, students will be required to register for this minor dissertation component and complete a suitable research project under supervision of an appropriate computer science academic staff member. The research component will expose the student to research methodology, experimental design, data analysis techniques, and dissertation writing skills. Students should be in a position to submit the final dissertation by the end of the year.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

CSC5037W ARTIFICIAL INTELLIGENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Completion of all coursework, or permission of the convener.
Course outline:
Upon successful completion of the coursework component, students will be required to register for this minor dissertation component in Artificial Intelligence and complete a suitable research project on a topic within the broad area of Artificial Intelligence under supervision of an appropriate computer science academic staff member. The research component will expose the student to research methodology, experimental design, data analysis techniques, and dissertation writing skills. Students should be in a position to submit the final dissertation by the end of the year.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

CSC5008Z DATA VISUALISATION
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor M M Kuttel
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener.

Course outline:
Visualisation is the graphical representation of data with the goal of improving comprehension, communication, hypothesis generation and decision making. This course aims to teach the principles of effective visualisation of large, multidimensional data sets. We cover the field of visual thinking, outlining current understanding of human perception and demonstrating how we can use this knowledge to create more effective data visualisations.
DP requirements: 40% for assignment component.
Assessment: Students will be assessed with assignments (50%) and an exam (50%). A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

CSC5020Z RESEARCH METHODS IN COMPUTER SCIENCE

18 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener.
Course outline:
The objective of the Research Methods course is to introduce students to a suite of research methods from the perspective of Computer Science, that will prepare them for the minor dissertation component of the degree. More specifically, the aim is to ensure that students are able to write an appropriate research proposal, and have a good understanding of what it means to conduct research within Computer Science.
Course content includes: An introduction to finding and reading research papers; Literature reviews; Writing research proposals; Problem statements, research questions, and hypotheses; Types of research within Computer Science; Research Ethics within Computer Science; Scientific and technical writing; Qualitative and quantitative research methods; Research statistics; Research planning and grant writing; Academic career planning.
DP requirements: None
Assessment: A submitted literature review (50%) and research proposal (50%).

CSC5021Z COMPUTATIONAL GEOMETRY FOR 3D PRINTING

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener. Computer Graphics at third-year level.
Course outline:
The objective is to master surface and volumetric modelling concepts applicable to 3D printing.
The use of 3D printers for rapid prototyping is becoming increasingly prevalent. However, the process used by most current 3D printers of depositing thin layers of semi-molten material, which is known as Fused Deposition Modelling (FDM), is not without limitations. Factors such as material thickness and support structures need to be considered. This course will cover the theoretical concepts required for creating geometric models suitable for 3D printing. From a practical perspective, students will code modelling software, then design and ultimately print a 3D model.
Topics covered include: Geometry and Topology for Computer Graphics; 3D Printing Concepts: Printing Hardware, Overhang Support, Applications; Volumetric Concepts: Voxels, Computational Solid Geometry, Isosurface Extraction; Surface Concepts: Parametric Surfaces, Mesh Smoothing, Free-Form Deformation.
DP requirements: None
Assessment: Exam: open book, 2 hours, 40%. Practical assessments 50%; Final printed show piece, 10%

CSC5022Z DISTRIBUTED SCIENTIFIC COMPUTING

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor R Simmonds
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener. A basic understanding of computer networking and software systems.
Course outline:
The objective is to provide an understanding of the basic components used to build Grid and Cloud computing systems, with a focus on how these can support Scientific Computing.
This course gives an overview of the components that make up Grid and Cloud computing environments. These include the components used to build distributed data and computing grids and the various "as a Service" systems referred to as Cloud computing. It also looks at how these are used for a range of activities, including supporting large scale Scientific Computing.
DP requirements: None
Assessment: Final examination: 60%; Practical assignments: 40%

CSC5023Z META-HEURISTICS

This course may not be offered every year.
12 NQF credits at NQF level 9
Convener: Associate Professor G Nitschke
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener. A basic understanding of genetics and evolution is useful, but not required.
Course outline:
Meta-heuristics are a sub-field of biologically inspired artificial intelligence and general algorithmic frameworks that can be applied to different optimisation problems with relative few modifications to adapt them to a specific problem. This course examines the theory and application of several different meta-heuristic methods, including: iterated local search, tabu search, evolutionary algorithms, ant colony optimisation, simulated annealing, and particle swarm optimisation. Course objectives include: gaining an understanding of the algorithmic theory and implementation of various meta-heuristic algorithms, identifying meta-heuristics suitable for solving different types of problems, and how to apply (implement) such meta-heuristics to various optimisation, machine learning, and design tasks.
DP requirements: None
Assessment: Exam: 50%; Practical assignments: 50%.

CSC5024Z INFORMATION RETRIEVAL

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: To be advised
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener. Basic understanding of XML data is required. Some background on statistics and linear algebra will be useful.
Course outline:
The objective is to understand how search engines work at an algorithmic level. Learn how to build and incorporate basic and specialized search engines into your own projects.
Course content includes: Introduction to Information Retrieval (IR); Models of Basic IR (Boolean, Vector, Probabilistic); IR evaluation and testbeds; Stemming, Stopping, Relevance Feedback; Models of Web and linked-data retrieval (Pagerank, HITS); Latent Semantic Analysis and Clustering; Multimedia IR; Cross-lingual and multilingual IR; and IR in Practice (CMSes, digital libraries, Web, social media, etc.).

Selected topics will be included from: Distributed and Federated IR; Recommender Systems; Natural Language Processing for IR; Sentiment Analysis; Opinion Retrieval; and Text Summarization.
DP requirements: None
Assessment: Exam (take-home): 40%; Assignments: 40%; Class participation: 20%

CSC5025Z INTELLIGENT SYSTEMS
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Associate Professor D Moodley
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener. A strong mathematics background.
Course outline:
This Computer Science masters course provides an introduction to designing and implementing intelligent systems, using selected Artificial Intelligence techniques. The course will introduce you to at least two widely used Artificial Intelligence approaches, including machine learning and Bayesian Artificial Intelligence. You will learn these techniques from a Computer Science perspective, specifically how to design real world intelligent systems that incorporate such AI techniques.
DP requirements: None
Assessment: 2 hour open book exam: 50%, Practical assignments: 50%

CSC5026Z INTRODUCTION TO ICT FOR DEVELOPMENT
This course will not be offered in 2025.
12 NQF credits at NQF level 9
Convener: Associate Professor M Densmore
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener.
Course outline:
The goal is for you to understand basic ideas underlying ICT4D and how they are used in practice. You will learn about and critically evaluate ICT4D projects. You will learn how to design and evaluate development-oriented computing projects.
Course Content: Introduction to key terminology around socio-economic development; Key concepts in ICT4D (e.g. social inclusion, after access); Case studies in specific domains, including healthcare, agriculture, mobile money, education, etc.; Critical evaluation of ICT4D projects.
DP requirements: None
Assessment: Practical assignments: 80%; Case Study Presentation: 10%; Class Participation: 10%

CSC5027Z LOGICS FOR ARTIFICIAL INTELLIGENCE
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor T A Meyer
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener. Familiarity with basic discrete mathematics is highly recommended.
Course outline:
This course will introduce students to logics used in the area of Knowledge Representation - a subarea of Artificial Intelligence.
Logic plays a central role in many areas of Artificial Intelligence. This course will introduce students to Description Logics, a family of logics frequently used in the area of Knowledge Representation and Reasoning. Description Logics are frequently used to represent formal ontologies.

Topics covered include the following: The Description Logic ALC; Reasoning in Description Logics with Tableaux Algorithms; Reasoning in the EL family of Description Logics; and Query Answering.
DP requirements: None
Assessment: Exam: open book, 3 hours, 50%; Assignments: 50%.

CSC5028Z ONTOLOGY ENGINEERING
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Associate Professor M Keet
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener. Experience in modelling (ER, UML Class diagrams) and some familiarity with logic will be helpful.
Course outline:
The principal aim of this module is to provide the participant with an overview of ontology engineering—including language features, automated reasoning, and top-down and bottom-up ontology development—and a main application field being the Semantic Web.
Course Content: Ontologies are used in a wide range of applications, such as data integration, recommender systems, e-learning, semantic scientific workflows, and natural language processing. While some of these applications pass the revue, the main focus of the course is on the ontologies. The topics covered include the following:
Logic foundations for ontologies: Languages (Description Logics, OWL); and Automated reasoning (class and instance classification, satisfiability and ontology consistency checking).
Ontology development: Ontology engineering, top-down - foundational ontologies, ontology design patterns; Ontology engineering, bottom-up - exploiting legacy material, such as relational databases, thesauri, text; and Methodologies for ontology development and maintenance, methods to enhance ontology quality and to automate some aspect of the methodology.
DP requirements: None
Assessment: Exam (closed-book but with some material provided) - 50%, assignments - 50%.

CSC5029Z INTRODUCTION TO IMAGE PROCESSING AND COMPUTER VISION
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Associate Professor P Marais
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
To introduce students to basic concepts in computer vision and image processing, oriented towards solving real world, practical image analysis problems. The student will be introduced to basic concepts from digital signal processing, and a foundation built that will allow understanding of how more sophisticated schemes such as image analysis/segmentation which can be used to describe image and volumetric data at a higher, more useful, levels of abstraction. Case studies and papers will be examined which relate this to real-world problems.
A number of lectures (as indicated below) will be presented by the course convener, interspersed with paper/review sessions in which topical papers are discussed and followed up by review questions.
Topic will include: Basic Signal processing; Image Transforms & Operations; Feature Detection; Object Descriptions; Basic Segmentation & Registration; Fundamental Segmentation techniques; Machine Learning & GAs in Cvision; Case Study; and Paper Reviews.
DP requirements: None
Assessment: Exam: Open Book; 2 hours. Class Record: Practical 60%, Review Questions 40%. Final Mark: Exam 40%, Class Record 60%.

CSC5030Z ADVANCED TOPICS IN COMPUTER SCIENCE MASTER'S 1
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
This course introduces advanced and cutting edge topics in Computer Science as they emerge with new areas of investigation or practice.
DP requirements: None
Assessment: Exam: 50% and Coursework: 50%

CSC5031Z ADVANCED TOPICS IN COMPUTER SCIENCE MASTER'S 2
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
To introduce advanced and cutting edge topics in Computer Science as they emerge as new areas of investigation or practice.
DP requirements: None
Assessment: Exam: 50% and Coursework: 50%

CSC5032Z NETWORKS & INTERNET SYSTEMS
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Dr J Chavula
Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener. Working knowledge of computer networks.
Course outline:
The objective is to gain advanced understanding of techniques for traffic engineering and quality of service in the Internet architecture. The course focuses on advanced topics in internetworking, traffic engineering, and mechanisms for measuring performance and Quality of Service (QoS) for network services and the Internet.
Course content includes: New Network and Transport Protocols (IPv6, Mobile IP, IP Multicast, Multipath TCP, QUIC); Routing and Traffic Engineering (Interdomain Routing and Traffic Engineering with Border Gateway Protocol); Traffic Engineering with Overlay Networking (MPLS/GMPL, Location/Identifier Separation Protocols, Software Defined Networking and Network Function Virtualization); Internet Measurements (Quality of Service and Quality of Experience (QoS and QoE), IP Traffic Monitoring and Analysis)
Selected reading/discussion topics will be included from: Cloud Infrastructure; Content Delivery Networks; Internet Access in the Developing World, Community Networks; ICT4D, Online Data Protection and Online Censorship.
DP requirements: None
Assessment: Assignments: 40%. Discussion sessions: 15%. Active Participation in Class: 5%. Final Exam : 40%

CSC5033Z HUMAN COMPUTER INTERACTION
This course will not be offered in 2025.
12 NQF credits at NQF level 9
Convener: Associate Professor M Densmore

Course entry requirements: Admission into the Master's degree specialising in Computer Science, or permission from the course convener.
Course outline:
This course will introduce you to basic concepts and practice around user-centred design of digital systems.
This course covers how to design and evaluate interactive systems for real users both in the developed and developing worlds. We will look at both theory and practice of designing digital systems.
Topics include the design cycle, sketching and storyboarding, task analysis, contextual inquiry, conceptual models, usability inspection, human information processing, experience design, and qualitative and quantitative study design and evaluation. We will also invite guest speakers from industry and research to talk about their own experiences with user-centred design.
The course will contain additional practical work to distinguish it from the honours level module on Human Computer Interaction (CSC4024Z).
DP requirements: None
Assessment: Participation: 10% (measured by participation in user studies, in-class activities, in-class discussion/presentations, and pre-class quizzes on Vula) Individual Practical Assessments: 20%. Group Project Assessments: 40% Final Exam : 30%

CSC5034Z MACHINE LEARNING

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Associate Professor G Nitschke
Course entry requirements: Admission into the Master's degree specialising in Artificial Intelligence, or permission from the course convener.
Course outline:
This course will expose students to foundational concepts and computational techniques in Machine Learning and underlying theory and concepts related to formulating and implementing machine learning algorithms to solve a wide range of problems. Students will also learn how to implement a broad range of classical to biologically inspired machine learning algorithms with realworld applications. Core topics include supervised and unsupervised learning such as: concept learning, clustering, artificial neural networks and reinforcement learning.
DP requirements: None
Assessment: Practical work counts 50%; examination counts 50%.

CSC5035Z NATURAL LANGUAGE PROCESSING

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Dr J Buys
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
The course will introduce students to fundamental concepts and current approaches in Natural Language Processing. Course content includes: Text preprocessing; Naive Bayes and logistic regression for text classification; Word vectors and distributional semantics; n-gram language models; Sequence labelling with hidden Markov Models; Syntactic parsing; Recurrent neural networks for sequence processing; Encoder-decoder neural networks; Transformers neural networks and contextual embeddings. A selection of Natural Language Processing applications included from: Sentiment analysis, Parts-of-Speech tagging, Named Entity Recognition, machine translation, information extraction and question answering.
DP requirements: None
Assessment: Exam (take-home): 50%; Assignments: 50%.

CSC5036Z VIRTUAL REALITY

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
Virtual Reality (VR) involves the creation of a digital replacement for the senses (sight, hearing, smell, taste, touch) using devices, such as head-mounted displays and haptic feedback, in such a way that users perceives themselves to be immersed in an alternate or augmented reality. VR has applications in games, simulation and training. This course will introduce the theoretical underpinnings and practical skills necessary for creating virtual environments. Topics covered include the following: Interaction in VR, navigation and locomotion in VR, simulator sickness, immersion and presence, designing VR Environments with Unity, non-visual modalities (binaural output, virtual flavour, haptics).
DP requirements: None
Assessment: Exam: open book, 24 hours, 50%; Assignments: 50%.

CSC5038Z ARTIFICIAL LIFE

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Associate Professor G Nitschke
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
Artificial life is a multi-disciplinary field of study (drawing from computer science, artificial intelligence, complex systems, evolutionary biology and chemistry), wherein researchers examine living systems, their adaptive processes and evolution, through the use of computer simulations, robotics, and biochemistry. In Artificial Intelligence (AI), researchers ponder the nature of intelligence by trying to build intelligent systems from scratch, and in Artificial Life (ALIFE), researchers investigate the nature of "life" by trying to build artificial living systems from scratch. This course examines the origins of ALIFE, Cybernetics and AI: simulation and synthesis of life-like systems, self-reproducing artificial evolution systems of digital organisms, cellular automata, swarm intelligence and stigmergy, as well as nature-inspired computation such as automated product design and evolutionary art. Course objectives include gaining an understanding of the theory and application of several selected topics via the implementation and analysis of various artificial life systems.
DP requirements: None
Assessment: Exam: 50%; Practical Work: 50%.

CSC5039Z NON-MONOTONIC REASONING

This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Professor T A Meyer
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
This course will introduce students to the subarea of Artificial Intelligence known as Non-Monotonic Reasoning. In addition to a brief history of the topic, students will be given a detailed introduction to at least one of the widely used approaches to Non-Monotonic Reasoning. Students will learn these approaches from both a theoretical and computational perspective.
DP requirements: None
Assessment: 24-hour take-home exam, 50%; Assignments: 50%.

CSC5042Z NATURAL LANGUAGE GENERATION
This course will not be offered every year.
12 NQF credits at NQF level 9
Convener: Dr Z Mahlaza
Course entry requirements: Admission into the Master's degree specialising in Computer Science or Artificial Intelligence, or permission from the course convener.
Course outline:
This course will introduce you to the subarea of Artificial Intelligence known as Natural language generation (NLG). In addition to a brief history of the topic, you will be given a detailed introduction to three approaches for building NLG systems (i.e., symbolic, statistical, and neural techniques). You will learn these approaches from both a theoretical and computational perspective.
DP requirements: None
Assessment: Exam: 24-hour take-home exam, 60%; Assignments: 40%.

Master's specialising in Information Technology by Coursework and Minor dissertation

Programme Convener: Associate Professor G Nitschke
Entry requirements: The Masters in Information Technology by Coursework and Dissertation is a conversion course designed for those with a degree in a non-IT field to attain a strong background and a qualification in Information Technology. This course follows a Bachelor Honours or equivalent in any non-IT degree. All admissions decisions are at the discretion of the university.
Course structure: See General Rules for Master's Degrees in the front section of this book.
Progression: Students should pass a minimum of three courses each year. Should a student fail any course on the second attempt, they will not be allowed to continue with their studies. Students are eligible to register for dissertation research (CSC5004W or INF5007W) once they have passed 7 of the 8 courses. Students should register for their dissertation in the department of their supervisor.

CSC5004W INFORMATION TECHNOLOGY MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Associate Professor G Nitschke
Course entry requirements: CSC5005H and CSC5006H or (CSC5007Z/CSC5013Z, CSC5010Z, CSC5011Z, CSC5012Z, CSC5014Z/INF5007Z, CSC5015Z/INF5009Z, CSC5016Z/INF5008Z and CSC5017Z) or permission from the convener.
Course outline:
Upon successful completion of the coursework component (Two block modules (CSC5005H and CSC5006H) or all eight individual modules (CSC5007Z, CSC5010Z, CSC5011Z, CSC5012Z, CSC5014Z, CSC5015Z, CSC5016Z and CSC5017Z)), students will be required to register for this minor dissertation course and complete a one year research project under supervision of an appropriate computer science academic staff member.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

INF5010W MASTERS IN IT: INFORMATION TECHNOLOGY MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: I Brown
Course entry requirements: A non-IT honours degree, or equivalent.
Co-requisites: None.
Course outline:

The research component will expose students to critical reading and writing skills, develop analysis and research skills through research methodology and data analysis techniques. Students should be in a position to submit the final dissertation by the end of the year

DP requirements: In order to be permitted to sit the final exam a minimum average of 40% on the coursework must be obtained.

Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

CSC5010Z MIT: COMPUTER NETWORKS

12 NQF credits at NQF level 9

Convener: Dr J Chavula

Course entry requirements: Admission into the Master's degree specialising in IT, or permission from the course convenor.

Course outline:

In the course, a framework for describing the operation of computer networks is developed. Within this framework, we start with the operation of local-area networks, packet-switched networks and the Internet. After this, the module moves to the uses made of these networks, concentrating on business applications. The effect on organisations of introducing such networked applications is also examined.

DP requirements: 40% for assignment component.

Assessment: Final examination: 50%; Practical assignments: 50%. A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

CSC5011Z MIT: OBJECT-ORIENTED PROGRAMMING IN PYTHON

12 NQF credits at NQF level 9

Convener: To be advised

Course entry requirements: Admission into the Master's degree specialising in IT, or permission from the course convenor.

Course outline:

The underlying aim of all courses is to develop a foundation in key topics related to the application of computer hardware and software in solving practical problems. This is a basic introduction to object-oriented programming in a modern language, namely, Python. Python is becoming increasingly popular as an effective means of introducing programming concepts to those who are new to programming. Students will be taught how to create simple applications in the Python language.

DP requirements: 40% for assignment component.

Assessment: Final examination: 50%; Practical assignments: 50%. A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

CSC5012Z MIT: HUMAN COMPUTER INTERACTION

12 NQF credits at NQF level 9

Convener: To be advised

Course entry requirements: Admission into the Master's degree specialising in IT, or permission from the course convenor.

Course outline:

Introduction to the discipline of human-computer interaction. This module covers how knowledge from fields such as psychology and graphic design can be used to increase the usability of computer software.

DP requirements: 40% for assignment component.

Assessment: Final examination: 50%; Practical assignments: 50%. A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

INF5007Z SOCIAL ISSUES AND PROFESSIONAL PRACTICE
12 NQF credits at NQF level 9
Convener: T Chimboza
Course entry requirements: A non-IT honours degree, or equivalent.
Co-requisites: None.
Course outline:
1 Identify important social and human factor issues that impact professional behaviour linked to Cyber Security.
2 Research and analyse material and real-world situations that relate to social and human factor issues linked to Cyber Security.
3 Discuss and report the outcomes of investigations.
4 Provide advice and recommendations about how to tackle social and human factor issues linked to Cyber Security
DP requirements: In order to be permitted to sit the final exam a minimum average of 40% on the coursework must be obtained.
Assessment: 2 Assignments (50%) and an Exam (50%).

INF5008Z SYSTEMS SECURITY
12 NQF credits at NQF level 9
Convener: Z Ruhwanya
Course entry requirements: A non-IT honours degree, or equivalent.
Co-requisites: None.
Course outline:
The course will cover the following topics: • Cybersecurity and impacting issues • Cyber security theories & frameworks • Real-world Cybercrime Cases • Cyber-Forensic investigations • Reporting and evidence admissibility • Strategies to address Cyber security challenges
DP requirements: In order to be permitted to sit the final exam a minimum average of 40% on the coursework must be obtained.
Assessment: 2 Assignments (50%) and an Exam (50%).

INF5009Z SOFTWARE ENGINEERING
12 NQF credits at NQF level 9
Convener: D Snyman
Course entry requirements: A non-IT honours degree, or equivalent.
Co-requisites: None.
Course outline:
This module aims to introduce a range of techniques within both structured and object-oriented methods, in order to enable you to analyse and design well engineered software solutions. You will be introduced to the practical use of CASE tools in modelling and documenting analysis and design specifications. Different life cycle models will also be discussed.
DP requirements: In order to be permitted to sit the final exam a minimum average of 40% on the coursework must be obtained
Assessment: 2 Assignments (50%) and an Exam (50%).

CSC5017Z MIT: RESEARCH METHODS
12 NQF credits at NQF level 9
Convener: Associate Professor G Nitschke
Course entry requirements: Admission into the Master's degree specialising in IT, or permission from the course convenor.
Course outline:
This module is intended to provide students with the insight and techniques required to allow them to write a successful postgraduate research project - the final module leading to the Master's Degree. Topics to be covered include: Introduction to IT Research; Ethics in Research; Conducting a

Literature Review; Finding a Research Question/Goal; Project Management; Research Proposals; Experimentation; Prototypes; Case Studies; Surveys; Conducting Observations; Testing in IT Research; Modelling; Usability Analysis; Introduction to Statistics; The Writing Process; Research Presentations; and The Masters/PhD Thesis.
DP requirements: 40% for assignment component.
Assessment: Final examination: 50%; Practical assignments: 50%. A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

Master's specialising in Data Science

For details of this course, refer to the Department of Statistical Sciences. The curriculum structure is outlined in the front section of this book.

CSC5007Z DATABASE SYSTEMS

12 NQF credits at NQF level 9
Convener: Associate Professor S Berman
Course entry requirements: Acceptance into the Master's degree, specialising in Data Science or Information Technology.
Course outline:
This course will introduce students with little or no prior experience to the three cornerstone database technologies for big data, namely relational, NoSQL and Hadoop ecosystems. The course aims to give students an understanding of how data is organised and manipulated at large scale, and practical experience of the design and development of such databases using open source infrastructure. The relational part will cover conceptual, logical and physical database design, including ER modelling and normalisation theory, as well as SQL coding and best practices for performance enhancement. NoSQL databases were developed for big data and semi-structured data applications where relational systems are too inefficient; all four types of NoSQL architecture will be introduced. Distributed data processing is key in manipulating large data sets effectively. The final section of the course will teach the popular Hadoop technologies for distributed data processing, such as MapReduce programming and the execution model of Apache Spark. The course will be presented in an online format.
DP requirements: 40% for assignment component.
Assessment: Final examination: 50%; Practical assignments: 50%. A sub-minimum of 40% will be required for each of the assignment and exam components of the course.

CSC5009W DATA SCIENCE MINOR DISSERTATION

90 NQF credits at NQF level 9
Convener: Professor J Gain
Course entry requirements: Successful completion of the coursework component of the Master's specialising in Data Science.
Course outline:
The research component of the degree is based on a 90 credit dissertation. The topic of the research will be based on an analysis of large data sets from Physics, Astronomy, Medicine, Finance or other areas of application using methodology learnt in coursework component of degree. Alternatively, the dissertation component may focus on methodological developments in Computer Sciences required for the analysis of large amount of data.

PhD

CSC6000W COMPUTER SCIENCE THESIS

Students will be expected to attend a research methods course in the first year.

360 NQF credits at NQF 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.

DEPARTMENT OF ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE

The Department is housed in the 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:
P Anderson, MSc PhD *Cape Town*
Professor and South African Research Chair in Climate Change:
B C Hewitson, MSc PhD *Penn State*
Professor and South African Research Chair in Environmental and Social Dimensions of the Bio-economy:
R P Wynberg, MPhil *Cape Town* PhD *Strathclyde*
Professor and UP-UCT Future Africa Research Chair in Sustainability Transformations
M F Ramutsindela, MA *Unin* PhD *London FSSAG*
Professors:
F D Eckardt, MSc *Cranfield* DPhil *Oxon*
M New, MPhil PhD *Cantab*
Emeritus Professors:
R F Fuggle, MSc *Louisiana* PhD *McGill*
S Parnell, MA PhD *Witwatersrand*
Emeritus Professors and Senior Research Scholars:
M E Meadows, PhD *Cantab* FRSSG FRSSAf
M R Sowman, MSc PhD *Cape Town*
Honorary Professors:
B Chase, MSc *Sheffield* DPhil *Oxon*
W J Gutowski, BSc *Yale* PhD *MIT*
Associate Professors:
B J Abiodun, MTech *FUTA* Lic *Uppsala* PhD *FUTA*
J Battersby, MA *Newcastle* DPhil *Oxon*
Z Patel, MSc *Natal* PhD *Cantab*
Emeritus Associate Professor:
K J Winter, MA *London* PhD *Cape Town*
Affiliated Associate Professor:
S Daya, MA PhD *Durham*
Honorary Associate Professor:
S Lwasa, MSc *Netherlands* Masters PhD *Uganda*
Senior Lecturers:
P Mbatha, MSocSc PhD *Cape Town*
S Scheba, MPhil *Cape Town* PhD *Manchester*
Lecturers:
D Kibirige, MSc *Lund* PhD M*iskolc*
P Matikinca, MSc *Cape Town* PhD *Stellenbosch*
M Norton, MA PhD *Cape Town*
P Sabela-Rikhotso, MSc *UFS* PhD *NWU*
J R von Holdt, MPhil PhD *Cape Town*
Junior Research Fellow:
M J van Niekerk, BScHons *Stell* MPhil *Cape Town*
Honorary Research Associates:
D Fig, BScHons PhD *LSE*
R Hill, BSc Civil Eng PhD *Cape Town*
Honorary Research Affiliates:
E W Bergh, PhD *Cape Town*
I Pinto, Licenciatura *Maputo* MSc PhD *Cape Town*

Administrative Officer:
S Adams
Administrative Assistant:
F Hartley
Finance Officer:
L George
Senior Secretary:
L Claassen
Technical Officer:
S Hess
Project Manager:
M Damons

CLIMATE SYSTEM ANALYSIS GROUP
Director:
B C Hewitson, MSc PhD *Penn State*
Deputy Director:
C Jack, PhD *Cape Town*
Researchers:
O Crespo, MSc *Montpellier* PhD *Toulouse*
P Johnston, MSc *Stell* PhD *Cape Town*
C Lennard, MSc PhD *Cape Town*
A McClure, BScHons MSc *Rhodes*
S A Omar, MSc PhD *Cape Town*
M Tadross, BScHons *Newcastle* PhD *Cantab*
P Wolski, MSc *Krakow* PhD *Amsterdam*
Research Support:
R Duffet, MSc *Cape Town*
S Govender, BSc *Unisa* MSc *UFS*
P Kloppers, BScHons MSc *Cape Town*
P Mukwenha, BScHons *MSU Zimbabwe*
M Rustin-Nefdt, BCom *Unisa*
L Van Aardenne, BScHons MSc *Cape Town*

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.

The Department undertakes research into numerous aspects of society and the environment but is particularly involved in studies of environmental and social change, environment interactions, and sustainability. There is an active postgraduate programme. The department offers Masters and PhD programmes by research dissertation as well as Masters by coursework and research in Environment, Society and Sustainability, and in African Climate and Development.

Of major interest are the socio-political and ecological drivers of environmental change in the past and present, and their likely impacts in the future. The Department is active in projects which involve assessing the impact of development projects on the biophysical and social environment. The Department is involved in ongoing research and teaching centred on the governance of social-ecological systems, including a specific focus on marine and coastal environments and their interface with communities. An active research programme considers the social and environmental dimensions of the bio-economy. Researchers in the department actively engage in contemporary policy, governance and civil society processes across a range of topical focal areas

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 remote sensing and geomorphological studies. 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

Fieldwork
All students attending courses in Environmental & Geographical Science are required to take part in fieldwork arranged during the year.

First-Year Courses

EGS1007S HUMAN & PHYSICAL SYSTEMS
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: At least 50% for NSC Geography or GEO1009F
Course outline:
The course presents fundamental environmental and geographical concepts from the fields of human and physical geography and explores the interconnections, flows and boundaries across these systems. How these systems have played out in the past, how they are changing, and what the future may hold, is critical to a full appreciation of current and future environmental challenges. This course seeks to bring together an understanding of both the biophysical geographic settings and processes that inform all facets of our landscapes, and the social engagement with their components, which present both opportunity and limitation to human development.
Lecture times: Monday - Friday, 2nd period
DP requirements: Attendance and satisfactory completion of tutorial assignments; students must attain an average mark of not less than 40% for the coursework component.
Assessment: Essays, assignments and tutorial work count 60%; one 2-hour theory examination written in November counts 40% (subminimum of 40% required).

GEO1009F GEOSYSTEMS: AN INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES
This course is presented jointly by the Departments of Archaeology, Environmental & Geographical Sciences, Geological Sciences, and Oceanography, but administered by Geological Sciences. Students majoring in these subjects are required to attend one half-day excursion.
18 NQF credits at NQF level 5
Convener: Associate Professor E M Bordy
Course entry requirements: At least 50% for NSC Geography or at least 60% for NSC Physical Science or Life Sciences. NOTE: Preference will be given to students majoring in Archaeology, Environmental and Geographical Science, Geology or Oceanography.
Course outline:
This course aims to develop a broad understanding of how the Earth works. Over its >4.5 billion-year-long history, the Earth has been shaped by chemical, physical and biological processes. The course demonstrates why decoding the rock record of deep-time events is critical for explaining past, present and future environmental changes and the distribution of natural resources. It examines the interplay of terrestrial, marine, atmospheric, and cryospheric processes within the Earth system, with an emphasis on monitoring essential variables for understanding climate variability and change. The Earth has also sustained life over the last >3.5 billion years. Our species, *Homo sapiens*, is a relatively recent arrival, yet it has had, and continues to have, the greatest impact on our planet. The course reviews human evolution and how we became the dominant cause of global environmental

change. The course also explores the social risks and vulnerabilities in response to the Earth's biophysical processes and change. The course concludes with attention to the concepts of environmental hazard, risk, resilience, monitoring and adaptation.
Lecture times: Monday - Friday, 2nd period
DP requirements: An average of 40% on all marked classwork and tests. Submission of 80% of weekly assignments in each of the four sections (i.e., GEO, AGE, SEA, EGS). Attendance of the field trip is compulsory for students majoring in Archaeology, EGS, Geology, or Oceanography.
Assessment: Marked classwork, including class test/s, counts 50%, and a 3-hour written examination counts 50%. A subminimum of 40% in the class mark is required to write the theory examination paper. Supplementary examinations for GEO1009F will be offered in July.

Second-Year Courses

EGS2013F THE PHYSICAL ENVIRONMENT

There is a compulsory fieldwork component involving half-day field excursions.
24 NQF credits at NQF level 6
Convener: Professor F Eckardt
Course entry requirements: GEO1009F
Course outline:
The course focuses on contemporary Atmosphere-Earth surface interactions, in particular the role of precipitation and water from a global to a regional scale and examines temporal dynamics, driven by natural process as well as anthropogenic pressures. It covers in detail global circulation patterns, climate variability, soil formation, polar response to climate change, informants of regional biome formation, tropical deforestation, and desertification and earth observation technology. It is expected that students will enhance their understanding of Earth system dynamics, systems interactions and develop an appreciation for scales both temporal and spatial. Students are also expected to put the local context into a regional setting and make linkages to the larger global picture.
Lecture times: Monday - Friday, 5th period
DP requirements: Satisfactory completion of practicals and all written assignments, including projects, fieldwork reports, practicals, essays and class tests. Students must attain an average mark of not less than 40% for the coursework.
Assessment: Project, essays, class tests and practical assignments including fieldwork report count 50%; one 3-hour examination written in June count 50% (subminimum of 40% required).

EGS2015S SOCIETY & SPACE

There is a compulsory fieldwork component involving half-day field excursions.
24 NQF credits at NQF level 6
Convener: Associate Professor J Battersby
Course entry requirements: For BSc: EGS1007S; For BA or BSocSc: EGS1007S or Social Science Foundation course and two full first year Humanities courses, or equivalent.
Course outline:
Spatial thinking sits at the core of Geographical scholarship, and space and human societies are always mutually constitutive. This course explores how geographers have theorised space and place as central to understanding historical processes, social relations and cultural practices. Focusing particularly on Africa and other regions of the global South, the course covers foundational Human Geography concepts including modernity, landscape, memory, heritage, identity and inclusion. Through theoretical work and field-based experiential learning, we examine how space and place both shape and are shaped by a range of power dynamics.
Lecture times: Monday - Friday, 5th period
DP requirements: Attendance and satisfactory completion of practical including fieldwork and tutorial assignments; students must attain an average mark of not less than 40% for the coursework.
Assessment: Essays, a class test, practical assignments based on compulsory fieldwork and tutorial work count 60%; one 2-hour theory examination written in November counts 40%. In order to pass the course, you are required to obtain an average mark of at least 50% across all submissions.

Third-Year Courses

EGS3012S ATMOSPHERIC SCIENCE

36 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: GEO1009F or equivalent, EGS2013F or SEA2004F (or SEA2002S or SEA2003F) or any approved 2000-level Science course, and or any approved 1000-level Physics or Mathematics course.
Course outline:
This course aims to provide a thorough understanding of the physical processes that control the Earth's atmosphere. It covers the following topics: atmospheric energy balance, thermodynamics, dynamics, and general circulation; tropical and mid-latitude weather producing systems; weather and climate extreme events (e.g. heat-waves, drought, and floods) in Africa; climate variability and change; atmospheric boundary layer turbulence, chemistry, and pollution. The lectures are complemented with field measurements and laboratory practicals to demonstrate basic data analysis techniques employed in atmospheric sciences.
Lecture times: Monday - Friday, 1st period
DP requirements: Satisfactory completion of practicals and all written assignments, including essays, project reports and class tests.
Assessment: Essays and tests count 20%; project reports and practicals count 20%; one 3-hour examination in November counts 60% (subminimum of 40% required).

EGS3021F SUSTAINABILITY & ENVIRONMENT

There is a compulsory fieldwork component involving a half-day field excursion.
36 NQF credits at NQF level 7
Convener: Dr P Sabela-Rikhotso
Course entry requirements: EGS2013F, EGS2015S
Course outline:
The course critically engages with current debates and discourses in the fields of sustainability, vulnerability and environmental management, including examination of key concepts such as integration, systems-thinking, complexity, equity, vulnerability, risk, resilience, adaptation and mitigation. Approaches and methods for analysing environmental problems and integrating risk reduction as well as sustainability principles and practices into policy, programme, plan and project cycle processes are investigated and applied in different contexts.
Lecture times: Monday - Friday, 3rd period
DP requirements: Attendance and satisfactory completion of practicals (including fieldwork), other assignments and tests; students must attain an average mark of not less than 40% for the coursework.
Assessment: Practical reports (including fieldwork), class tests and other assignments count 60%; one 3-hour June examination counts 50% (subminimum of 40% required).

EGS3022S GEOGRAPHIC THOUGHT

36 NQF credits at NQF level 7
Convener: Associate Professor Z Patel
Course entry requirements: EGS2015S
Course outline:
The course focuses on debates in classical and contemporary human geography. It considers important thematic areas in the geographical literature, such as development; spatiality; urban, political and feminist geographies. Each thematic area explores specific debates and key author's work in the field, providing students with an introduction to literature, a content overview, and skills to deconstruct and build conceptual and analytical arguments related to evidence drawn from geographical research from around the world, other than South Africa. The course also emphasises academic reading and writing skills taught in the practical sessions.

Lecture times: Monday - Friday, 4th period
DP requirements: Satisfactory completion of essay and practical assignments and participation in tutorials; students must attain an average mark of not less than 40% for the coursework
Assessment: Essay and other assignments count 70%; one 3-hour written examination in November count 30% (subminimum of 40% required).

EGS3023F ANTHROPOCENE ENVIRONMENTS IN PERSPECTIVE
36 NQF credits at NQF level 7
Convener: Dr D Kibirige
Course entry requirements: EGS2013F
Course outline:
The course deals with the dynamic physical environment including the human impact on global environments at various spatial and temporal scales during the so-called Anthropocene. The general aim of this course is to illustrate the nature and scale of changes that characterise the earth's environment, against a background of both natural and anthropogenically-induced processes. This provides an important perspective when thinking about contemporary environments and how they might change in the future – with obvious consequences for our own species and that of the others with which we share the planet.
Lecture times: Monday - Friday, 5th period
DP requirements: Satisfactory completion of practicals and all written assignments, including fieldwork report, essays and class tests. Students must attain an average mark of not less than 40% for the coursework.
Assessment: Field report, essays, class tests and practical assignments count 50%; one 3-hour examination written in June count 50% (sub-minimum of 40% required).

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 ATMOSPHERIC SCIENCE HONOURS
Since the code EGS4001W will not carry a NQF credit value, students will be concurrently registered for EGS4052W (coursework component of 120 NQF credits) and EGS4053W (research project of 40 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: To be advised
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. Computer literacy 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.
DP requirements: Students must pass at least three of their coursework electives and achieve a composite pass on the coursework. Students must achieve a pass on their research project to proceed to graduation in the degree.
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. These component parts of the course will be combined in a final overall mark which will be reflected against the course code EGS4001W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

EGS4004W ENVIRONMENTAL & GEOGRAPHICAL SCIENCE HONOURS
Since the code EGS4004W will not carry a NQF credit value, students will be concurrently registered for EGS4054W (coursework component of 120 NQF credits) and EGS4055W (research project of 40 NQF credits). Entrance is limited to 30 students
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Dr P Sabela-Rikhotso
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 Hons degree in Environmental & Geographical Science.
DP requirements: Students must pass at least three of their coursework electives and achieve a composite pass on the coursework. Students must achieve a pass on their research project to proceed to graduation in the degree.
Assessment: Courses will be examined at the end of each semester, and the marks combined with project, essay, fieldwork and seminar presentation marks. 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. These component parts of the course will be combined in a final overall mark which will be reflected against the course code EGS4004W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

EGS4023F/S RESEARCH METHODS FOR NATURAL SCIENTISTS
30 NQF credits at NQF level 8
Convener: To be advised
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The course has a dual purpose. Firstly, a series of weekly lectures and hands-on practical seminars on the nuts and bolts of quantitative analysis. The analysis techniques investigated are (mostly) the fundamental methods found commonly in the literature; viz: Classification, time series analysis,

EOF/PCA, non-linear analysis. In parallel to this are a series of seminars on "the Philosophy of Science" addressing issues of values, perception, the science community, etc.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS4030F/S CLIMATE MODELLING
30 NQF credits at NQF level 8
Convener: To be advised
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
An introduction into the development and application of climate models for exploring climate dynamics, forecasting, and climate change. The course explores the inner workings of climate models, the use in operational seasonal forecasting in Africa (with hands-on work with the current forecasts), and actual running model experiments. Students are expected to have done EGS3012S or its equivalent.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS4031F/S INTRODUCTION TO CLIMATE CHANGE & SUSTAINABLE DEVELOPMENT
30 NQF credits at NQF level 8
Convener: Dr M Norton
Course entry requirements: Acceptance for EGS Honours and by agreement of the course convenor.
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: 80% of classes, and all assignments.
Assessment: Coursework 75%; examination 25%

EGS4032F/S CLIMATE CHANGE ADAPTATION & MITIGATION
30 NQF credits at NQF level 8
Convener: Drs M Norton and D Sparks
Course entry requirements: Acceptance for EGS Honours and by agreement of the course convenor.
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 and mitigation 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.
DP requirements: 80% of classes and all assignments
Assessment: Coursework 80%; examination 20%

EGS4034F/S INTERROGATING SOUTHERN AFRICAN LANDSCAPES
NB: enrolment to this course is by invitation only
30 NQF credits at NQF level 8
Convener: Associate Professor S Daya
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
South African landscapes have always been contested. In the contemporary moment of global environmental crisis and deepening social inequality, it is critical that we build an interdisciplinary understanding of the histories, legacies and transformations playing out in particular places. Geography and allied disciplines offer many different ways of studying how the ecological and the cultural intertwine in shaping our landscapes. In this course, through foundational theoretical engagements and field-based activities, we explore some of the cross-cutting social, political, economic, ecological and biophysical dynamics playing out in the context of the rapidly changing Southern African region.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 60%; examination 40%.

EGS4038F/S CLIMATE CHANGE AND PREDICTABILITY
30 NQF credits at NQF level 8
Convener: Professor B Hewitson
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The course explores the theory of climate change, and then goes into the question of predictability, cross scale relationships and feedbacks in the climate system, the tools and techniques of prediction, and translation of predictions into the user community including impacts and vulnerability analyses and touching on the social dimension.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS4039F/S URBAN FOOD SECURITY
30 NQF credits at NQF level 8
Convener: Associate Professor J Battersby
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
Topics include an overview of poverty and urbanization in Southern Africa; urban food security, methods and issues; urban poverty and vulnerability debates; food security and health; managing urban food systems (ecological, regulatory and fiscal dynamics).
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 75%; examination 25%.

EGS4040F/S SPECIAL TOPIC IN HUMAN/ENVIRONMENT INTERACTIONS
30 NQF credits at NQF level 8
Convener: Dr S Scheba
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
Issues and themes in contemporary aspects of the Human/ Environmental interface will be covered. Specific attention will be given to profiling core debates in a specialist field of human or environmental geography. The course will focus on using theory, but will encourage the use of case studies. Course outcomes will emphasize the development of conceptual and analytical skills.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework

EGS4041F/S APPROACHES AND ISSUES IN PHYSICAL AND ENVIRONMENTAL SCIENCES
30 NQF credits at NQF level 8
Convener: Dr S Scheba
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
Issues and themes in contemporary aspects of the Physical/ Environmental interface will be covered. Specific attention will be given to profiling core debates in a specialist field of physical or environmental geography. The course will cover theoretical, empirical and methodological concerns and will include a fieldwork component.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS4043F/S CLIMATE CHANGE ADAPTATION AND TRANSFORMATION
30 NQF credits at NQF level 8
Convener: Professor G Ziervogel
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The central question of this course is "Why does adaptation to climate change need to be understood from a social and governance perspective?" Climate change adaptation will be explored as a means for responding to global environmental change, at the local, national and international scale and from the perspective of individuals, organisations and government. Coming out of the course you will understand the complexity of adaptation and the relationship between reducing climate risk and broader socio-economic issues, how to position adaptation to climate change in the development context and as a means of transformation. Through the course you will develop skills to critically assess adaptation responses in terms of potential contributions and challenges and identify how the social and governance aspects of adaptation could be strengthened.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 60%; examination 40%.

EGS4045F/S GEOMORPHOLOGY
30 NQF credits at NQF level 8
Convener: Professor F Eckardt
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The aim of this course is to introduce students to the theory of geomorphological systems and apply this to an area or topic of their choice. The course is particularly targeted at Honours students who have selected physical geography topics for their dissertation. It gives them the opportunity to deepen some of their geomorphological literature relevant to their chosen project. Students are expected to interpret landscapes, identify formative processes and events, examine environmental changes at different spatial and temporal scales, place their area of study into the geological, Quaternary, climatic and applied context in order to appreciate geomorphologic concepts such as systems approach, complexity, relationships, feedbacks, thresholds, equilibrium and cycles.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 50%; examination 50%.

EGS4046F/S WATER RESOURCE MANAGEMENT
30 NQF credits at NQF level 8
Convener: Dr D Kibirige
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The aim of the module is to develop a comprehensive understanding of issues and challenges in water resources management at both an urban and catchment scale, and with a primary focus on the

South African context. The various themes in this module will present a fascinating interplay of tensions and challenges that play out in geographical space and over time, and will involve the consideration of factors such as the increasing demand that society places on scarce water resources; on efforts to meet the basic social need for clean, potable water; on the consequences of interventions and institutional arrangements involved in water governance; and on the role of the private sector in managing water risk in a particular catchment. The module also emphasises the value of an integrated understanding of theories and practices in water resources management and it does so by exploring the perspectives and approaches of sustainability science. Key themes in the module include water quality, monitoring and compliance; new directions in water research in South Africa; a consideration of biological treatment of water; participation in water governance; and how corporate enterprises are becoming leaders in water stewardship, shared water risk and value creation. These and other themes will be discussed in interactive seminar sessions. The course includes a three-week directed reading period, as well as a 4-day field camp.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 50%; examination 50%.

EGS4047F/S POLICY AND GOVERNANCE
30 NQF credits at NQF level 8
Convener: Associate Professor Z Patel
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course looks at the underlying dynamics involved in the negotiation of environmental policy and its implementation. The assumption here is that unsustainable outcomes are not a result of a lack of will or intention, but rather due to vastly varying values, knowledge and data that are brought to bear on decision making for the environment. The approach of this course is to challenge the 'cultural embeddedness' of policy i.e. it critiques the cultural processes underlying environmental policy. A deeper understanding of the cultural politics of environmental policy and practice will deal with the processes through which institutions define and mediate policy outcomes; governance arrangements for sustainable development; the roles of power, rationality, knowledge and values in achieving environmental and social justice.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 60%; examination 40%.

EGS4057F/S URBAN POLITICAL ECOLOGY
30 NQF credits at NQF level 8
Convener: Dr S Scheba
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course explores urbanisation dynamics with a particular interest in examining the role of political economic shifts, history, discourse, and new forms of techno-management in shaping the contemporary urban environment. It does this through drawing on urban political ecology as an interdisciplinary field of study that provides insights into the power relations underlying unequal access to urban space, resources and infrastructure. Situated in this rapidly evolving field of Urban Studies, the course aims to open up conversations about the dynamics underlying unequal access to cities as well as the possibilities that could support more just and equitable cities. Students will be expected to read set texts, both empirical and theoretical, in preparation for classes, which take the form of weekly, student-led seminars.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 70%; examination 30%.

EGS4058F/S CRITICAL PERSPECTIVES ON THE BIO-ECONOMY
30 NQF credits at NQF level 8
Convener: Professor R Wynberg
Course entry requirements: Acceptance for Honours or Master's specialising in EGS or cognate disciplines.
Course outline:
Located at the interface of fast-changing genetic and information technologies, and the juncture of a range of social, environmental and ethical concerns, the so-called bio-economy has changed ways in which biodiversity is used, conserved and commercialised. Although often touted as a panacea for energy crises, livelihoods, environmental remediation and food security, critical questions have been raised about who stands to benefit, the involvement of local communities, and economic and political drivers behind the bio-economy "push". Using a political ecology framing, this interdisciplinary course aims to introduce key theories that situate the bio-economy and to deepen understandings about the nature of emerging debates. These range from contestations about genetically modified crops, and 'biopiracy' charges of patenting biodiversity and traditional knowledge, through to the potential of agroecology as a sustainable agricultural future. The course aims to deepen critical thinking around these questions, and to inspire a scholarship that explores possibilities for socially just and environmentally sustainable approaches, with a particular focus on the Global South. The course involves both theory and practice, drawing on research mostly from Sub-Saharan Africa. Students will be expected to read set texts, to watch set videos, and to prepare seminars. The course includes several short fieldtrips. For more information see bio-economy.org.za.
DP requirements: At least 80% attendance and submission of all assignments
Assessment: 1 exam - 40%, 1 essay (3000-4000 words) - 30%, 1 seminar presentation - 15%, 1 critique (response to a particular article, policy or media piece) - 15%.

EGS4059F/S ENVIRONMENTAL GOVERNANCE IN THE GLOBAL SOUTH
30 NQF credits at NQF level 8
Convener: Dr P Mbatha
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course aims to introduce students to the theory and praxis of environmental governance relevant to global South contexts. It begins by outlining and discussing dominant historical and current environmental governance theories, models and approaches at the global level. The course then engages with various economic, political, historical, institutional and social drivers that influence environmental governance processes, practices and implementation, using the global South as a lens. It underlines symmetries and asymmetries of environmental governance by drawing on various natural resource use and governance sectors, i.e. biodiversity conservation, mining, forestry, tourism, etc. The course also engages the Sustainable Development Goals from a governance perspective, by critically analysing whether or not they can realistically be in conversation with and address issues relating to environmental governance practice in the global South.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 60%; examination 40%.

EGS4066F/S GEOGRAPHIES OF SEXUALITIES: IDENTITY, PLACE, & HEALTH.
30 NQF credits at NQF level 8
Convener: Professor A Tucker
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course explores and critically engages with geographical research related to sexuality, with a particular focus on the interrelationships between identity, place and health. The course explores

how geographical thinking on sexuality – and in particular on Lesbian, Gay, Bisexual, and Trans (LGBT) groups – has evolved over time, and the key relationships that have emerged between the study of sexuality and the study of health needs and inequalities. Starting with an exploration of the historical roots of the geographies of sexualities literature the course will go on to explore the connections such work has had with wider post-structuralist queer theories, globalization debates, and research on sexualities drawn from sub-Saharan Africa. The course will then situate such work in relation to the development of work on HIV/ AIDS prevention, treatment and care, by considering how sexualities have been variously framed, and the at times limited conceptual space for an appreciation of diverse sexual identities. The course then draws together these various strands to consider the options and possibilities for current HIV programming in Cape Town for LGBT groups together with a critical examination of the epidemiological logics and conceptual challenges of the public health deployment of 'men who have sex with men'(MSM).
DP requirements: Class attendance (80%) and submissions of all assignments.
Assessment: 1 essay (4000-4500 words) – 35%, 1 seminar presentation – 5%, 1 24hr take-home exam – 60%.

EGS4067F/S AIR QUALITY MONITORING, MANAGEMENT AND PREDICTION
30 NQF credits at NQF level 8
Convener: Dr J von Holdt
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
Compromised air quality is a major environmental concern, especially in urban environments and even more so in cities in developing parts of the world. This course explores the current state of global air quality but with a focus on examples and case studies from the global south, particularly Africa. We will investigate the factors and role players that have an influence on air quality, the distribution of polluted versus clean air and the impacts on people and the environment. This module will look at the different scales at which people are exposed to poor air quality and the data and tools we use to study and monitor the atmosphere at these different scales and explore the potential for locally developed interventions and solutions. We will also look at air quality management and how the current socio-economic situation is reflected in this space with specific reference to South and southern Africa. Students will be expected to identify an air quality issue of their choice, find and interpret relevant literature, appropriate datasets and methods and produce results which will culminate in a short research report with recommendations for interventions that can potentially result in improvements in the air quality at receptor sites.
DP requirements: At least 80% class attendance and 40% minimum in assignments.
Assessment: Assignments 60%; Examination 40%

EGS4068F/S DISASTER RISK SCIENCE
30 NQF credits at NQF level 8
Convener: Dr P Sabela-Rikhotso
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The severity and frequency of disastrous events has been in the rise for the past two decades. In the South African context however, declaration of the state of disaster has become a bone of contention in its ability to encourage disaster risk reduction. A myriad of stereotypes and bad publicity has been built around the roles, responsibilities, and authority of government to efficiently manage disasters. Through a transdisciplinary lens, this course aims to explore broad concepts, legislative and policy framework, practical applications, tools, and skills influencing disaster risk science. The course begins by exploring different scholarly arguments about the unnatural state of natural disasters. It will further investigate theoretical models and case studies which will underscore the fundamentals of disaster impact minimisation. The course will interrogate various ways in which humans, through environmental and socio-economic factors drive vulnerability and subsequently create disaster risk.
DP requirements: At least 80% attendance and submission of all assignments.
Assessment: Assignments 50%, Final exam 50%

EGS5000W ENVIRONMENTAL & GEOGRAPHICAL SCIENCE DISSERTATION
180 NQF credits at NQF level 9
Convener: Dr S Scheba
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.

EGS5003W ENVIRONMENTAL & GEOGRAPHICAL SCIENCE DISSERTATION
180 NQF credits at NQF level 9
Convener: Dr S Scheba
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.

EGS5008H ENVIRONMENT, SOCIETY & SUSTAINABILITY COURSEWORK
Entrance is limited to 12 students
90 NQF credits at NQF level 9
Convener: Dr M Norton
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 considered. Since there is a limit of 12 places in this course, admission is competitive. Selection will be at the discretion of the Head of the Department, based on quality of qualification, experiential learning and/or referee reports. For further details refer to the departmental website - see www.egs.uct.ac.za.
Course outline:
This interdisciplinary course is designed for students with diverse backgrounds who have an interest in the issues pertaining to the environment, society and sustainability. This course contributes half of the total credits for a Master's qualification which can be awarded as an MSc or MPhil, depending on the academic background of the student. The coursework component starts with registration in February. Students select four coursework modules in, for example, Theory & Practice of Environmental Management, Capital Politics & Nature, Geography of Development & Environment, Living with Environmental Change, Urban Food Security, Cultural Geographies, Managing Complex Human-Ecological Systems, or Geomorphology. Upon successful completion of the coursework component, students will be required to register for the minor dissertation component (EGS5009W) in the following year.

Assessment: Assessment for the coursework modules includes both written examinations and coursework assignments such as essays, projects, practical assignments, etc. Examinations on average count 50% and coursework 50% for each module. The combined module results will be reflected as a final coursework result.

EGS5009W ENVIRONMENT, SOCIETY & SUSTAINABILITY MINOR DISSERTATION

90 NQF credits at NQF level 9

Convener: Dr M Norton

Course entry requirements: EGS5008H

Course outline:

Students will be required to register for this course in the first semester of the second year and complete a suitable research proposal in consultation with an appropriate supervisor. After approval of the proposal in the first year of registration, students will 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 minor dissertation early in the second year.

Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

EGS5012W CLIMATE CHANGE AND PREDICTABILITY COURSEWORK

This course is convened by UCT's African Climate & Development Initiative; refer to the section "Inter-faculty Units" later in this handbook. The code EGS5012W represents the overall coursework component; the overall coursework result will be reflected against this code. There are a range of possible minor dissertation codes, depending on the discipline in which the student chooses to register for the research component.

0 NQF credits at NQF level 9

Convener: Dr M Norton

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 taught Master's course (MSc or MPhil) is offered over 13 months, beginning in January. It 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 as well as those with several years' experience and 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 curriculum comprises two compulsory core courses, EGS5031F: Introduction to Climate Change & Sustainable Development and EGS5032F/S: Climate Change Adaptation & Mitigation (details of these courses are presented later in this section). In addition, students will choose at least two elective courses, chosen from a range of courses which offer the student the opportunity to explore new areas, or look at climate and development through existing disciplinary backgrounds. A partial list and details of these courses are available from the ACDI handbook.

Assessment: To qualify for the Master's degree, students must pass all coursework with a subminimum of 33% for each core or elective course module; an aggregate coursework mark of 50% is required. A composite grade of the performance on the coursework component as a whole will be reflected against the assessment course EGS5012W. The choice of project for the minor dissertation 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, Chemical Engineering, Mechanical Engineering, Economics, Sociology, Law [Refer to relevant Faculty Handbooks]. Minor Dissertation options in the Science Faculty.

EGS5023F/S RESEARCH METHODS FOR NATURAL SCIENTISTS
23 NQF credits at NQF level 9
Convener: To be advised
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The course has a dual purpose. Firstly, a series of weekly lectures and hands-on practical seminars on the nuts and bolts of quantitative analysis. The analysis techniques investigated are (mostly) the fundamental methods found commonly in the literature; viz: Classification, time series analysis, EOF/PCA, non-linear analysis. In parallel to this are a series of seminars on "the Philosophy of Science" addressing issues of values, perception, the science community, etc. At the NQF level 9 students will do an additional grand challenge submission for their portfolio which will entail the development of an independent research question, aim and methods, and the application of these methods in carrying out the research.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS5023H SENIOR RESEARCH PROJECT IN ENVIRONMENTAL & GEOGRAPHICAL STUDIES (MA)
90 NQF credits at NQF level 9
Convener: Dr M Norton
Course outline:
The minor dissertation is based on a three- to six-month supervised research project, to be submitted at the end of January, with the possibility of extension to June the following year.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

EGS5029H CLIMATE CHANGE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Dr M Norton
Course entry requirements: EGS5012W
Course outline:
The minor dissertation is based on a three- to six-month supervised research project, to be submitted at the end of January, with the possibility of extension to June the following year.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

EGS5030F/S CLIMATE MODELLING
23 NQF credits at NQF level 9
Convener: To be advised
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
An introduction into the development and application of climate models for exploring climate dynamics, forecasting, and climate change. The course explores the inner working of climate models, the use in operational seasonal forecasting in Africa (with hands on work with the current forecasts), and actual running model experiments. Students are expected to have done EGS3012S or its equivalent. At the NQF level 9 students will do an additional grand challenge submission for their portfolio which will entail the development of an independent research question, aim and methods, and the application of these methods in carrying out the research.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS5031F INTRODUCTION TO CLIMATE CHANGE & SUSTAINABLE DEVELOPMENT
23 NQF credits at NQF level 9
Convener: Dr M Norton
Course entry requirements: Acceptance for EGS5012W and by agreement of the course convenor.
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.
Assessment: Coursework 75%; Examination 25%

EGS5032F/S CLIMATE CHANGE ADAPTATION & MITIGATION
This course will run in the second semester in 2025.
23 NQF credits at NQF level 9
Convener: Dr M Norton
Course entry requirements: Acceptance for EGS5012W and by agreement of the course convenor.
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 and mitigation 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.
Assessment: Coursework 80%; Examination 20%.

EGS5038F/S CLIMATE CHANGE & PREDICTABILITY
23 NQF credits at NQF level 9
Convener: Professor B Hewitson
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The course explores the theory of climate change, and then goes into the question of predictability, cross scale relationships and feedbacks in the climate system, the tools and techniques of prediction, and translation of predictions into the user community including impacts and vulnerability analyses and touching on the social dimension. At the NQF 9 level students will be expected to compose reports with a higher word count, at a higher intellectual level and with an expectation of a more comprehensive understanding of the pertinent literature. Students at this level will be expected to display a greater commitment and engagement in the oral components of the course.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS5039F/S URBAN FOOD SECURITY
23 NQF credits at NQF level 9
Convener: Associate Professor J Battersby
Course entry requirements: Acceptance for Honours or Master's specialising in EGS or cognate disciplines.
Course outline:
Topics include an overview of poverty and urbanization in Southern Africa; urban food security, methods and issues; urban poverty and vulnerability debates; food security and health; managing urban food systems (ecological, regulatory and fiscal dynamics). At the NQF 9 level students will be

expected to conduct a small piece of independent fieldwork which will inform their extended essay for the course. In this essay all students are expected to engage a current debate on food security or food systems studies. For students at the NQF 9 level they will use a real world case study to critically engage the theoretical literature. These students will be assessed on their ability to interpret the data and use data to critically engage theory.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 75%; examination 25%.

EGS5040F/S SPECIAL TOPIC IN HUMAN/ENVIRONMENT INTERACTIONS
23 NQF credits at NQF level 9
Convener: Dr S Scheba
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
Issues and themes in contemporary aspects of the Human/ Environmental interface will be covered. Specific attention will be given to profiling core debates in a specialist field of human or environmental geography. The course will focus on using theory, but will encourage the use of case studies. Course outcomes will emphasize the development of conceptual and analytical skills. At the NQF 9 level there is a strong emphasis on the development of analytical skills and students are expected to apply these skills in the context of an appropriate theory, to a case study of their own specialist field of human or environmental geography.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS5041F/S APPROACHES AND ISSUES IN PHYSICAL AND ENVIRONMENTAL SCIENCES
23 NQF credits at NQF level 9
Convener: Dr S Scheba
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
Issues and themes in contemporary aspects of the Physical/ Environmental interface will be covered. Specific attention will be given to profiling core debates in a specialist field of physical or environmental geography. The course will cover theoretical, empirical and methodological concerns and will include a fieldwork component. NQF 9 level there is a strong emphasis on the development of analytical skills and students are expected to apply these skills in the context of an appropriate theory, to a case study of their own specialist field of physical geography.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: 100% Coursework.

EGS5045F/S GEOMORPHOLOGY
23 NQF credits at NQF level 9
Convener: Professor F Eckardt
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The aim of this course is to introduce students to the theory of geomorphological systems and apply this to an area or topic of their choice. The course is particularly targeted at Honours students who have selected physical geography topics for their dissertation. It gives them the opportunity to deepen some of their geomorphological literature relevant to their chosen project. Students are expected to interpret landscapes, identify formative processes and events, examine environmental changes at different spatial and temporal scales, place their area of study into the geological, Quaternary, climatic and applied context in order to appreciate geomorphologic concepts such as systems approach, complexity, relationships, feedbacks, thresholds, equilibrium and cycles.
At the NQF 9 level students will be expected to back their literature review with data analyses including climatic or hydrological in nature and may also consider the application of GIS data and

use Remote Sensing. At the NQF 9 level converting and preparing elements of course content towards the use for a publication would be expected.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 50%; examination 50%.

EGS5046F/S WATER RESOURCE MANAGEMENT
23 NQF credits at NQF level 9
Convener: Dr D Kibirige
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
The aim of the module is to develop a comprehensive understanding of issues and challenges in water resources management at both an urban and catchment scale, and with a primary focus on the South African context. The various themes in this module will present a fascinating interplay of tensions and challenges that play out in geographical space and over time, and will involve the consideration of factors such as the increasing demand that society places on scarce water resources; on efforts to meet the basic social need for clean, potable water; on the consequences of interventions and institutional arrangements involved in water governance; and on the role of the private sector in managing water risk in a particular catchment. The module also emphasises the value of an integrated understanding of theories and practices in water resources management and it does so by exploring the perspectives and approaches of sustainability science. Key themes in the module include water quality, monitoring and compliance; new directions in water research in South Africa; a consideration of biological treatment of water; participation in water governance; and how corporate enterprises are becoming leaders in water stewardship, shared water risk and value creation. These and other themes will be discussed in interactive seminar sessions. The course includes a three-week directed reading period, as well as a 4-day field camp. At the NQF 9 level students are required to complete an additional assignment that comprises a literature review on a topic of their choice. Furthermore, students at this level are required to prepare, manage and lead a course discussion. NQF 9 level students will receive a separate exam paper to those at the NQF 8 level.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 50%; examination 50%.

EGS5047F/S POLICY AND GOVERNANCE
23 NQF credits at NQF level 9
Convener: Associate Professor Z Patel
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course looks at the underlying dynamics involved in the negotiation of environmental policy and its implementation. The assumption here is that unsustainable outcomes are not a result of a lack of will or intention, but rather due to vastly varying values, knowledge and data that are brought to bear on decision making for the environment. The approach of this course is to challenge the 'cultural embeddedness' of policy i.e. it critiques the cultural processes underlying environmental policy. A deeper understanding of the cultural politics of environmental policy and practice will deal with the processes through which institutions define and mediate policy outcomes; governance arrangements for sustainable development; the roles of power, rationality, knowledge and values in achieving environmental and social justice. At the NQF 9 level students will be expected to apply theory to appropriate areas of application in the realm of urban environmental policy. Masters level students will be assigned two presentations and subsequent written submissions, with an emphasis on the application of theoretical considerations. The extended policy analysis assignment will contain additional analytical variables to ensure a higher level of analysis.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 60%; examination 40%.

EGS5052W APPLIED OCEAN SCIENCES MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Professor M Vichi
Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.
Co-requisites: BIO5012W, BIO5013F, BIO5014F/SEA5011F
Course outline:
The minor dissertation, which forms 50% of the overall degree, is based on a six-month supervised research project. The choice of project will be determined by the student's prior qualification and in agreement with the course conveners and supervisors. The dissertation should be submitted at the end of January, with the possibility of extension to June of the next year.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

EGS5057F/S URBAN POLITICAL ECOLOGY
23 NQF credits at NQF level 9
Convener: Dr S Scheba
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course explores urbanisation dynamics with a particular interest in examining the role of political economic shifts, history, discourse, and new forms of techno-management in shaping the contemporary urban environment. It does this through drawing on urban political ecology as an interdisciplinary field of study that provides insights into the power relations underlying unequal access to urban space, resources and infrastructure. Situated in this rapidly evolving field of Urban Studies, the course aims to open up conversations about the dynamics underlying unequal access to cities as well as the possibilities that could support more just and equitable cities. Students will be expected to read set texts, both empirical and theoretical, in preparation for classes, which take the form of weekly, student-led seminars.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 70%; examination 30%.

EGS5058F/S CRITICAL PERSPECTIVES ON THE BIO-ECONOMY
23 NQF credits at NQF level 9
Convener: Professor R Wynberg
Course entry requirements: Acceptance for Honours or Master's specialising in EGS or cognate disciplines.
Course outline:
Located at the interface of fast-changing genetic and information technologies, and the juncture of a range of social, environmental and ethical concerns, the so-called bio-economy has changed fundamentally ways in which biodiversity is used, conserved and commercialised. Although often touted as a panacea for energy crises, livelihoods, environmental remediation and food security, critical questions have been raised about who stands to benefit, the involvement of local communities, and economic and political drivers behind the bio-economy "push". Using a political ecology framing, this interdisciplinary course aims to introduce key theories that situate the bio-economy and to deepen understandings about the nature of emerging debates. These range from contestations about genetically modified crops, and 'biopiracy' charges of patenting biodiversity and traditional knowledge, through to the potential of agroecology as a sustainable agricultural future. The course aims to deepen critical thinking around these questions, and to inspire a scholarship that explores possibilities for socially just and environmentally sustainable approaches, with a particular focus on the Global South. The course involves both theory and practice, drawing on research mostly from Sub-Saharan Africa. Students will be expected to read set texts, to watch set videos, and to prepare seminars. The course includes a short fieldtrip.

DP requirements: At least 80% attendance and submission of all assignments
Assessment: 1 exam - 40%, 1 essay (4000-5000 words) - 30%, 1 seminar presentation - 15%, 1 critique (response to a particular article, policy or media piece) - 15%.

EGS5059F/S ENVIRONMENTAL GOVERNANCE IN THE GLOBAL SOUTH
23 NQF credits at NQF level 9
Convener: Dr P Mbatha
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course aims to introduce students to the theory and praxis of environmental governance relevant to global South contexts. It begins by outlining and discussing dominant historical and current environmental governance theories, models and approaches at the global level. The course then engages with various economic, political, historical, institutional and social drivers that influence environmental governance processes, practices and implementation, using the global South as a lens. It underlines symmetries and asymmetries of environmental governance by drawing on various natural resource use and governance sectors, i.e. biodiversity conservation, mining, forestry, tourism, etc. The course also engages the Sustainable Development Goals from a governance perspective, by critically analyzing whether or not they can realistically be in conversation with and address issues relating to environmental governance practice in the global South.
DP requirements: At least 80% attendance record and submission of all assignments.
Assessment: Assignments 60%; examination 40%.

EGS5064W THEORIES OF JUSTICE & INEQUALITY MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Dr S Daya
Course outline:
Students will complete a suitable research proposal in consultation with an appropriate supervisor. After approval of the proposal, students will undertake a research project critically interrogating established paradigms of understanding justice and inequality and/or demonstrating the application of theory to empirical issues related to justice and inequality.
Assessment: By Faculty external examination process.

EGS5066F/S GEOGRAPHIES OF SEXUALITIES: IDENTITY, PLACE, & HEALTH
23 NQF credits at NQF level 9
Convener: A Tucker
Course entry requirements: Acceptance for Honours or Master's specialising in EGS.
Course outline:
This course explores and critically engages with geographical research related to sexuality, with a particular focus on the interrelationships between identity, place and health. The course explores how geographical thinking on sexuality – and in particular on Lesbian, Gay, Bisexual, and Trans (LGBT) groups – has evolved over time, and the key relationships that have emerged between the study of sexuality and the study of health needs and inequalities. Starting with an exploration of the historical roots of the geographies of sexualities literature the course will go on to explore the connections such work has had with wider post-structuralist queer theories, globalization debates, and research on sexualities drawn from sub-Saharan Africa. The course will then situate such work in relation to the development of work on HIV/ AIDS prevention, treatment and care, by considering how sexualities have been variously framed, and the at times limited conceptual space for an appreciation of diverse sexual identities. The course then draws together these various strands to consider the options and possibilities for current HIV programming in Cape Town for LGBT groups together with a critical examination of the epidemiological logics and conceptual challenges of the public health deployment of 'men who have sex with men'(MSM).

DP requirements: Class attendance (80%) and submissions of all assignments.
Assessment: 1 essay (6000-6500 words) – 30%, 1 seminar presentation – 10%, 1 24hr take-home exam – 60%.

EGS5067F/S AIR QUALITY MONITORING, MANAGEMENT AND PREDICTION
23 NQF credits at NQF level 9
Convener: Dr J von Holdt
Course outline:
Compromised air quality is a major environmental concern, especially in urban environments and even more so in cities in developing parts of the world. This course explores the current state of global air quality but with a focus on examples and case studies from the global south, particularly Africa. We will investigate the factors and role players that have an influence on air quality, the distribution of polluted versus clean air and the impacts on people and the environment. This module will look at the different scales at which people are exposed to poor air quality and the data and tools we use to study and monitor the atmosphere at these different scales and explore the potential for locally developed interventions and solutions. We will also look at air quality management and how the current socio-economic situation is reflected in this space with specific reference to South and southern Africa. Students will be expected to identify an air quality issue of their choice, find and interpret relevant literature, appropriate datasets and methods and produce results which will culminate in a short research report with recommendations for interventions that can potentially result in improvements in the air quality at receptor sites.
DP requirements: At least 80% class attendance and 40% minimum in assignments.
Assessment: Literature review 10%, data analysis assignment and paper 35%, discussion piece 10%, project poster and presentation 15%, final capstone exam 30%.

EGS5068F DISASTER RISK SCIENCE
23 NQF credits at NQF level 9
Convener: Dr P Sabela-Rikhotso
Course entry requirements: Acceptance for EGS Masters
Course outline:
The severity and frequency of disastrous events has been in the rise for the past two decades. In the South African context however, declaration of the state of disaster has become a bone of contention in its ability to encourage disaster risk reduction. A myriad of stereotypes and bad publicity has been built around the roles, responsibilities, and authority of government to efficiently manage disasters. Through a transdisciplinary lens, this course aims to explore broad concepts, legislative and policy framework, practical applications, tools, and skills influencing disaster risk science. The course begins by exploring different scholarly arguments about the unnatural state of natural disasters. It will further investigate theoretical models and case studies which will underscore the fundamentals of disaster impact minimisation. The course will interrogate various ways in which humans, through environmental and socio-economic factors drive vulnerability and subsequently create disaster risk.
DP requirements: At least 80% attendance and submission of all assignments.
Assessment: Assignments 50%, Final exam 50%

EGS6003W ENVIRONMENTAL & GEOGRAPHICAL SCIENCE THESIS
360 NQF credits at NQF 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 this degree as set out in Book 3, General Rules and Policies.

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:
P E Janney, BSc *New Hampshire* PhD *San Diego*
Philipson Stow Professor of Mineralogy & Geology:

Chamber of Mines Professor of Geochemistry:

Professor:
E M Bordy, MSc *Budapest* PhD *Rhodes*
Emeritus Professors:
C Harris, MA DPhil *Oxon*
A P le Roex, BSc *Stell* BSc Hons PhD *Cape Town*
S H Richardson, BSc Hons *Cape Town* PhD *MIT*
Associate Professors:
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R Pickering, MSc *Witwatersrand* PhD *Berne*
A Sloan, MSc PhD *Cantab*
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D L Reid, MSc *Wellington* PhD *Cape Town*
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G Howarth, MSc PhD *Rhodes*
Chief Research Officer:
P J le Roux, BSc Hons PhD *Cape Town*
Lecturer:
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D Basson
Chief Technical Officer:
J Leukes
Chief Scientific Officers:
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F Rawoot, BSc *UWC*
C E Tinguely, MSc *Clermont-Ferrand*
R van der Merwe
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S Hashibi, BSc Hons *Cape Town*
N Laidler, BSc Hons *Cape Town*

Administrative Officer:
N Barends
Administrative Assistant:
E Roos
Technical Assistants:
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 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 Earth's 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 and electron microprobe equipment, solution and laser ablation ICP-MS and MC-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 field excursions which take place during the Easter and September mid-semester vacations; full daily participation is required by all students.

NOTE: Supplementary examinations are not normally granted to students for senior courses in Geology. Students who pass the coursework, but underperformed in the final exam may be recalled for a re-exam immediately after the exam, but before the results are approved. Notification will be issued by email to the UCT email account.

First-Year Courses

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

GEO1009F GEOSYSTEMS: AN INTRODUCTION TO EARTH & ENVIRONMENTAL SCIENCES

This course is presented jointly by the Departments of Archaeology, Environmental & Geographical Sciences, Geological Sciences, and Oceanography, but administered by Geological Sciences. Students majoring in these subjects are required to attend one half-day excursion.

18 NQF credits at NQF level 5

Convener: Professor E M Bordy

Course entry requirements: At least 50% for NSC Geography or at least 60% for NSC Physical Science or Life Sciences. NOTE: Preference will be given to students majoring in Archaeology, Environmental and Geographical Science, Geology or Oceanography.

Course outline:

This course aims to develop a broad understanding of how the Earth works. Over its >4.5 billion-year-long history, the Earth has been shaped by chemical, physical and biological processes. The course demonstrates why decoding the rock record of deep-time events is critical for explaining past, present and future environmental changes and the distribution of natural resources. It examines the interplay of terrestrial, marine, atmospheric, and cryospheric processes within the Earth system, with an emphasis on monitoring essential variables for understanding climate variability and change. The Earth has also sustained life over the last >3.5 billion years. Our species, *Homo sapiens*, is a relatively recent arrival, yet it has had, and continues to have, the greatest impact on our planet. The course reviews human evolution and how we became the dominant cause of global environmental change. The course also explores the social risks and vulnerabilities in response to the Earth's biophysical processes and change. The course concludes with attention to the concepts of environmental hazard, risk, resilience, monitoring and adaptation.

Lecture times: Monday - Friday, 2nd period

DP requirements: An average of 40% on all marked classwork and tests. Submission of 80% of weekly assignments in each of the four sections (i.e., GEO, AGE, SEA, EGS). Attendance of the field trip is compulsory for students majoring in Archaeology, EGS, Geology, or Oceanography.

Assessment: Marked classwork, including class test/s, counts 50%, and a 3-hour written examination counts 50%. A subminimum of 40% in the class mark is required to write the theory examination paper. Supplementary examinations for GEO1009F will be offered in July.

Second-Year Courses

GEO2001F MINERALOGY, CRYSTALLOGRAPHY AND PETROGRAPHY

Entrance is limited to 35 students

24 NQF credits at NQF level 6

Convener: Professor P E Janney

Course entry requirements: GEO1009F and GEO1006S, CEM1000W or equivalent.

Course outline:

This course covers the fundamentals of physical and chemical mineralogy and its application to igneous and metamorphic rocks as a basis for senior courses in petrology. The course comprises inter-related sections as follows: crystallography and crystal optics (including a brief introduction to X-ray crystallography): mineralogy (the chemical, physical and optical properties of selected groups of rock-forming minerals, and the theory and practice of identifying minerals by means of the polarising microscope); phase diagrams (interpretation of simple phase diagrams relevant to igneous and metamorphic rocks); classification and petrography of igneous rocks (physical processes of magma differentiation; the relationship between chemical composition and modal mineralogy); classification and petrography of metamorphic rocks (types of metamorphism, metamorphic textures and mineral assemblages).

Lecture times: Monday - Friday, 2nd period

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 examination in June counts 50%. Subminima of 40% are required in practical and theory examination papers.

GEO2004S PHYSICAL GEOLOGY
24 NQF credits at NQF level 6
Convener: Associate Professor A Sloan
Course entry requirements: GEO2001F, PHY1031F or equivalent
Course outline:
This course builds on the previous mineralogy course and explores the physical structure of the Earth and the physical processes involved in sedimentary rock formation and rock deformation. These include transport and deposition of sediments; sedimentary textures and structure; siliciclastic, carbonate, evaporitic and other sedimentary rocks; earthquakes, stress, displacement and strain; brittle and ductile deformation; interpretation of geological maps and cross sections; introduction to tectonics and global geophysics.
Lecture times: Monday - Friday, 2nd period
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 examination in November counts 45%. Subminima of 40% are required in practical and theory examination papers.

GEO2005X FIELD GEOLOGY & GEOLOGICAL MAPPING
24 NQF credits at NQF level 6
Convener: Associate Professor J F Diener
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.
Lecture times: None
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

GEO3001S STRATIGRAPHY & ECONOMIC GEOLOGY
36 NQF credits at NQF level 7
Convener: Dr G Howarth
Course entry requirements: GEO2004S and 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.
Lecture times: Monday - Friday, 2nd period
DP requirements: An average of 30% in all marked class work and class tests.

Assessment: Practicals 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.

GEO3005F PETROLOGY & STRUCTURAL GEOLOGY
36 NQF credits at NQF level 7
Convener: Professor P E Janney
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; kinematic principles, deformation mechanisms, microstructure, faulting and tectonic geomorphology.
Lecture times: Monday - Friday, 2nd period
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 examination written in June counts 50%. Subminima of 40% required in practical and theory examination papers.

Postgraduate Courses

GEO4000W GEOLOGY HONOURS
Since the code GEO4000W will not carry a NQF credit value, students will be concurrently registered for GEO4003W (coursework component of 120 NQF credits) and GEO4004W (research project of 40 NQF credits). Entrance is limited to 16 students.
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Associate Professor J F Diener
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 take 7 compulsory modules which cover the following subject areas: Geochemistry (including Isotope and Marine Geochemistry), Geophysics, Economic Geology, Igneous, Metamorphic and Mantle Petrology, Palaeontology, Quaternary Geology, Petroleum Geology, Sedimentary Basins, Tectonics, Geological Data Interpretation & Analysis, and Scientific Communication. In addition, each student is required to undertake a supervised research project. Choice of research project requires the approval of the Honours course co-ordinator and Head of Department. All students are required to attend a two week fieldtrip held during the year.
Assessment: The modules will be examined in mid-year and in October, and the latter examinations will include a 3 hour General Exam. Examinations will count 45%, practical and assignment work done during the year counts 30%, and the research project 25% towards the final grade. Subminima are required for the overall examination mark (40%) and for the research project (50%). These component parts of the course will be combined in a final overall mark which will be reflected against the course code GEO4000W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

GEO4001W GEOCHEMISTRY HONOURS

As for GEO4000W above. Students undertaking a geochemical or analytical geochemistry project can elect to graduate in Geochemistry, subject to the approval of the Head of Department. Since the code GEO4001W will not carry a NQF credit value, students will be concurrently registered for GEO4005W (coursework component of 120 NQF credits) and GEO4006W (research project of 40 NQF credits).

160 NQF credits at NQF level 8; the combined credit value of both components.

GEO5000W GEOLOGY DISSERTATION

180 NQF credits at NQF 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 GEOCHEMISTRY DISSERTATION

180 NQF credits at NQF 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.

GEO5005H CLIMATE CHANGE MINOR DISSERTATION

90 NQF credits at NQF level 9

Convener: To be advised

Course entry requirements: EGS5012W (refer to entry in Department of Environmental and Geographical Science section)

Course outline:

The minor dissertation is based on a three- to six-month supervised research project, to be submitted at the end of January, with the possibility of extension to June of the next year.

Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

GEO6000W GEOLOGY THESIS
360 NQF credits at NQF 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.

GEO6001W GEOCHEMISTRY THESIS
360 NQF credits at NQF 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.

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 department's website is https://science.uct.ac.za/department-mathematics and information specific to the Honours programme can be found at https://science.uct.ac.za/mam-honours.
The Departmental abbreviation for Mathematics and Applied Mathematics is MAM.

Associate Professor and Head of Department:
D J Erwin, MSc *Natal* PhD *Western Michigan*
South African Research Chair in Computational Mechanics:
B D Reddy, BSc (Eng) *Cape Town* PhD *Cantab* FRSSAf, MASSAf, OMB
South African Research Chair in Physical Cosmology:
A Weltman, BSc Hons *Cape Town* PhD *Columbia*
Professors:
I V Barashenkov, MSc *Moscow* PhD *Dubna*
B A Bassett, MSc *Cape Town* PhD *Trieste*
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Á de la Cruz-Dombriz, MSc *London* PhD *Madrid*
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S Haque, PhD *Wisconsin*
R Moolman, MSc *Johannesburg* PhD *Witwatersrand*
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Lecturers:
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S Chili, BScEng *Cape Town*
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S J Holloway, MSc PhD *Cape Town*
IT Technical Officer:
N Matotong, NDip *VUT*
Administrative Manager:
H S Leslie, BA Hons *UPE*
Financial Administrators:
A Ansary
A Willis-Thomas
Postgraduate Administrator:
T Hannival
Undergraduate Administrator:
G McBride
Senior Secretaries:
N Hlwele
A Wildschut
Departmental Assistant:
S Allie
Campus Cleaning Services Supervisor:
M Louw
Campus Cleaning Services:
N Bam
M Magwevana
T Mbonja
M Valentyn
MARAM Administrator:
D Lapido Loureiro

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, J H Webb)

General Relativity and Cosmology (P W M Adams, B A Bassett, C A Clarkson, Á de la Cruz-Dombriz, P K S Dunsby, G F R Ellis, C W Hellaby, B Mongwane, J Murugan, J P Shock, A Weltman)

Group Theory, Universal Algebra, Set Theory and Model Theory (F Russo)
Discrete Mathematics, Combinatorics, Computational Complexity, Cryptography, Graph Theory (D J Erwin, F Russo, H Spakowski)
Marine Population Dynamics (A Brandao, D S Butterworth, C de Moor, S J Holloway)
Mathematics Education (J J Conradie, G F R Ellis, C R A Gilmour, R Moolman, 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 (F Ebobisse-Bille, B D Reddy)
Approximation theory, special functions (K Driver)
Stochastic Ordinary Differential Equations (E Fredericks)
National Astrophysics & Space Science Programme (B A Bassett, Á de la Cruz-Dombriz, P K S Dunsby, G F R Ellis, J Murugan, P A Whitelock, J P Shock, A Weltman)
Topology and Category Theory (C R A Gilmour, G Janelidze, F Russo, A Schauerte)
String Theory and Quantum Gravity (J Murugan, J P Shock, A Weltman)
Category Theory (G Janelidze, T Janelidze-Gray)
Nonlinear dynamical systems, chaotic dynamics and Computational Mathematics (H Skokos)
Leavitt Path Algebras, Non-Associative Algebra, Ring Theory, Computer Algebra, Linear and Multilinear Algebra, Algebraic Combinatorics, Dialgebras (J Sanchez-Ortega)
Further information may be found on the Department's website at www.math.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.

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 syllabi indicate the contents of the various courses as recently given. All courses are subject to revision without advance notice.
3. For courses offered by the Department to Engineering and Commerce Faculty students refer to the relevant Faculty Handbooks.
4. In exceptional cases, the usual course entry requirements may be waived with special permission of the Head of Department.

Undergraduate Courses in Applied Mathematics

Undergraduate Courses

First-Year Courses

MAM1008S INTRODUCTION TO DISCRETE MATHEMATICS
Students cannot obtain credits for both MAM1008S and MAM1019H
18 NQF credits at NQF level 5
Convener: Dr I Allie
Co-requisites: MAM1004S or MAM1005H (unless a pass has been obtained for MAM1004F or MAM1031F or equivalent)
Objective: To introduce students to the language and methods of the area of Discrete Mathematics, and to show students how discrete mathematics can be used in modern computer science (with the focus on algorithmic applications).
Course outline:
This course provides a foundation for Computer Science and Applied Statistics. Many areas of Computer Science and Applied Statistics require the ability to work with concepts from discrete

structures, which include topics such as set theory, logic, graph theory, and probability theory. In this course, you will learn about (1) sets, relations and functions; (2) basic logic, including propositional logic, logical connectives, truth tables, propositional inference rules and predicate logic; (3) proof techniques, including the structure of mathematical proofs, direct proofs, disproving by counterexample, proof by contradiction; (4) basics of counting, including counting arguments, the pigeonhole principle, permutations and combinations, solving recurrence relation; (5) graphs and trees; (6) discrete probability, including finite probability space, axioms of probability, conditional probability; and, (7) linear algebra, including vectors, matrices and their applications. The course is offered in a blended-learning format. Students are provided with a set of video lectures that they can watch multiple times. Student contact time is in a tutorial format aimed at reinforcing the principles introduced in the online lectures and giving students time to do exercises under the supervision of tutors.
Lecture times: No face-to-face lectures. The course content is delivered online.
DP requirements: Class Record of at least 30% and attendance at 10 or more (out of 12) tutorials.
Assessment: Class Record counts 50% and Exam counts 50%.

MAM1043H MODELLING & APPLIED COMPUTING
This course can be taken in conjunction with MAM1044H as lectures are arranged so that this is possible. Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.math.uct.ac.za. (A tablet or "netbook" will not be suitable). The course convener will provide details of additional software (open source) required.
18 NQF credits at NQF level 5
Convener: Dr P W Adams
Co-requisites: MAM1031F and MAM1032S or equivalent.
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 and/or Julia. Exposure to research methodology and mathematical communication is provided.
Lecture times: First Semester: 2nd period Monday, Wednesday, Friday. Second Semester: 2nd period Tuesday, Thursday.
DP requirements: A class record of 30% or more.
Assessment: Class record counts 50%; one 3-hour examination written in October/November makes up the balance.

MAM1044H DYNAMICS
This course can be taken in conjunction with MAM1043H as lectures are arranged so that this is possible.
18 NQF credits at NQF level 5
Convener: To be advised
Co-requisites: MAM1031F and MAM1032S or equivalent
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.
Lecture times: First semester: 2nd period Tuesday, Thursday. Second semester: 2nd period Monday, Wednesday, Friday.
DP requirements: A class record of 30% or more.
Assessment: Class record counts up to 40%. A project and one 2.5-hour examination written in October/November make up the balance.

Second-Year Courses

MAM2040F ORDINARY DIFFERENTIAL EQUATIONS (2OD)
12 NQF credits at NQF level 6
Convener: To be advised
Course entry requirements: MAM1031F and MAM1032S or equivalent, MAM1043H and MAM1044H
Co-requisites: MAM2010F and MAM2011F
Course outline:
The course will cover first-order equations; existence and uniqueness of solutions. Linear equations of the n-th order; systems of n linear first-order equations. Non-homogeneous linear equations and systems; variation of parameters; qualitative theory of non-linear equations; phase plane analysis; externally- and parametrically-driven oscillators; resonance; application to the theory of non-linear vibrations. Calculus of variations. Please note that lectures alternate during the week so that students can take MAM2040F and MAM2041F concurrently.
Lecture times: Monday - Friday, 3rd period.

MAM2041F NUMERICAL ANALYSIS (2NA)
12 NQF credits at NQF level 6
Convener: Dr B Mongwane
Course entry requirements: MAM1031F and MAM1032S or equivalent, MAM1043H and MAM1044H
Co-requisites: MAM2010F and MAM2011F
Course outline:
The course will cover non-linear equations and rates of convergence. Direct and iterative methods for solving linear systems, pivoting strategies, matrix factorisation, 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. Please note that lectures alternate during the week so that students can take MAM2040F and MAM2041F concurrently.
Lecture times: Monday - Friday, 3rd period.

MAM2042S NON-LINEAR DYNAMICS (2ND)
12 NQF credits at NQF level 6
Convener: To be advised
Course entry requirements: MAM1031F and MAM1032S or equivalent, MAM1043H, MAM1044H, MAM2010F and MAM2011F
Course outline:
The course will cover fixed points, bifurcations, phase portraits. Conservative and reversible systems. Index theory, PoincaréBendixson theorem, Liénard systems, relaxation oscillators. Hopf bifurcations, quasiperiodicity and Poincaré maps. Applications: chaos on a strange attractor, Lorentz map, logistic map, Hénon map. Lyapunov exponents. Fractals. Please note that lectures alternate during the week so that students can take MAM2042S and MAM2043S concurrently.
Lecture times: Monday - Friday, 3rd period.
DP requirements: Class record (CR) of at least 30% and satisfactory attendance at tutorials and submission of all assigned work.
Assessment: The class record (CR) is comprised of at least two class tests and any additional assessments the course convenor feels are necessary. The examination (EX) at the end of the semester is two hours long The final mark (FM) is calculated as 50% CR + 50% EX. Note that the CR comprises a maximum of 50% of the FM, while the EX makes up the balance.

MAM2043S BOUNDARY-VALUE PROBLEMS (2BP)
12 NQF credits at NQF level 6
Convener: Associate Professor B Osano
Course entry requirements: MAM1031F and MAM1032S or equivalent, MAM1043H, MAM1044H, MAM2010F, MAM2011F, and MAM2040F
Course outline:
The course will cover homogeneous and non-homogeneous boundary-value problems, Sturm-Liouville problems. Partial differential equations and their solution via separation of variables. Fourier series. Green's functions. Eigenfunction expansions. Please note that lectures alternate during the week so that students can take MAM2042S and MAM2043S concurrently.
Lecture times: Monday - Friday, 3rd period.
DP requirements: Class record (CR) of at least 30% and satisfactory attendance at tutorials and submission of all assigned work.
Assessment: The class record (CR) is comprised of at least two class tests and any additional assessments the course convenor feels are necessary. The examination (EX) at the end of the semester is two hours long The final mark (FM) is calculated as 50% CR + 50% EX. Note that the CR comprises a maximum of 50% of the FM, while the EX makes up the balance.

Third-Year Courses

MAM3042F ADVANCED NUMERICAL METHODS (3AN)
18 NQF credits at NQF level 7
Convener: Dr N Alexeeva
Course entry requirements: MAM2040F, MAM2041F, MAM2042S and MAM2043S.
Course outline:
Advanced methods for ODEs, boundary value problems, differential eigenvalue problems. Numerical solution of PDEs by methods of finite differences, finite elements and spectral methods. Please note that lectures alternate during the week so that students can take MAM3042F and MAM3044F concurrently.
Lecture times: Monday - Friday, 3rd period.
Assessment: Class record counts up to 50%, while the balance is given by the final examination.

MAM3043S METHODS OF MATHEMATICAL PHYSICS (3MP)
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: MAM2040F, MAM2041F, MAM2042S and MAM2043S.
Course outline:
The aim of this course is to introduce a selection of advanced topics in Applied Mathematics. Topics include: The Fourier-transform solution of linear PDEs on the line. The long-term asymptotic behaviour of solutions: the methods of Laplace, stationary phase and steepest descents. Nonlinear waves: the method of characteristics; the effect of dissipation; the Cole-Hopf transform for the Burgers equation; travelling fronts for the KPP equation. The effect of dispersion: KdV and nonlinear Schroedinger equation. Elliptic integrals and elliptic functions; dark and bright solitons; kinks and breathers for the sine-Gordon equation. Multisoliton solutions: the Hirota method and Baecklund transformations. Please note that lectures alternate during the week so that students can take MAM3043S and MAM3045S concurrently.
Lecture times: Monday - Friday, 3rd period.
DP requirements: Class record of 30% or more.
Assessment: Class record counts up to 50%, while the balance is given by the final examination.

MAM3044F FUNCTIONS OF A COMPLEX VARIABLE (3CV)
18 NQF credits at NQF level 7
Convener: To be advised
Course entry requirements: MAM2014S, MAM2040F, MAM2041F, MAM2042S and MAM2043S.
Course outline:
Complex calculus, calculus of residues, special functions, applications to physics. Please note that lectures alternate during the week so that students can take MAM3044F and MAM3042F concurrently.
Lecture times: Monday - Friday, 3rd period.
Assessment: Class record counts up to 50%, while the balance is given by the final examination.

MAM3045S INTRODUCTION TO GENERAL RELATIVITY (3GR)
18 NQF credits at NQF level 7
Convener: Dr B Mongwane
Course entry requirements: MAM2040F, MAM2041F, MAM2042S and MAM2043S.
Course outline:
This course introduces special relativity and general relativity including tensors, the metric tensor, symmetries, curvature, Einstein's field equations and solutions of Minkowski space and Black Holes. Please note that lectures alternate during the week so that students can take MAM3043S and MAM3045S concurrently.
Lecture times: Monday - Friday, 3rd period.
Assessment: Class record counts up to 50%, while the balance is given by the final examination.

MAM3046S FLUID DYNAMICS (3FD)
18 NQF credits at NQF level 7
Convener: Professor A Malan
Course entry requirements: MAM2040F, MAM2041F, MAM2042S and MAM2043S.
Course outline:
Applications, description of fluids, equations of fluid flow for simple fluids, analytical techniques.
Lecture times: Monday and Tuesday, meridian. Thursday, 5th period.

MAM3055Z PROJECT/INTERNSHIP IN APPLIED MATHEMATICS
0 NQF credits at NQF level 7
Convener: Professor I V Barashenkov
Course outline:
With permission from the Convenor, and subject to the availability of a suitable supervisor in the Department, students may complete a project or internship on a topic in Applied Mathematics. This is strongly recommended for students intending to continue to Honours in Applied Mathematics.

Undergraduate Courses in Mathematics

Students who are registered for the courses MAM1004F/S, MAM1005H, MAM1006H, MAM1008S, MAM1010F/S, MAM1012F/S, MAM1020F/S, MAM1021F/S, MAM1023F/S, MAM1024F/S, MAM1031F, MAM1032S, MAM1110F/H, and MAM1112S will be able to access an EBook version of the prescribed textbook at no extra cost (i.e., students in these courses do not have to buy the textbook).

First-Year Courses in Mathematics

A semesterised course in Mathematics at first-year level is offered in the Science Faculty, MAM1031F and MAM1032S. (The courses MAM1010F/S and MAM1012F/S are intended for Commerce students and the courses MAM1020F/S and MAM1021F/S for Engineering students. Details of these can be found in the Handbooks for the Faculty of Commerce and the Faculty of

Engineering & the Built Environment respectively). Credit equivalent to MAM1031F can be obtained by passing MAM1005H or MAM1033F, and credit equivalent to MAM1032S can be obtained by passing MAM1006H or MAM1034S. 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 take the half course MAM1019H, usually during their first year of study.
No student may register for more than one of MAM1004F, MAM1004S, MAM1005H, MAM1006H, MAM1031F, MAM1032S, MAM1033F and MAM1034S simultaneously. Credit will not be given for more than one of MAM1004F, MAM1004S, MAM1005H, MAM1031F and MAM1033F. Credit for any first-year half course in Mathematics falls away on obtaining credit for MAM1031F, with the exception of MAM1008S and MAM1019H. Credit will not be given for both MAM1008S and MAM1019H.

The course STA1001F/S carries no credit in the Faculty of Science.

Students intending to major in Mathematics should take MAM2010F, MAM2011F, MAM2013S and MAM2014S at second-year level.

Students intending on pursuing an Honours in Mathematics should take MAM3010F and MAM3011F at third-year level, along with at least two of MAM3012S, MAM3013S, MAM3014S and MAM3015F.

Undergraduate Courses

First-Year Courses

MAM1004F MATHEMATICS 1004
18 NQF credits at NQF level 5
Convener: T C Van Heerden
Course entry requirements: At least 70% in NSC Mathematics. Students registered in other faculties who do not meet the 70% NSC requirement may instead complete MAM1014F/MAM1022F followed by MAM1015S with a mark of 70% or higher to gain entry to MAM1004F and MAM1004S. *Students who fail MAM1004F are expected to register for MAM1004S in the 2nd 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. Antiderivatives and integrals. Mathematical modelling. Separable and linear differential equations.
Lecture times: Monday - Friday, 1st period
DP requirements: Minimum of 30% in class tests, and satisfactory tutorial attendance.
Assessment: Class tests and regular WebAssigns determine a class record; one 3-hour examination makes up the balance of the final mark.

MAM1004S MATHEMATICS 1004
18 NQF credits at NQF level 5
Convener: To be advised
Course entry requirements: At least 70% in NSC Mathematics. Students registered in other faculties who do not meet the 70% NSC requirement may instead complete MAM1014F/MAM1022F followed by MAM1015S with a mark of 70% or higher to gain entry to

MAM1004F and MAM1004S. *Students who fail MAM1004F are expected to register for MAM1004S in the 2nd 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. Antiderivatives and integrals. Mathematical modelling. Separable and linear differential equations.
Lecture times: Monday - Friday, Meridian
DP requirements: Minimum of 30% in class tests, and at least 80% attendance at tutorials.
Assessment: Year mark counts up to 40%; one 3-hour examination makes up the balance.

MAM1005H MATHEMATICS 1005

18 NQF credits at NQF level 5
Convener: Dr M Geyer
Course entry requirements: At least 70% in NSC Mathematics. The permission of the Dean or Head of Department is required prior to registration for this course. *NOTES: 1) The course 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. 2) MAM1005H + MAM1006H is equivalent to MAM1031F + MAM1032S in level, credit value towards the degree and as prerequisite for other courses.*
Course outline:
Similar to MAM1031F, the aim of this course is to introduce the fundamental ideas in calculus and related topics. It will cover the topics in MAM1031F including differential calculus of functions of one variable, but extended over the full year.

Lecture times: Students attend Monday - Friday in 1st or 3rd period (depending on the rest of their timetable); 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 50%; one 2-hour examination written in October/November makes up the balance.

MAM1006H MATHEMATICS 1006

18 NQF credits at NQF level 5
Convener: Associate Professor B Osano
Course entry requirements: MAM1005H or a pass with at least 65% in MAM1004F/S. Students who have passed MAM1004F/S 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. *NOTES: 1) This course follows on from MAM1005H and also 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. 2) MAM1005H + MAM1006H is equivalent to MAM1000W in level, credit value towards the degree and as prerequisite for certain other courses.*
Course outline:
Similar to the full-year course MAM1000W, the aim of this course is to introduce the fundamental ideas in calculus, linear algebra and related topics. This 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.

Lecture times: Lectures on Monday, Tuesday, Wednesday and Friday in first period. Tutorials on Thursday in first period. No workshops.
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 examination written in October/November makes up the balance.

MAM1019H FUNDAMENTALS OF MATHEMATICS
Students who intend to major in mathematics are expected to take MAM1019H during their first year of study. Students cannot obtain credits for both MAM1008S and MAM1019H
18 NQF credits at NQF level 5
Convener: Associate Professor A Schauerte
Course entry requirements: At least 70% in NSC Mathematics
Co-requisites: MAM1031F and MAM1032S or equivalent.
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 mathematical structures and the fundamental number systems.
Lecture times: Five lectures every two weeks 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.

MAM1031F MATHEMATICS 1031
18 NQF credits at NQF level 5
Convener: Dr H Wiggins
Course entry requirements: At least 70% in NSC Mathematics
Course outline:
The aim of this course is to introduce students to the fundamental ideas in differential calculus covering functions of one variable, limits, continuity and differentiation with applications, as well as formal proof methods. This course (or equivalent), along with MAM1032S (or equivalent) is necessary for entry into second year mathematics.
Lecture times: Five lectures per week, Monday - Friday, 1st or 3rd period
DP requirements: Minimum of 30% for class tests, minimum 30% for weekly online tests, and 80% attendance at tutorial sessions.
Assessment: Semester mark counts 33.3% and end-of-semester exam counts 66.6%.

MAM1032S MATHEMATICS 1032
18 NQF credits at NQF level 5
Convener: Dr H Wiggins
Course entry requirements: MAM1031F or MAM1033F or MAM1004F (with 65% or higher)
Course outline:
The aim of this course is to continue from the work in MAM1031F and introduce students to integral calculus, taylor polynomials, complex numbers, vector geometry, linear algebra and differential equations. This course, along with MAM1031F is necessary for entry into second year mathematics.
Lecture times: Five lectures per week, Monday - Friday, 1st or 3rd period.
DP requirements: Minimum of 30% for class tests, minimum 30% for weekly online tests, and 80% attendance at tutorial sessions.
Assessment: Semester mark counts 33.3% and end-of-semester exam counts 66.6%.

MAM1033F MATHEMATICS 1033

The augmented courses MAM1033F and MAM1034S cover the same material as MAM1031F and MAM1032S, but require more of a student's time as there are supplementary workshops on Monday and Friday afternoons. Consequently, students registered for MAM1033F and MAM1034S are restricted to registering for the equivalent of three full courses (108 credits) rather than four (144 credits), so that they have time to engage with the additional workshops.

18 NQF credits at NQF level 5

Convener: Dr H Wiggins

Course entry requirements: At least 70% in NSC Mathematics

Course outline:

The aim of this course is to introduce students to the fundamental ideas in differential calculus. It is designed for students majoring in mathematical and physical sciences. In addition, a fundamental aim is for students to come away with an understanding of how to read, write and apply mathematics using mathematical thinking practices for clarity, consistency and a depth of understanding that prepares them for MAM2000W, MAM3000W, and the mathematical requirements of their other Science courses.

Lecture times: Five lectures per week, Monday - Friday, 1st or 3rd period.

DP requirements: Minimum of 30% for class tests, minimum 30% for weekly online tests, 80% attendance at tutorial sessions and 100% attendance at Mathematical Thinking workshops.

Assessment: Semester mark counts 33.3% and end-of-semester exam counts 66.6%.

MAM1034S MATHEMATICS 1034

18 NQF credits at NQF level 5

Convener: Dr H Wiggins

Course entry requirements: MAM1033F

Course outline:

The aim of this course is to introduce the fundamental ideas in calculus and related topics. The main topics include integral calculus, differential equations, partial derivatives, vector geometry, matrix algebra, complex numbers, and Taylor polynomials. The course includes an explicit focus on mathematical thinking practices necessary for the depth of mathematical understanding for studies in the mathematical and physical sciences. These practices include: inductive and deductive reasoning, justifying, defining, proving, using mathematical understanding to flexibly solve multi-level problems, reading mathematics for learning, and communicating mathematical knowledge in writing and applying mathematics using mathematical thinking practices for clarity, consistency and a depth of understanding that prepares them for second- and third-year mathematics, and the mathematical requirements of their other Science courses. This course (or equivalent), along with MAM1033F (or equivalent) is necessary for entry into second year mathematics.

Lecture times: Five lectures per week, Monday - Friday, 1st or 3rd period.

DP requirements: Minimum of 30% for class tests, minimum 30% for weekly online tests, 80% attendance at tutorial sessions, and 100% attendance at Mathematical Thinking workshops.

Assessment: Semester mark counts 33.3% and end-of-semester exam counts 66.6%.

MAM2010F ADVANCED CALCULUS (2AC)

12 NQF credits at NQF level 6

Convener: Dr F Ebobisse-Bille

Course entry requirements: MAM1031F and MAM1032S or equivalent. With permission from the convener, students with 70% for both MAM1010F and MAM1012S may register for MAM2010F.

Course outline:

Students will study the fundamentals of multivariable calculus, including: Curves and surfaces in three dimensions, change of coordinates; Line integrals, surface integrals; Stoke's, Green's and divergence theorems. Please note that lectures alternate during the week so that students can take MAM2010F and MAM2011F concurrently.

Lecture times: Tuesdays, Fridays and some Wednesdays in 5th period.

MAM2011F LINEAR ALGEBRA (2LA)
12 NQF credits at NQF level 6
Convener: Dr H Spakowski
Course entry requirements: MAM1031F and MAM1032S or equivalent. With permission from the convener, students with 70% for both MAM1010F and MAM1012S may register for MAM2010F.
Course outline:
Students will study the fundamentals of linear algebra, including: Vector spaces, linear independence, spans, bases, row space, column space, null space; Linear maps; Eigenvectors and eigenvalues; Inner product spaces, orthogonality. Please note that lectures alternate during the week so that students can take MAM2010F and MAM2011F concurrently.
Lecture times: Mondays, Thursdays and some Wednesdays in 5th period.

MAM2012S DIFFERENTIAL EQUATIONS (2DE)
12 NQF credits at NQF level 6
Convener: T C Van Heerden
Course entry requirements: MAM1031F and MAM1032S or equivalent, MAM2010F and MAM2011F.
Course outline:
Students will study the fundamentals of differential equations, including topics from: First and second-order difference equations; Linear differential equations, constant coefficients; Laplace transforms; Nonlinear equations, phase plane analysis; Parabolic partial differential equations, separation of variables, boundary value problems; Black-Scholes equation; Stochastic differential equations. Please note that lectures alternate during the week so that students can take any of MAM2012S, MAM2013S and MAM2014S concurrently.
Lecture times: Tuesdays, Fridays and some Wednesdays in 4th period.

MAM2013S INTRODUCTORY ALGEBRA (2IA)
12 NQF credits at NQF level 6
Convener: Associate Professor A Schauerte
Course entry requirements: MAM1031F and MAM1032S or equivalent.
Course outline:
Students will study the fundamentals of abstract algebra and number theory, including: induction, strong induction and Well-Ordering axiom; Divisibility and prime factorization; Modular arithmetic; Permutations; Groups, Subgroups, Cyclic groups; Isomorphisms; Simple groups, Factor groups, Lagrange's Theorem; The First Isomorphism Theorem. Please note that lectures alternate during the week so that students can take any of MAM2012S, MAM2013S and MAM2014S concurrently.
Lecture times: Tuesdays, Fridays and some Wednesdays in 5th period.

MAM2014S REAL ANALYSIS (2RA)
12 NQF credits at NQF level 6
Convener: M Vandeyar
Course entry requirements: MAM1031F and MAM1032S or equivalent.
Course outline:
Students will study the fundamentals of real analysis, including: Axioms of the real numbers, supremum and infimum; Countable sets; Sequences and series; Open and closed sets, compactness; Limits, continuity, differentiability; Sequences and series of functions, uniform convergence, power series; Integration. Please note that lectures alternate during the week so that students can take any of MAM2012S, MAM2013S and MAM2014S concurrently.
Lecture times: Mondays, Thursdays and some Wednesdays in 4th and 5th period.

Third-Year Courses

MAM3010F METRIC SPACES (3MS)
18 NQF credits at NQF level 7
Convener: S Chili
Course entry requirements: MAM2010F, MAM2011F, MAM2014S and at least one of MAM2012S or MAM2013S.
Course outline:
The aim of this course is to introduce fundamental concepts in metric spaces and topology. Basic tools - Metrics, ultrametrics, pseudometrics, quasi-metrics. Convergence in metric spaces. Closed sets and closures. Open sets and interiors. Definition of topology in metric space and in general. Functions: continuous, uniformly continuous, Lipschitz continuous, contractions, isometries. Isomorphisms: topological, uniform, metric. Fundamental concepts - Completeness, via Cauchy sequences. Cantor's intersection theorem. Construction of completion and proof of uniqueness. Banach's Fixed Point Theorem and some applications. Compactness, via convergent subsequences; equivalence with total boundedness and completeness, and with open cover property. Connectedness, disconnectedness, and connected components.
Lecture times: Tuesdays, Fridays and some Wednesdays in 5th period.

MAM3011F MODERN ABSTRACT ALGEBRA (3AL)
18 NQF credits at NQF level 7
Convener: Dr J Sanchez-Ortega
Course entry requirements: MAM2010F, MAM2011F, MAM2013S and at least one of MAM2012S or MAM2014S.
Course outline:
This course focusses on Group Theory. Topics include: Lagrange's Theorem. Isomorphism Theorems, Correspondence Theorem. p-Groups. Cauchy's Theorem. Sylow Theorems. Direct Product of groups. Finitely generated Abelian Groups. Jordan-Holder Theorem.
Lecture times: Mondays, Thursdays and some Wednesdays in 5th period.

MAM3012F DISCRETE MATHEMATICS (3DM)
18 NQF credits at NQF level 7
Convener: Associate Professor D Erwin
Course entry requirements: MAM2010F, MAM2011F, and two of MAM2012S, MAM2013S and MAM2014S.
Course outline:
Graph theory, combinatorial counting, discrete probability theory, recurrences, algorithms, applications.
Lecture times: Monday - Friday, 4th period.

MAM3013S TOPICS IN ALGEBRA (3TA)
18 NQF credits at NQF level 7
Convener: Dr J Sanchez-Ortega
Course entry requirements: MAM2010F, MAM2011F, and two of MAM2012S, MAM2013S and MAM2014S.
Course outline:
This course provides an Introduction to Ring Theory. A selection of the topics covered: Definition of a ring, examples, main properties. The field of fraction of an integral domain. Polynomial rings.
Lecture times: Tuesdays, Fridays and some Wednesdays in 5th period.

MAM3014S TOPICS IN ANALYSIS (3TN)
18 NQF credits at NQF level 7
Convener: Dr F Ebobisse-Bille
Course entry requirements: MAM3010F
Course outline:
1. Study of sequences: basic definitions on sequences of numbers; study of the behaviour of sequences of real numbers. 2. Revision on metric spaces: distance, balls, open and closed sets, limit of a function, convergence of sequences, compactness, completeness; spaces of continuous functions between metric spaces (continuity, uniform continuity, Lipschitz continuity, H?lderian continuity; ointwise convergence and uniform convergence for sequences of functions; normed spaces and linear continuous mappings between normed spaces; equivalence of norms; Banach spaces; linear continuous mappings between normed spaces (norm of a linear continuous mapping, the dual space). 3. Hilbert spaces: scalar product (parallelogram identity; Hilbert spaces; the orthogonal complement, the orthogonal projection operator, the Gram-Schmidt orthonormalization process. 5. Differential calculus between normed spaces: Gâteaux and Fréchet differentiability; chain rule; the Lagrange inequality; convexity (convex Fréchet differentiable functions); the implicit function theorem (IFT) – Inverse mapping theorem (IMT). 6. On Riemann integration and its limitations.
Lecture times: Mondays, Thursdays and some Wednesdays in 5th period.

MAM3015F COMPLEX ANALYSIS (3CA)
18 NQF credits at NQF level 7
Convener: Associate Professor E Berdysheva
Course entry requirements: MAM2010F, MAM2011F, MAM2014S and at least one of MAM2012S or MAM2013S.
Course outline:
Fields of complex numbers, Holomorphic functions, Power series, Elementary functions, Complex integration, Cauchy's Integral Theorem, Cauchy's Integral Formula, Liouville's Theorem, Fundamental Theorem of Algebra, Coincidence Principle, Maximum Modulus Principle, Singularities, Residues, Laurent Series, Arguments, Rouche's Theorem, Open Mapping Theorems.
Lecture times: Tuesdays, Fridays and some Wednesdays in 4th period.

MAM3006Z PROJECT IN MATHEMATICS
0 NQF credits at NQF level 7
Convener: Associate Professor E Berdysheva
Course outline:
With permission from the Convenor, and subject to the availability of a suitable supervisor in the Department, students may complete a project on a topic in Mathematics. This is strongly recommended for students intending to continue to Honours in Mathematics.

Postgraduate Courses

There are a number of Honours courses available to students who have completed senior courses in Applied Mathematics and Mathematics. Details can be found on the website www.mamhonours.uct.ac.za. Those interested should contact the Honours Program Convenor, Dr D J Erwin.

MAM4000W MATHEMATICS HONOURS
Since the code MAM4000W will not carry an NQF credit value, students will be concurrently registered for MAM4013W (coursework component of 120 NQF credits) and MAM4014W (research project of 40 NQF credits). Students registered for MAM4000W are expected to tutor in the Department of Mathematics and Applied Mathematics.
160 NQF credits at NQF level 8; the combined credit value of both components.

Convener: Dr F Ebobisse-Bille
Course entry requirements: (i) 65% or higher for MAM3000W (or the equivalent at another institution), and, (ii) The average of the four marks for MAM1000W, MAM1019H, MAM2000W, and MAM3000W (or the equivalents at another institution) should be 65% or higher. In all cases acceptance is subject to individual approval by the Head of Department.
Course outline:
This course provides an introduction to some topics that are basic to a professional mathematician. Students do a mathematics project, at least three of the four core modules in Algebra, Analysis, Differential Geometry, and Topology, and other modules for a total of at least 160 credits (most modules are 20 credits; the project, which consists of a thesis and two seminars, is 40 credits total). Students have some flexibility in selecting their other modules but all curricula must be approved by the convenor. The decision about which modules will be offered is made by the Department, but typically includes (in addition to the previously mentioned core modules) a selection from such topics as Algebraic Geometry, Category Theory, Computational Complexity, Cryptology, Differential Topology, Functional Analysis, Graph Theory, Homological Algebra, Lie Algebras, Measure Theory, Number Theory, Operator Theory, Partial Differential Equations, and Theory of Hamiltonian Groups. Students may, with permission from the convenor and with agreement from a suitable supervisor in the Department, pursue reading modules on topics that are not offered as taught modules.
Assessment: The project counts 25% of the final mark and must be passed (with 50%). On average, the examination counts at least 50% of the balance of the final mark for the course. Three core modules together count 37.5% of the final mark. The remaining 37.5% of the final mark is calculated using the student's best marks in their other modules. These component parts of the course will be combined in a final overall mark which will be reflected against the course code MAM4000W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

MAM4100W MATHEMATICS HONOURS (EXTENDED1)
80 NQF credits at NQF level 8
Convener: Dr F Ebobisse-Bille
Course entry requirements: (i) 60% or higher for MAM3000W, and, (ii) The average of the four marks for MAM1000W, MAM1019H, MAM2000W, and MAM3000W should be 60% or higher. In all cases acceptance is subject to individual approval by the Head of Department.
Course outline:
This course, together with MAM4110W and MAM4014W, covers the content of MAM4000W over two years. Students in this course will do two core modules in the first semester and two more modules in the second semester (total 80 credits).
Assessment: As per MAM4000W

MAM4110W MATHEMATICS HONOURS (EXTENDED2)
40 NQF credits at NQF level 8
Convener: Dr F Ebobisse-Bille
Course entry requirements: A pass in MAM4100W.
Co-requisites: MAM4014W
Course outline:
This course, together with MAM4100W and MAM4014W, covers the content of MAM4000W over two years. Students in this course will do two modules in the first semester and the project (MAM4014W) in the second semester (total 80 credits).
Assessment: As per MAM4000W

MAM4001W APPLIED MATHEMATICS HONOURS

Since the code MAM4001W will not carry an NQF credit value, students will be concurrently registered for MAM4015W (coursework component of 120 NQF credits) and MAM4016W (research project of 40 NQF credits). Students registered for MAM4001W are expected to tutor in the Department of Mathematics and Applied Mathematics.

160 NQF credits at NQF level 8; the combined credit value of both components.

Convener: Dr F Ebobisse-Bille

Course entry requirements: (i) 65% or higher for MAM3040W (or the equivalent at another institution), and, (ii) The average of the three marks for MAM1043H/1044H, MAM2046W, and MAM3040W (or the equivalents at another institution) should be 65% or higher. In all cases acceptance is subject to individual approval by the Head of Department.

Course outline:

This course provides an introduction to a selection of topics in applied mathematics. Students do an applied mathematics project and modules for a total of at least 160 credits (most modules are 20 credits; the project, which consists of a thesis and two seminars, is 40 credits total). Each student's curriculum must be approved by the convenor and must include a minimum of 60 credits of applied mathematics modules taught by MAM (CERECAM and DMTCS modules are considered in this category). There is considerable flexibility in the structure of individual curricula and students are encouraged to include suitable modules from MAM4000W and from cognate departments (for example: Computer Science, Physics, Statistics, Economics, Oceanography). The decision about which modules will be offered is made by the Department, but typically includes a selection from such topics as Advanced Mathematical Methods, Continuum Mechanics, Finite Element Analysis, Mathematical Biology, General Relativity and Cosmology, and String Theory. Students may, with permission from the convenor and with agreement from a suitable supervisor in the Department, pursue reading modules on topics that are not offered as taught modules.

Assessment: The project and seminar together count 25% of the final mark and must be passed (with 50%). On average, the examination counts at least 50% of the balance of the final mark for the course. At least 37.5% of the final mark must come from the previously mentioned applied mathematics modules taught by MAM. The remaining 37.5% of the final mark is calculated using the student's best marks in their other modules. These component parts of the course will be combined in a final overall mark which will be reflected against the course code MAM4001W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

MAM4101W APPLIED MATHEMATICS HONOURS (EXTENDED1)

80 NQF credits at NQF level 8

Convener: Dr F Ebobisse-Bille

Course entry requirements: (i) 60% or higher for MAM3040W, and, (ii) The average of the three marks for MAM1043H/1044H, MAM2046W, and MAM3040W should be 60% or higher. In all cases acceptance is subject to individual approval by the Head of Department.

Course outline:

This course, together with MAM4111W and MAM4016W, covers the content of MAM4001W over two years. Students in this course will do two core modules in the first semester and two more modules in the second semester (total 80 credits).

Assessment: As per MAM4001W

MAM4111W APPLIED MATHEMATICS HONS (EXTENDED2)

40 NQF credits at NQF level 8

Convener: Dr F Ebobisse-Bille

Course entry requirements: A pass in MAM4101W.

Co-requisites: MAM4016W

Course outline:

This course, together with MAM4101W and MAM4016W, covers the content of MAM4001W over two years. Students in this course will do two modules in the first semester and the project (MAM4016W) in the second semester (total 80 credits).
Assessment: As per MAM4001W

MAM5000W MATHEMATICS DISSERTATION
180 NQF credits at NQF 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.

MAM5001W APPLIED MATHEMATICS DISSERTATION
180 NQF credits at NQF 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.

MAM5005W ASTROPHYSICS & SPACE SCIENCE MINOR DISSERTATION
(National Astrophysics & Space Science Programme (NASSP); for further details see entry under Department of Astronomy)
90 NQF credits at NQF level 9
Course entry requirements: AST5003F
Assessment: Students will work on an approved research topic on which a minor dissertation must be presented for formal examination.

MAM5019W TERTIARY MATHEMATICS EDUCATION DISSERTATION
180 NQF credits at NQF 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 section of the faculty handbook.

MAM6000W MATHEMATICS THESIS
360 NQF credits at NQF 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.

MAM6001W APPLIED MATHEMATICS THESIS
360 NQF credits at NQF 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.

MAM6002W TERTIARY MATHEMATICS EDUCATION THESIS
360 NQF credits at NQF 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.

DEPARTMENT OF MOLECULAR AND CELL BIOLOGY

The Department is housed in the Molecular Biology Building, 22 University Avenue
Telephone (021) 650-2494
The Departmental abbreviation for Molecular and Cell Biology is MCB.

Head of Department:
S Rafudeen, BSc Hons PhD *Cape Town*
Deputy Head of Department – Postgraduate:
C O'Ryan, BSc Hons PhD *Cape Town*
Deputy Head of Department – Undergraduate:
R A Ingle, BA Hons DPhil *Oxon*
South African Research Chair in Molecular Physiology of Plant Desiccation Tolerance:
J M Farrant, BSc Hons PhD *Natal*
Professors:
J P Hapgood, BSc Hons PhD *Cape Town*
N Illing, MSc *Cape Town* DPhil *Oxon*
Senior Research Scholar:
E P Rybicki, MSc PhD *Cape Town*
Emeritus Professor:
J A Thomson, BSc *Cape Town* MA *Cantab* PhD *Rhodes*
Emeritus Associate Professors:
V R Abratt, BSc Hons *Rhodes* PhD *Cape Town*
S J Reid, BSc Hons PhD *Rhodes*
Associate Professors:
R A Ingle, BA Hons DPhil *Oxon*
C O'Ryan, BSc Hons PhD *Cape Town*
Senior Lecturers:
F Dube, BSc Hons PhD *Cape Town*
R Hurdayal, MSc *UKZN* PhD *Cape Town*
P Meyers, BSc Hons PhD *Cape Town*
S Rafudeen, BSc Hons PhD *Cape Town*
M J Williams, BSc Hons PhD *Cape Town*
Lecturers:
S Mbewana, BSc Hons MSc *US* PhD *Cape Town*
T Oelgeschläger, Dr rer nat *Hanover*
C Ross, BSc Hons PhD Rhodes
Research Officer:
C Avenant, BSc Hons *Stell* PhD *Cape Town*
Junior Research Fellow:
A J Bick, BSc (Med) Hons, MSc (Med), PhD Cape Town
Honorary Research Associates:
L Donaldson, BSc Hons PhD *Cape Town*
H Hillhorst, BSc Hons PhD *Netherlands*
I Hitzeroth, BSc Hons PhD *Cape Town*
A Meyers, BSc Hons PhD *Cape Town*
S Plon, BSc Hons *Wales* PhD *Rhodes*
Principal Scientific Officers:
K Iyer, PhD *Cape Town*
T Millard, BSc *Pret*
Chief Scientific Officers:
B L Arendze-Bailey, BSc Hons *Cape Town*
K Cooper, MSc *Cape Town*

M D Krige, MSc *Stell*
S Sattar, MSc *Cape Town*
Senior Scientific Officer:
P Liebrich, MSc *Cape Town*
Scientific Officers:
I Hoffman-Jacobs, MSc *Stell*
A Marthinus, BSc Hons *Cape Town*
Research Officer:
C Avenant, BSc Hons *Stell* PhD *Cape Town*
Research Assistant:
K van der Merwe, HDipEd *CPUT*
Principal Technical Officer:
N Bredekamp
Chief Technical Officer:
D September
Senior Technical Officer:
G Pietersen
Department Manager:
Y L Burrows
Finance Administrator:
C Saunders
Administrative Assistant:
G Spannenberg
Senior Secretary:
P Nkosi
Departmental Assistants:
M Adams
K Makalima
P Tobi
E Vellem
Senior Lab Assistants:
D August, NDip Biotech *CPUT*
D Marubelela, BA Human Ecology *UWC*
S Mzuzu

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 with Associate Professors Hitzeroth and Rafudeen; and Dr Meyers): research is focused on optimising transient expression of pharmaceutically-relevant proteins in plants and other systems, and developing virus-resistant and drought-tolerant crops, respectively. Eukaryotic gene expression (Professors Hapgood and Illing, Associate Professor Ingle and Dr Oelgeschläger): projects include regulation of transcription by steroid receptors, the role of circadian rhythms in regulating the plant immune responses, the regulation of gene transcription in the malaria parasite *Plasmodium*, and the regulation of gene expression during neuronal differentiation. Autism Spectrum Disorder Genetics (Associate Professor O'Ryan): This research focuses on the genetic, epigenetic and biochemical associations of Autism Spectrum Disorder. 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 Dr Oelgeschläger): 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*. Research in cellular and molecular

immunology (Dr Hurdayal) includes gene-deficient murine-models of human Leishmaniasis and parasite-based transcriptomics/proteomics to understand host susceptibility or resistance to *Leishmania* infection. Research in marine biotechnology (Associate Professor Coyne): includes the development of vaccines for farmed kob, 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 (Drs Meyers, Dube and Williams): South African soil and marine actinomycete bacteria are being screened for novel antibiotics; the population genetics of *Streptococcus pneumoniae* in South African children is being characterised; and the physiology of mycobacteria (environmental and pathogenic) is being studied to identify enzymes that can be targeted for the development of new drugs and diagnostic tools.

Undergraduate Courses

Each student registered for any MCB undergraduate course is required to have an "entry level" laptop for use during class sessions as well as after hours (www.icts.uct.ac.za; A tablet or "netbook" will not be suitable).

Second-Year Courses

MCB2020F BIOLOGICAL INFORMATION TRANSFER

Entrance is limited to 140 students. Registration for this course is provisional until confirmed by the department. Should the limit be exceeded students will be ranked on CEM1000W (or equivalent) marks. No semester abroad students will be admitted to this course.

24 NQF credits at NQF level 6

Convener: Dr P Meyers

Course entry requirements: CEM1000W or equivalent, BIO1000F and BIO1004S (or equivalent).

Course outline:

This course introduces students to fundamental concepts in genetics and examines how biological information is organised, used and transferred in viruses, prokaryotes and eukaryotes. Topics covered include the biological explanations for Mendel's laws of genetics, principles of evolutionary genetics, genome organisation, horizontal gene transfer and gene structure and regulation.

Lecture times: Monday - Friday, 4th period

DP requirements: 50% average for assignments and practical reports; attendance at all practicals and tutorials.

Assessment: Tests and assignments count 40%; practicals count 10%; one three-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

MCB2021F MOLECULAR BIOSCIENCE

Entrance is limited to 140 students. Registration for this course is provisional until confirmed by the department. Should the limit be exceeded students will be ranked on CEM1000W (or equivalent) marks. No semester abroad students will be admitted to this course.

24 NQF credits at NQF level 6

Convener: To be advised

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 understanding the distinctive properties of living matter and biological processes. The course covers core principles in three major areas, (i) the structural chemistry of key components of living matter and the relationship between chemical structure and biological function of these components, (ii) metabolism - the nature of chemical reactions that occur in living matter and (iii) the chemistry of molecules and processes involved in the transmission of biological information. In addition to these core principles, students will learn about scientific method, basic biochemistry/molecular biology techniques and experimental design.

Lecture times: Monday - Friday, 5th period
DP requirements: 50% average for assignments and practical reports; attendance at all practicals and tutorials.
Assessment: Tests and assignments count 40%; practicals count 10%; one three-hour paper written in June counts 50%. A subminimum of 40% in the examination is required.

MCB2022S METABOLISM & BIOENGINEERING
Entrance is limited to 140 students.
24 NQF credits at NQF level 6
Convener: Dr M Williams
Course entry requirements: MCB2020F and MCB2021F
Course outline:
This course will introduce students to some key aspects of metabolic energy production in eukaryotic and prokaryotic systems. 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. Topics covered may include carbohydrate and lipid metabolism, metabolic integration, the metabolic diversity in Bacteria and Archaea, and bioengineering in bacteria and plants.
Lecture times: Monday - Friday, 5th period
DP requirements: 50% average for assignments and practical reports; attendance at all practicals and tutorials.
Assessment: Tests and assignments count 40%; practicals count 10%; one three-hour paper written in November counts 50%. A subminimum of 40% in the examination is required.

MCB2023S FUNCTIONAL GENETICS
Entrance is limited to 140 students
24 NQF credits at NQF level 6
Convener: Professor N Illing
Course entry requirements: MCB2020F and MCB2021F
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 include gene mapping, forward and reverse genetics; microbial genetics, including regulation of the lac operon; CRISPR/ Cas9 gene editing and DNA repair; alternative splicing and sex-determination; epigenetic mechanisms used in dosage compensation; the genetic analysis of cell cycle regulation; stem cell technology and axis determination in *Drosophila*.
Lecture times: Monday - Friday, 4th period
DP requirements: 50% average for assignments and practical reports; attendance at all practicals and tutorials.
Assessment: Tests and assignments count 40%; practicals count 10%; one three-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 both third year second semester MCB courses.

MCB3012Z RESEARCH PROJECT IN MOLECULAR & CELL BIOLOGY
0 NQF credits at NQF level 7
Convener: Associate Professor R Ingle
Course entry requirements: MCB3025F or MCB3026F (or concurrent registration in 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. This course replaces practical classes for all the third year second semester MCB courses.
DP requirements: None
Assessment: Project counts 100%

MCB3023S MOLECULAR EVOLUTIONARY GENETICS & DEVELOPMENT
36 NQF credits at NQF level 7
Convener: Dr S F Dube
Course entry requirements: MCB2020F, MCB2021F and MCB2022S or MCB2023S
Course outline:
This course provides advanced level studies in the area of molecular evolutionary genetics and development. Focus is placed on understanding key experiments in these fields and on interpreting data. Topics covered include: The origins and molecular genetics of viruses, principles of mouse molecular genetics applied to limb and neural development; evo-devo or how genetic change leads to morphological diversity; interactions between genetics, the environment and development.
Lecture times: Monday - Friday, 4th period
DP requirements: None
Assessment: Tests count 40%; one 3-hour examination written in November counts 60%. A subminimum of 40% in the examination is required.

MCB3024S DEFENCE & DISEASE
36 NQF credits at NQF level 7
Convener: Professor J Hapgood
Course entry requirements: MCB2020F, MCB2021F and MCB2022S or MCB2023S
Course outline:
This course will initially examine the innate immune systems of plants. The focus will switch to the adaptive immune system, with emphasis on three major disease challenges in South Africa; namely, HIV, TB and malaria. Host-pathogen interactions will also be discussed, with a focus on viruses and how they infect mammals. Finally, the course will examine strategies to produce vaccines that enable immunity to viral infection.
Lecture times: Monday - Friday, 5th period
DP requirements: None
Assessment: Tests count 40%; one 3-hour examination written in November counts 60%. A subminimum of 40% in the examination is required.

MCB3025F STRUCTURAL & CHEMICAL BIOLOGY
36 NQF credits at NQF level 7
Convener: Dr R Hurdayal
Course entry requirements: MCB2020F, MCB2021F and MCB2022S or MCB2023S
Course outline:
This course addresses how modern techniques of structural and chemical biology are being used to solve biological problems. It draws on multiple aspects of macromolecular biochemistry including nucleic acid structure and interactions, signalling proteins and membrane proteins, and demonstrates how this knowledge can be used in drug discovery and protein design in biotechnology. Topics include: mechanisms of reversible and irreversible enzyme inhibitors, ligand binding, protein folding, molecular basis for protein function, regulation of protein activity, cell signalling and proteomics.
Lecture times: Monday - Friday, 5th period
DP requirements: 50% average for assignments and practical reports; attendance at all practicals and tutorials.

Assessment: Tests count 40%; practicals, tutorials essays and assignments count 10%; one 3-hour examination written in June counts 50%. A subminimum of 40% in the examination is required.

MCB3026F MOLECULAR GENETICS AND GENOMICS

36 NQF credits at NQF level 7

Convener: Associate Professor C O'Ryan

Course entry requirements: MCB2020F, MCB2021F and MCB2022S or MCB2023S

Course outline:

This course explores various topics in molecular genetics covering humans, plants, bacteria, viruses and mobile genetic elements (MGEs). Focus is given to understanding genetic mechanisms by studying genes, proteins, antisense RNA, sRNA and the role they play in regulatory and biochemical processes. Topics include plasmid biology, regulation of viral lifecycles, bacterial biosynthetic pathways, human genetic disorders, transgenic plants and metagenomics among others. Different and cutting-edge tools in modern day molecular biology are taught with an emphasis on data analyses and interpretation and these include bioinformatics (DNA sequence analysis, assembly, annotation, databases, BLAST, primer design), phylogenetics, Next generation sequencing, RNA sequencing and genome projects.

Lecture times: Monday - Friday, 4th period

DP requirements: 50% average for assignments and practical reports; attendance at all practicals and tutorials.

Assessment: Tests count 40%; practicals, tutorials, essays and assignments count 10%; one 3-hour examination written in June counts 50%. A subminimum of 40% in the examination is required.

Postgraduate Courses

MCB4002W MOLECULAR & CELL BIOLOGY HONOURS

Since the code MCB4002W will not carry a NQF credit value, students will be concurrently registered for MCB4003W (coursework component of 96 NQF credits) and MCB4004W (research project of 64 NQF credits). Entrance is limited to 16 students.

160 NQF credits at NQF level 8; the combined credit value of both components.

Convener: Dr T Oelgeschläger

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 16 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%. These component parts of the course will be combined in a final overall mark which will be reflected against the course code MCB4002W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

MCB5005W MOLECULAR & CELL BIOLOGY DISSERTATION
180 NQF credits at NQF 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

MCB6002W MOLECULAR & CELL BIOLOGY THESIS
360 NQF credits at NQF 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

DEPARTMENT OF OCEANOGRAPHY

The Department is housed on the lower ground level 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:
M Vichi, MSc *Bologna* PhD *Oldenburg*
South African Research Chair in Modelling of the Coupled Ocean-Land-Atmosphere Phenomena Related to Climate:
B J Abiodun, MTech FUTA Lic Uppsala PhD FUTA
Professor and UCT Fellow:
C J C Reason, BSc Hons *Cape Town* MPhil *City* MSc PhD *British Columbia*
Professor:
I J Ansorge, BSc *Plymouth* MSc PhD *Cape Town*
Emeritus Professors:
G B Brundrit, BSc Hons PhD *Manchester*
F A Shillington, BSc Hons *Witwatersrand* MSc PhD *Cape Town*
Honorary Professor:
J Hermes, BSc *Bangor* PhD *Cape Town* (SAEON)
Associate Professor:
K E Altieri, MA *Princeton* PhD *Rutgers*
S E Fawcett, BA Hons *Harvard* MA PhD *Princeton*
Senior Lecturer:

Lecturer:
M N Ragoasha, MSc *Cape Town* PhD *Cape Town*
Honorary Research Associates:
B Backeberg, PhD *Cape Town*
M Krug, MSc PhD *Cape Town*
T Lamont, PhD *Cape Town*
E Puccinelli, PhD *Cape Town*
C Rautenbach, PhD *TUC Norway*
M Smith, PhD *Cape Town*
Departmental Librarian:
N Jabaar, BInf *Unisa*
Principal Technical Officer:
P Truter, BSc *Stell*
Principal Scientific Officer:
R Roman, MSc PhD *Cape Town*
Chief Scientific Officer:
B Kuyper, MSc PhD *Cape Town*
Senior Research Officer:
R Blamey MSc PhD *Cape Town*
Administrative Officer:
C Karriem, Dipl Office Administration *Rosebank College*

NANSEN-TUTU CENTRE FOR MARINE ENVIRONMENTAL RESEARCH:
The University of Cape Town, the Nansen Environmental Centre in Norway and their partners are a joint venture in South Africa to gather information about the three oceans around southern Africa and to better understand and deal with global change across the continent. The Nansen-Tutu Centre for Marine Environmental Research aims to develop and implement operational oceanography and methods of data integration into models in the South Atlantic Ocean, the Indian

Ocean and the Southern Ocean, with a focus on ocean state, marine environmental and ecosystem modelling, research and capacity building, including their roles in climate and global teleconnections – the relationship between climate anomalies in different parts of the world.

MARINE AND ANTARCTIC RESEARCH CENTRE FOR INNOVATION AND SUSTAINABILITY (MARIS)

The Department of Oceanography is affiliated with the Marine and Antarctic Research Centre for Innovation and Sustainability (MARIS). For more information refer to the "Inter-Faculty Units" section, further on in this handbook.

RESEARCH IN OCEANOGRAPHY AND ATMOSPHERIC SCIENCE

Oceanography: Ocean and atmospheric modelling, coastal and shelf oceanography, air-sea interaction, marine climatology, climate change and variability, marine and coastal meteorology, extreme events, polar and regional oceanography, marine and atmospheric biogeochemistry, palaeo-oceanography.

Undergraduate Courses

Second-Year Courses

SEA2004F PRINCIPLES OF OCEANOGRAPHY

24 NQF credits at NQF level 6

Convener: Associate Professor K Altieri

Course entry requirements: GEO1009F, CEM1000W, or permission of the convener

Course outline:

An 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 multiple modules, which cover the above topics. Oceanographic instrumentation and methods of data analysis will be covered in the tutorials and practicals.

Lecture times: Monday - Friday, 4th period

DP requirements: Attendance at practicals and a class mark of at least 40%.

Assessment: Practicals and tests count 40%; one 3-hour examination written in June/July counts 40%. A subminimum of 40% in the examination is required.

SEA2005S MARINE SYSTEMS

24 NQF credits at NQF level 6

Convener: Associate Professor S E Fawcett

Course entry requirements: GEO1009F, CEM1000W, SEA2004F, or permission of the convener

Course outline:

Building on the Principles of Oceanography SEA2004F course, this more advanced course will cover the main ocean and atmosphere systems, with a particular emphasis on their biogeochemical functioning. This includes an introduction to the major marine biogeochemical cycles, seawater carbonate chemistry, phytoplankton-nutrient interactions and growth kinetics, surface ocean-lower atmosphere interactions, and an introduction to Earth system dynamics. The physical forcings and their biogeochemical and ecosystem responses will be quantitatively illustrated for upwelling systems, oligotrophic systems, coastal systems around South Africa, and the Southern Ocean. Emphasis will be placed on treating the systems in an integrative manner. Methods of data sampling and analysis, and computation of biogeochemical pools, rates and feedbacks will be covered in the tutorials and practicals.

Lecture times: Monday - Friday, 4th period

DP requirements: Attendance of lectures and practicals, and a class mark of at least 40%.

Assessment: Practicals, tests, and in-class activities count 60%; a final examination written in October/November counts 40%. A subminimum of 40% in the examination is required.

Third-Year Courses

SEA3004F OCEAN & ATMOSPHERE DYNAMICS
36 NQF credits at NQF level 7
Convener: Professor M Vichi
Course entry requirements: MAM1031F+MAM1032S (recommended) or equivalent, PHY1031F or equivalent, or permission of the convener.
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 with the carbon cycle in the earth system and climate change. Methods of analysis of both observations and model data will be covered in the tutorials and practicals.
Lecture times: Monday - Friday, 3rd period
DP requirements: Attendance at tutorials and practicals, and a class mark of at least 40%.
Assessment: Tutorials/practicals and tests count 50%; one 3-hour examination written in June/July counts 50%. A subminimum of 40% in the examination is required.

Postgraduate Courses

SEA4001W OCEAN & ATMOSPHERE SCIENCE HONOURS
Since the code SEA4001W will not carry a NQF credit value, students will be concurrently registered for SEA4003W (coursework component of 112 NQF credits) and SEA4004W (research project of 48 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Dr M.N Ragoasha
Course entry requirements: A BSc degree with a major/specialisation in Ocean & Atmosphere Science or in a related discipline. CEM1000W or equivalent is a prerequisite. 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 oceanography, meteorology and climate, an introduction to modelling and data analysis. Practical work includes fieldwork at sea and may include dive training (class 4 diving qualification, at the students own cost if they choose to do the dive course). Student performance in each module may be assessed by project work, seminar presentations, written assignments and examinations, together making up 65% 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 fieldtrip reports, skills examination and formal test results. A weighted average of the continuous assessment of reports and tests counts 65% of the final mark; the research project counts 35% of the final mark. The research project must be passed at 50%. These component parts of the course will be combined in a final overall mark which will be reflected against the course code SEA4001W: each of these components must be passed separately for the award of the degree.

SEA5000W OCEAN & ATMOSPHERE SCIENCE DISSERTATION
180 NQF credits at NQF 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.

SEA5001W PHYSICAL OCEANOGRAPHY DISSERTATION
180 NQF credits at NQF 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.

SEA5011F OPERATIONAL OCEANOGRAPHY COURSEWORK
50 NQF credits at NQF level 9
Convener: Professor M Vichi
Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.
Co-requisites: This course is a component of the Applied Ocean Sciences Master's coursework (refer to BIO5012W). Co-requisites are BIO5012W, BIO5013F, STA5014Z and a minor dissertation code chosen from the ones listed in the BIO5012W handbook. Changes in the dissertation code are allowed according to the student background and prior to consultation with the course conveners.
Course outline:
This course is comprised of 4 modules focusing on the usage and provision of marine services that describe the ocean physical and biogeochemical state through observational and modeling components. The course covers the global ocean and coastal observing systems, the usage of ocean diagnostics and climate indicators as well as an introduction to the major monitoring techniques for physical and biogeochemical oceanography. Qualified students will have the possibility of participating to an open ocean research cruise in July. In addition, students will choose at least two elective courses, chosen from a range of modules offered in both disciplinary streams. They provide the student the opportunity to explore new areas, or look at more specific disciplinary backgrounds in the vast subject of ocean sciences. The list and details of these courses will be made available at the opening of each registration period in the BIO5012W handbook on the Marine and Antarctic Research Centre for Innovation and Sustainability (MARIS) website.
Assessment: Every module is assessed independently either with a class test or individual project assignments. The syllabus and the relative weight for each module are described in a handbook that

will be made available on the BIO5012W website (hosted by the Marine and Antarctic Research Centre for Innovation and Sustainability - MARIS).

SEA5012W APPLIED OCEAN SCIENCES MINOR DISSERTATION

90 NQF credits at NQF level 9

Convener: Professor M Vichi (SEA) and a representative from BIO

Course entry requirements: A relevant Honours degree (or equivalent). Students with backgrounds in scientific and engineering disciplines are encouraged to apply.

Co-requisites: BIO5012W, BIO5013F, BIO5014F/SEA5011F, STA5014Z

Course outline:

The minor dissertation, which forms 50% of the overall degree, is based on a six-month supervised research project. The choice of project will be determined by the student's prior qualification and in agreement with the course conveners and supervisors. The dissertation should be submitted at the end of January, with the possibility of extension to June of the next year.

Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree. A distinction in the minor dissertation can be attained only if there is a distinction in the coursework component.

SEA6000W OCEAN & ATMOSPHERE SCIENCE THESIS

360 NQF credits at NQF 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.

DEPARTMENT OF PHYSICS

The Department is housed in the R W James Building, 9 University Avenue
Telephone (021) 650-3326 Fax (021) 650-3342 Website: www.phy.uct.ac.za

The Departmental abbreviation for Physics is PHY.

Associate Professor and Head of Department:
S W Peterson, MA PhD *Wisconsin*
Professors:
M S Allie, MSc PhD *Cape Town* (CHED)
A Buffler, MSc PhD HDE *Cape Town*
A Peshier, MA PhD *Dresden*
Emeritus Professors:
D G Aschman, BSc Hons *Cape Town* DPhil *Oxon*
D T Britton, MSc PhD *London*
C A Dominguez, MSc PhD *Buenos Aires* FRSSAf
Associate Professors:
M D Blumenthal, BSc *Witwatersrand* Dipl Phys *Bonn* PhD *Cantab*
W A Horowitz, MA MSc PhD *Columbia*
D L Taylor, BSc Hons HDE *UKZN* MSc PhD *Witwatersrand* (CHED)
H W G Weigert, Dipl Phys Dr rer nat habil *Regensburg*
Associate Professor and CERN Project Associate:
S Yacoob, MSc *Cape Town* PhD *Northwestern*
Emeritus Associate Professors:
R W Fearick, BSc Hons PhD *Witwatersrand*
M Härting, Dipl Phys *Regensberg* Dr. Ing BW *München*
G N v d H Robertson, BSc Hons *Cape Town* DPhil *Oxon*
Adjunct Associate Professor:
S R Naidoo, PhD *Witwatersrand*
Senior Lecturers:
J M Keaveney, PhD *Dublin*
T Leadbeater, MSc PhD *Birmingham*
S M Wheaton, MSc PhD *Cape Town*
Lecturers:
T D Bucher, MSc *Cape Town* PhD *Stell*
D R Geduld, MSc *Cape Town*
M Lushozi, MSc PhD *Cape Town*
T Salagaram, MSc PhD *UKZN*
Honorary Research Associates:
J A Ayala, PhD *Minnesota*
C David, Meng *Toulose* PhD *Victora*
T Dietel, Dipl Phys *Heidelberg* Dr phil nat *Frankfurt am Main*
L A Hernandes, PhD *Cape Town*
M Loewe, PhD *Hamburg*
K Schilcher, PhD *Vienna*
M Spiesberger, PhD *Mainz*
Chief Scientific Officer:
N Razak, MSc PhD *Cape Town*
Scientific Officer:
K Maibane, MSc *UWC*
Junior Research Fellow (MeASURe):
T Hutton, EngD *Birmingham*

Principal Technical Officers:
J Dickson
G K Fowle
K J Ontong
C J J Sadler
Chief Technical Officer:
M Christians
Technical Officer:
R Hansen
Department Administrator:
N Lovric
Administrative Assistants:
B Matubatuba
J Patel
Senior Laboratory Attendant:
K Jiza

Departmental Assistant:
N Mzamo

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, ultracold physics (8 mK dilution refrigerator), and physics education research. Additional facilities available to the Department are provided by iThemba Laboratories for Accelerator-Based Sciences (200 MeV cyclotron and other particle accelerators).

Major areas of interest at present include:

1. Experimental nuclear physics at iThemba LABS (D Bucher, A Buffler, R W Fearick, T Leadbeater, and S W Peterson) comprising: (a) Gamma ray spectroscopy with the AFRODITE array; (b) Giant resonance reactions with the magnetic spectrometer; (c) Fast neutron physics; (d) Radiation detection and measurement.
2. Theoretical Physics (C A Dominguez, W A Horowitz, M Lushozi, A Peshier and H W G Weigert), 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.
3. Experimental high energy physics (J M Keaveney), 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 and T Salagaram), comprising: (a) Research within the Nanoelectronics Research Laboratory; (b) Structural and electrical properties of nanomaterials; (c) Single electron transport and interactions; (d) Computational studies.
5. Applied Physics (M D Blumenthal, D Bucher, A Buffler, T Leadbeater, S W Peterson, T Salagaram, and T Hutton), comprising: (a) Research within the Metrological and Applied Sciences University Research Unit (MeASURe). (b) Positron Emission Particle Tracking at PEPT Cape Town, iThemba LABS; (c) Radiation transport modelling in industrial and medical systems; (d) Applied nuclear physics and engineering; (e) Electrical and radiation measurement standards.
6. Tertiary physics education (M S Allie, A Buffler, T Salagaram, D L Taylor and S M Wheaton), comprising: (a) Curriculum design and evaluation; (b) Role of language; (c) Understanding of measurement and uncertainty; (d) Modelling and visualization; (e) Computational physics education.

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

PHY1004W MATTER & INTERACTIONS

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.phy.uct.ac.za. (A tablet or "netbook" will not be suitable). The course convener will provide details of additional software (open source) required.

36 NQF credits at NQF level 5

Convener: Professor A Buffler

Course entry requirements: At least 60% for NSC Physical Science. MAM1000W or both MAM1031F & MAM1032S (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 Python. 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.

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.

Lecture times: Monday - Friday, 3rd period

DP requirements: Minimum of 40% in class record, including 50% in laboratory assessment.

Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour examination in June counts 25%; one 2-hour examination in November counts 25%.

PHY1023H PRINCIPLES OF PHYSICS

Students passing PHY1023H may proceed into PHY1032S. Students who pass PHY1023H and then register for and pass PHY1004W will gain credit for both courses.

18 NQF credits at NQF level 5

Convener: Associate Professor D L Taylor

Course entry requirements: At least 60% for NSC Physical Science. The permission of the Dean or Head of Department is required prior to registration for this course. *Notes: 1) 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 PHY1004W or PHY1031F (see entries for these courses). 2) The course 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.*

Course outline:

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, co-ordinate 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 and Doppler Effect.
Lecture times: Monday - Friday, 3rd period
DP requirements: Minimum of 40% for the class record, including 50% in laboratory assessment.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination in November counts 50%.

PHY1031F GENERAL PHYSICS A
18 NQF credits at NQF level 5
Convener: Dr S M Wheaton
Course entry requirements: At least 60% for NSC Physical Science. *Note: Students registered for this course will be assessed in week 5; if it is judged that they are not coping with the level and pace of the course, and would benefit from an opportunity to strengthen foundational concepts and learn new material at a slower pace, they will be required to transfer to PHY1023H from week 7.*
Course outline:
PHY1031F is an algebra-based introductory course for Science students who do not intend proceeding to second-year courses in Physics. Some calculus may be used. The course includes the following topics: Mechanics: vectors, kinematics, forces, dynamics, momentum, impulse, work, energy, power, collisions, rotation, rotational dynamics, torque, angular momentum, static equilibrium, gravitation. Properties of matter: elasticity, hydrostatics, hydrodynamics. Vibrations and waves: simple harmonic motion, damped oscillations, forced oscillations, resonance, travelling waves, superposition, standing waves, sound waves, sound intensity and Doppler Effect.
Lecture times: Monday - Friday, 3rd period
DP requirements: Minimum of 40% for the class record; including 50% in laboratory assessment.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination in June counts 50%.

PHY1032S GENERAL PHYSICS B
18 NQF credits at NQF level 5
Convener: Associate Professor H W G Weigert
Course entry requirements: PHY1031F or PHY1023H
Course outline:
PHY1032S is an algebra-based introductory course usually taken by Science students. Some calculus may be used. The course includes the following topics: Electricity and magnetism: electric charge, electric field, Gauss' law, electric potential, capacitance, current, current density, emf, resistance, resistivity, networks, magnetic field, Biot Savart law, Ampere's law, electromagnetic induction, inductance, alternating currents. Thermal physics: temperature, heat, kinetic theory of gases, first and second laws of thermodynamics. Optics: Geometrical optics, polarization, electromagnetic waves, interference, diffraction. Modern physics: atomic structure, quantum physical phenomena, wave-particle duality, X-rays, elementary nuclear physics, radioactivity.
Lecture times: Monday - Friday, 3rd period
DP requirements: Minimum of 40% for the class record, including 50% in laboratory assessment.
Assessment: Class record (weekly problem sets, class tests and laboratory record) counts 50%; one 2-hour written examination in November counts 50%.

Second-Year Courses

PHY2004W INTERMEDIATE PHYSICS
Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.phy.uct.ac.za. (A tablet or "netbook" will not be suitable). The course convenor will provide details of additional software (open source) required.

48 NQF credits at NQF level 6
Convener: Dr S M Wheaton
Course entry requirements: PHY1004W, a full first-year course in Mathematics, and MAM2000W or (MAM2010F, MAM2011F, MAM2013S and MAM2014S) or (MAM2004H and MAM2047H) or (MAM2010F and MAM2011F and MAM2040F and 1 of MAM2041F, MAM2042S, MAM2043S) as co-requisite.
Course outline:
PHY2004W develops the foundations of a major in Physics and allows continuation to third-year Physics. The theory component features a set of intermediate topics, and the laboratory component develops both experimental and computational skills. The course includes the following topics:
Mechanics: Review of Newton's Laws, inertial and non-inertial frames, transformations, equations of motion for 1D systems, oscillations, resonance, non-linear systems, Euler's equation, Lagrange's equation, generalized co-ordinates and constrained systems, Hamiltonian formalism, phase space and Liouville's theorem, effective potentials, planetary motion, systems of particles, angular momentum, collisions, rigid bodies, simple harmonic motion, resonance, coupled oscillators, wave equation, special relativity, relativistic mechanics.
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.
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.
Laboratory: Practical and computational tasks designed to develop advanced skills of experimentation and problem solving within the context of Mechanics, Electromagnetism and Quantum Mechanics.
Lecture times: Monday - Friday, 4th period
DP requirements: Minimum of 40% for the class record; completion of all laboratory reports and 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 25%; one 3-hour examination in November counts 25%. A subminimum of 40% is required in each of the two examinations.

Third-Year Courses

PHY3004W ADVANCED PHYSICS

Each student registered for this course is required to have a laptop for use during class sessions as well as after hours. The minimum specifications of the laptop are available at www.phy.uct.ac.za. (A tablet or "netbook" will not be suitable). The course convenor will provide details of additional software (open source) required.
72 NQF credits at NQF level 7
Convener: Dr T W Leadbeater
Course entry requirements: PHY2004W, and 40% in MAM2000W or (MAM2004H and MAM2047H).
Course outline:
This course completes the major in Physics. The theory component aims to develop advanced skills in problem solving within physics, and includes the following topics:
Electromagnetism: Maxwell's equations in vacuum and matter, momentum and angular momentum in electromagnetic fields, electromagnetic waves, wave guides, gauge transformations, retarded potentials, electric and magnetic dipole radiation, special relativity, relativistic kinematics and electrodynamics, electromagnetic field tensor.
Thermodynamics and Statistical Physics: Temperature, heat and work, laws of thermodynamics, ensembles and entropy, 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.
Applications of Quantum Mechanics: Atomic Physics (atomic structure and spectra, selection rules, spin, fine structure, Zeeman effect, time dependent and independent perturbation theory); Nuclear and Particle Physics (properties of nuclei, nuclear forces, structure, reactions and models, nuclear models, interactions of elementary particles, quarks and leptons, symmetries and the gauge forces); and Solid State Physics (crystal structure, lattice vibrations, electron states in solids, energy band theory, semiconductor physics and devices).
The laboratory component includes practical and computational tasks to develop advanced skills of experimentation and scientific report writing.
Lecture times: Monday - Friday, 4th period
DP requirements: Minimum of 40% for the class record; attendance at all tests; completion of all laboratory reports; completion of the project and completion of 75% of tutorials and problem sets.
Assessment: Class record (tests, weekly problem sets, laboratory work and project) counts 50%; two 2-hour examinations in June count 25%; two 2-hour examinations in November count 25%. A subminimum of 40% exists in the weighted average of the four examinations.

Postgraduate Courses

PHY4000W PHYSICS HONOURS
Since the code PHY4000W will not carry a NQF credit value, students will be concurrently registered for PHY4006W (coursework component of 120 NQF credits) and PHY4007W (research project of 40 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Dr J M Keaveney
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 convenor. Criteria for acceptance include a pass of 60% in PHY3004W, 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. Each student needs to design a module package which sums up to at least 12 units, and not more than 14 units. The Research Project (3 units) is compulsory. The compulsory modules (1 unit each) are: Electromagnetism 1, Quantum Mechanics 1 and Statistical Physics. At least five further modules (1 unit each) must be chosen from: Electromagnetism 2, Quantum Mechanics 2, Classical Mechanics, Computational Physics, Particle Physics, Nuclear Physics, Relativistic Quantum Mechanics, Quantum Field Theory, and Solid State Physics. Students are strongly encouraged to include both Electromagnetism 2 and Quantum Mechanics 2 in their module choice. 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, for example. The choice of modules and research project must be approved by the Head of Physics in consultation with the PHY4000W convener. Details appear on the Physics website: www.phy.uct.ac.za. The Department of Physics is presently reviewing the curriculum of PHY4000W.
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 the results 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 one of the compulsory modules. The Research Project will count 25% of the final mark. These component parts of the course will be combined in a final overall mark which will be reflected against the course code PHY4000W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

PHY5000W PHYSICS DISSERTATION
180 NQF credits at NQF 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.

PHY5001W THEORETICAL PHYSICS DISSERTATION
180 NQF credits at NQF 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.

PHY5003W ASTROPHYSICS & SPACE SCIENCE MINOR DISSERTATION
(National Astrophysics & Space Science Programme (NASSP); for further details see entry under Department of Astronomy)
90 NQF credits at NQF level 9
Course entry requirements: AST5003F
DP requirements: None.
Assessment: Students will work on an approved research topic on which a minor dissertation must be presented for formal examination.

PHY5006W TERTIARY PHYSICS EDUCATION DISSERTATION
180 NQF credits at NQF 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.

PHY5007Z DATA SCIENCE FOR PARTICLE PHYSICS
12 NQF credits at NQF level 9
Convener: Dr J M Keaveney
Course entry requirements: Core modules of the Masters course in Data Science.
Course outline:
This course introduces students to the important computational aspects of high-energy nuclear and particle physics research. Using examples from current research at the European Organization for Nuclear Research (CERN), the students are introduced to: the basic principles of high-energy physics, the Grid computing model employed by the Worldwide LHC Computing Grid (WLCG), the simulation of interactions between subatomic particles and their detection, the ROOT data analysis tool used by all the large high-energy physics collaborations, the signal extraction and significance estimation techniques employed by the most recent particle discoveries including concepts like nuisance parameters and the look-elsewhere effect.
DP requirements: 50% average for the two projects.
Assessment: Two projects: 25% each. Practical 'take-home' Computing examination: 50%. A sub-minimum of 50% for each of the project and examination components will be required.

PHY5008W DATA SCIENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Dr S Er
Course entry requirements: Successful completion of the coursework component of the Masters course in Data Science.
Course outline:
The research component of the degree is based on a 90 credit dissertation. The topic of the research will be based on an analysis of large data sets from Physics.

PHY6000W PHYSICS THESIS
360 NQF credits at NQF 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.

PHY6001W TERTIARY PHYSICS EDUCATION THESIS
360 NQF credits at NQF 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.

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 N Gumedze, MSc PhD *Cape Town*
Professor:
R Altwegg, PhD *Zurich*
Emeritus Professors:
G D I Barr, MSc PhD *Cape Town*
D Bradfield, BSc Hons MSc PhD *Cape Town*
Senior Scholar:
L M Haines, BA MA *Cantab* BSc Hons *Natal* MPhil *UCL* PhD *Unisa*
Associate Professors:
G Distiller, PhD *Cape Town*
T Gebbie, BSc Hons *Witwatersrand* MSc PhD *Cape Town* CPhys. MInstP. (IoP) FRM (GARP)
S Silal, PhD *Cape Town*
Honorary Research Associates:
D Borchers, PhD *St Andrews*
J Colville, PhD *Cape Town*
F A Gebreselassie, PhD *Bern*
T Gridley, PhD *St Andrews*
D Hendricks, PhD Witwatersrand
J Hutton, PhD *Imperial College London*
D Maphisa, PhD *Cape Town*
S Mecenero, PhD *Cape Town*
G Moncrieff, PhD *Frankfurt*
M Naidoo, MPH *Columbia University*
M Rogan, PhD *Yale*
Emeritus Associate Professors:
J M Juritz, BSc Hons *Unisa* MSc PhD *Cape Town*
C Thiart, BSc (Agric) Hons *Stell* MSc PhD *Cape Town*
Senior Lecturers:
A Clark, MSc PhD *Cape Town*
S Er, PhD *Istanbul*
B Erni, BSc Hons MSc *Cape Town* PhD *Basel*
E Pienaar, PhD *Cape Town*
Adjunct Associate Professor:
I Durbach, MSc PhD *Cape Town*
Adjunct Senior Lecturer:
I Meyer, MSc MBA *Pret* PhD *Unisa*
Lecturers:
S Britz, MSc *UFS*
D Katshunga, BSc Hons *DRC* MSc *Cape Town*
M Mavuso, MPhil MSc *Cape Town*
M Ngwenya, MSc *Cape Town*
A Paskaramoorthy, BSc Hons MSc *Witwatersrand*
R G Rakotonirainy, PhD *Stell*
Y Robbertze, BSc Hons MSc *Cape Town*
S Salau, MSc *Witwatersrand*
N Watson, MSc *Cape Town*

Research Officer (Statistical Consultant):
I Karangwa, MSc PhD *UWC*
Administrative Manager:
B King, HDE *UWC*
Administrative Officer:
C Jansen-Fielies
Administrative Assistant:
N Maqubela
Financial Officer:
D Davids
Senior Clerk:
K Jeptha

CENTRE FOR STATISTICS IN ECOLOGY, ENVIRONMENT AND CONSERVATION (SEEC)
Director:
R Altwegg, PhD *Zurich*
Core members:
D Borchers, PhD *St Andrews*
A E Clark, MSc *Cape Town*
J Colville, PhD *Cape Town*
G Distiller, PhD *Cape Town*
I Durbach, PhD *Cape Town*
B Erni, BSc Hons MSc *Cape Town* PhD *Basel*
T Gridley, PhD *St Andrews*
N Karenyi, PhD *NMMU*
D Maphisa, PhD *Cape Town*
M Ngwenya, MSc *Cape Town*
J Slingsby, PhD *Cape Tow*n
V Visser, PhD *Sheffield*
H Winker, PhD *Rhodes*

RESEARCH IN STATISTICAL SCIENCES
The department focuses on research in statistics, operations research and decision modelling and the underlying methodology and application of these methods to ecology, medicine, finance and big data. Specific research areas that fall into these groupings include:
BAYESIAN DECISION THEORY: General principles of Bayesian statistical analysis; applications in sequential stochastic optimisation and other fields (A Clark).
BIOSTATISTICS: Medical applications of statistics (L M Haines, F Gumedze, S Silal). The objectives of the Biostatistics Interest Group are to develop statistical methodology motivated by medical problems.
DATA SCIENCE: Development and application of statistical methods for the analysis of large data sets (S Er, S Britz, E Pienaar).
FINANCIAL MODELLING AND MARKET MICROSTRUCTURE: 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 (T Gebbie, A Paskaramoorthy).
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).
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

optimisation; application to decision making and planning in private and public sectors (N Watson, R G Rakotonirainy).
OPTIMAL DESIGN: The design of experiments in agriculture, biology and engineering which are in some sense optimal (L M Haines).
SOCIAL SCIENCE STATISTICS: Research surveys; local government support; analysis of poverty and development, structural equation modelling (S Er).
SPATIAL STATISTICS AND TIME SERIES: (B Erni, M Ngwenya, C Thiart).
STATISTICS IN ECOLOGY: Applications of statistics to biological and environmental data (B Erni, G Distiller, R Altwegg, A Clark)
STOCHASTIC MODELLING: (M Mavuso, E Pienaar, Y Robbertze)

Undergraduate Courses

NOTE: Students who intend to specialise in Statistics are strongly advised to include Computer Science in their curriculum.

A student cannot obtain credits for more than one of STA1000F/S/P/L, STA1007S, STA1006S, STA1008F/S, STA1100S, STA1106H
A student cannot obtain credits for more than one of STA2020F/S, STA2007F/H/S, STA2005S.
A student cannot obtain credits for both STA2004F and STA2030S.
A student cannot obtain credits for both STA3030F and STA3041F.
A student cannot obtain credits for both STA3043S and (STA3047S+STA3048S)

First-Year Courses

STA1000F INTRODUCTORY STATISTICS
(No first year students) STA1000F and STA1000S are identical courses offered in first and second semesters. Owing to the mathematics prerequisites, first-year students can only register for STA1000S in the second semester and STA1000F on completion of the mathematics prerequisite. One lecture per week, one workshop per week and one tutorial per week. A student cannot obtain credits for more than one of STA1000F/S/P/L, STA1007S, STA1006S, STA1008F/S.
18 NQF credits at NQF level 5
Convener: N Watson
Course entry requirements: A pass in any of MAM1004F/S or MAM1005H or MAM1031F or MAM1033F or MAM1020F/S or MAM1010F/S or MAM1110F/H.
Course outline:
This is an introductory statistics course aimed at exposing students to principles and tools to support appropriate quantitative analysis. The aim is to produce students with a functional sense of statistics. We introduce students to statistical modelling and also cover exploratory data analysis. Appropriate tools for display, analysis and interpretation of data are discussed. This course is offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will encounter and apply statistics in their other courses and professions. Topics covered include: exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; Binomial, Poisson, Exponential, Normal and Uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including tests on means; tabular data and bivariate data); determining sample sizes; simple linear regression and measures of correlation. Students are assessed on their knowledge of the topics covered and their ability to perform simple and appropriate statistical analyses using spreadsheet functions.
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 40% and a 2-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA1000S INTRODUCTORY STATISTICS

STA1000F and STA1000S are identical courses offered in first and second semesters. Owing to the mathematics prerequisites, first-year students can only register for STA1000S in the second semester and STA1000F on completion of the mathematics prerequisite. One lecture per week, one workshop per week, and one tutorial per week. A student cannot obtain credits for more than one of STA1000F/S/P/L, STA1007S, STA1100S, STA1006S, STA1106H, STA1008F/S.

18 NQF credits at NQF level 5

Convener: N Watson

Course entry requirements: A pass in any of MAM1004F/S or MAM1005H or MAM1031F or MAM1033F or MAM1020F/S or MAM1010F/S or MAM1110F/H or at least 45% for MAM1010F or MAM1004F or MAM1020F or MAM1031F or MAM1033F in the current year.

Course outline:

This is an introductory statistics course aimed at exposing students to principles and tools to support appropriate quantitative analysis. The aim is to produce students with a functional sense of statistics. We introduce students to statistical modelling and also cover exploratory data analysis. Appropriate tools for display, analysis and interpretation of data are discussed. This course is offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will encounter and apply statistics in their other courses and professions. Topics covered include: exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; Binomial, Poisson, Exponential, Normal and Uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including tests on means, tabular data and bivariate data); determining sample sizes; simple linear regression and measures of correlation. Students are assessed on their knowledge of the topics covered and their ability to perform simple and appropriate statistical analyses using spreadsheet functions.

DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or exercises as set out in course outline. Class record of at least 35%.

Assessment: Class record 40% and a 2-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA1000P/L INTRODUCTORY STATISTICS

(offered during summer and winter terms)

18 NQF credits at NQF level 5

Convener: N Watson

Course entry requirements: Students should have obtained a DP for either STA1000F/S.

Course outline:

This is an introductory statistics course aimed at exposing students to principles and tools to support appropriate quantitative analysis. The aim is to produce students with a functional sense of statistics. We introduce students to statistical modelling and also cover exploratory data analysis. Appropriate tools for display, analysis and interpretation of data are discussed. This course is offered predominantly, but not exclusively, to Commerce students. The aim is to give a foundation to students who will encounter and apply statistics in their other courses and professions. Topics covered include: exploratory data analysis and summary statistics; probability theory; random variables; probability mass and density functions; Binomial, Poisson, Exponential, Normal and Uniform distributions; sampling distributions; confidence intervals; introduction to hypothesis testing (including tests on means, tabular data and bivariate data); determining sample sizes; simple linear regression and measures of correlation. Students are assessed on their knowledge of the topics covered and their ability to perform simple and appropriate statistical analyses using spreadsheet functions.

DP requirements: Satisfactory attendance of tests and completion of assignments and/or exercises as set out in course outline. Class record of at least 35%.

Assessment: Class record 40% and a 2-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA1006S MATHEMATICAL STATISTICS I

A student cannot obtain credits for more than one of STA1000F/S/P/L, STA1007S, STA1006S, STA1008F/S.

18 NQF credits at NQF level 5

Convener: S Salau

Course entry requirements: At least 60% in MAM1031F or MAM1033F or MAM1005H or MAM1020F/S or at least 70% in MAM1010F/S or MAM1004F and concurrent registration for MAM1032S or MAM1034S, or MAM1006H or MAM1012F/S or MAM1021S OR an average of at least 60% for both (MAM1031F & MAM1032S) or (MAM1033F & MAM1034S) or (MAM1020F/S & MAM1021S) or (MAM1005H & MAM1006H) or an average of least 70% for both (MAM1010F/S & MAM1012F/S).

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 (proportions, difference between two proportions, means, difference between two (means, difference between means: for independent samples and dependent samples). F-test (ratio of two independent variances). Chi-squared-test. Meaning of p-values. Bivariate data: scatterplot, simple linear regression and correlation.

Lecture times: Five lectures per week, Monday - Friday, 4th period

DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.

Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA1007S INTRODUCTORY STATISTICS FOR SCIENTISTS

A student cannot obtain credits for more than one of STA1000F/S/P/L, STA1007S, STA1006S, STA1008F/S.

18 NQF credits at NQF level 5

Convener: Associate Professor R Altwegg

Course entry requirements: A pass in any of MAM1004F/S or MAM1005H or MAM1031F or MAM1033F or at least 45% for MAM1004F or MAM1031F or MAM1033F in the current year.

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 R. The course is the equivalent of STA1000S, in a biological setting.

Lecture times: Five lectures per week, Monday - Friday, 1st period.

DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.

Assessment: Class record 40% and a 3-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

Second-Year Courses

STA2004F STATISTICAL THEORY & INFERENCE

A student cannot obtain credits for both STA2004F and STA2030S.
24 NQF credits at NQF level 6
Convener: M Mavuso
Course entry requirements: A pass in (MAM1000W or MAM1032S or MAM1034S or MAM1012S or MAM1006H) and STA1006S or STA1106H.
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.
Lecture times: Five lectures per week, Monday to Friday, 1st period.
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA2005S LINEAR MODELS

A student cannot obtain credits for more than one of STA2020F/S, STA2007F/H/S, STA2005S.
24 NQF credits at NQF level 6
Convener: Dr B Erni
Course entry requirements: A pass in STA2004F. MAM2011F - Linear Algebra (2LA) is strongly recommended.
Course outline:
This course gives an introduction to statistical modelling and the theory of linear statistical models. The material is presented from a parametric and non-parametric perspective. The course has two 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, bootstrap sampling; principal component analysis for dimension reduction and for regression.
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, permutation/randomization tests, nonparametric tests, bootstrapping.
The students are introduced to relevant statistical software and practical data analysis through weekly computer practicals and the exposure to many datasets.
Lecture times: Five lectures per week, Monday - Friday, 1st period.
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA2007F/S/H STUDY DESIGN & DATA ANALYSIS FOR SCIENTISTS

This course is offered in blended learning format. A student cannot obtain credits for more than one of STA2020F/S, STA2007F/H/S, STA2005S.

24 NQF credits at NQF level 6

Convener: Associate Professor R Altwegg

Course entry requirements: A pass in STA1000F/S or STA1006S or STA1007S or STA1106H or STA1100S or STA1008F/S) and (MAM1000W or MAM1031F or MAM1033F or MAM1004F/S or MAM1005H or MAM1010F/S or MAM1020F/S or MAM1110F/H)

Course outline:

The course aims to equip students with practical experience and skills in analysing data, using 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. There will be a one-day face-to-face workshop at the beginning of the first semester and a one-day face-to-face workshop at the beginning of the second semester.

DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35% .

Assessment: Class record 40% and a 2-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA2007P STUDY DESIGN & DATA ANALYSIS FOR SCIENTISTS

This course is offered in blended learning format during summer term dependent on there being sufficient demand and dependent on capacity to offer course. Note that request for offering course in any one year should come from a UCT course convener. Students make use of online learning workshops.

24 NQF credits at NQF level 6

Convener: Associate Professor R Altwegg

Course entry requirements: A pass in STA1007S (preferably) or STA1000F/S or STA1006S or STA1106H or STA1100S or STA1008F/S) and (MAM1000W or MAM1031F or MAM1033F or MAM1004F/S or MAM1005H or MAM1010F/S or MAM1020F/S, MAM1110F/H).

Course outline:

The course aims to equip students with practical experience and skills in analysing data and applying statistical techniques relevant to the natural sciences. Skills include designing experiments, choosing appropriate statistical methods for analysing data, visual display and statistical modelling of data, model checking, interpretation and reporting of statistical results, and understanding limitations of statistical methods and data. Topics include: introduction to statistical notation, linear regression, design and analysis of experiments, generalised linear models. There will be a strong emphasis on the practical application of these methods using the open-source statistical software R. There will be a one-day face-to-face workshop at the beginning of the first semester and a one-day face-to-face workshop at the beginning of the second semester.

DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.

Assessment: Class record 40% and a 2-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA2020F APPLIED STATISTICS

A student cannot obtain credits for more than one of STA2020F/S, STA2007F/H/S, STA2005S.

24 NQF credits at NQF level 6

Convener: N Watson

Course entry requirements: A pass in STA1000F/S/P/L or STA1006S or STA1106H or STA1100S or STA1007S or STA1008F/S and MAM1000W or MAM1031F or MAM1033F or MAM1004F/S or MAM1010F/S or MAM1020F/S or MAM1110F/H or MAM1005H.

Course outline:

This course is designed to extend the student's basic knowledge acquired in STA1000F/S/P/L. The emphasis of the course is on applying statistical methods and modelling techniques to data rather than focusing on the mathematical rigour underpinning these methods. Topics covered include: Analysis of variance and experimental design; revision and extension of simple linear regression; multiple regression; logistic regression; model building; time series analysis; and non-parametric statistics. Students will analyse data using R.

Lecture times: Monday - Thursday, 1st or 5th period

DP requirements: Satisfactory attendance of lectures, lab practicals and tests and completion of weekly quizzes and lab practicals as set out in course outline. Class record of at least 35% and at least 35% for Practical test.

Assessment: Class record 40% and a 3-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA2020S APPLIED STATISTICS

A student cannot obtain credits for more than one of STA2020F/S, STA2007F/H/S, STA2005S.

24 NQF credits at NQF level 6

Convener: N Watson

Course entry requirements: A pass in STA1000F/S/P/L or STA1006S or STA1106H or STA1100S or STA1007S or STA1008F/S and MAM1000W or MAM1031F or MAM1033F or MAM1004F/S or MAM1010F/S or MAM1020F/S or MAM1110F/H or MAM1005H.

Course outline:

This course is designed to extend the student's basic knowledge, acquired in STA1000F/S/P/L. The emphasis of the course is on applying statistical methods and modelling techniques to data rather than focusing on the mathematical rigour underpinning these methods. Topics covered include: Analysis of variance and experimental design; revision and extension of simple linear regression; multiple regression; logistic regression; time series analysis; and non-parametric statistics. Students will analyse data using R.

Lecture times: Monday - Thursday, 7th period

DP requirements: Satisfactory attendance of lectures, lab practicals and tests and completion of weekly quizzes and lab practicals as set out in course outline. Class record of at least 35% and at least 35% for Practical test.

Assessment: Class record 40% and a 3-hour exam counting 60%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA2030S STATISTICAL THEORY

A student cannot obtain credits for both STA2004F and STA2030S.

24 NQF credits at NQF level 6

Convener: M Ngwenya

Course entry requirements: At least 45% for STA2020F/S or STA2007F/S/H or STA2005S.

Co-requisites: Concurrent registration for MAM1032S or MAM1034S or MAM1012S or MAM1021F/S. Note: A student may not register concurrently for STA2030S and MAM1006H.

Course outline:

This course introduces students to Statistical Theory and Inference. It explores aspects of probability theory that are particularly relevant to statistics, including the notions of random variables, joint probability distributions, expected values and moment generating functions. The course content

includes univariate distributions and moments of univariate distributions, moments of bivariate distributions, distributions of sample statistics and parameter estimation and inference.
Lecture times: Monday - Thursday, 1st period
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

Third-Year Courses

STA3022F APPLIED MULTIVARIATE DATA ANALYSIS

36 NQF credits at NQF level 7
Convener: Dr S Er
Course entry requirements: STA2020F/S or STA2005S or STA2007F/S/H
Course outline:
The aim of the course is to create a practical working familiarity with the analysis of data, focusing on multivariate methods as applied in areas such as marketing, the social science and the sciences. Topics covered include item reliability analysis, multidimensional scaling, correspondence analysis, principal component and factor analysis, cluster analysis, discriminant analysis, classification trees and structural equation modelling.
Lecture times: Monday - Thursday, 4th period
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA3030F STATISTICAL INFERENCE & MODELLING

A student cannot obtain credits for both STA3030F and STA3041F.
36 NQF credits at NQF level 7
Convener: Associate Professor G Distiller
Course entry requirements: STA2020F/S (or concurrent registration), STA2030S, MAM1032S or MAM1034S or MAM1006S or MAM1012F/S or MAM1021F/S or MAM1112S.
Course outline:
This course forms part of the third-year major in Applied Statistics. The aim of the course is to provide students with the main intellectual and practical skills required in the use of inferential statistics and statistical modelling. The course consists of 4 modules: The simulation module introduces students to the use of computer simulation and data re-sampling techniques (bootstrap) to investigate the following problems: one and two sample tests of means and variances; one way analysis of variance; moments and other properties of distributions. The generalized linear models module introduces students to the exponential family of distributions and extends linear regression models to models for non-normal response variables, including logistic regression. The machine learning module covers a basic introduction to statistical learning paradigms, applications of regression and classification trees, and a primer on feedforward neural networks and backpropagation. The Bayesian module introduces students to decision theory and Bayesian inference. Students will use the R programming language.
Lecture times: Monday - Thursday, 1st period
DP requirements: Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA3036S OPERATIONAL RESEARCH TECHNIQUES
36 NQF credits at NQF level 7
Convener: Dr R G Rakotonirainy
Course entry requirements: STA2030S or STA2005S; STA3030F is recommended
Course outline:
This course forms part of the third-year major in Applied Statistics. It is an introduction to the study of Operational Research (OR) and explores fundamental quantitative techniques in the OR armamentarium with a strong focus on computer-based application. The course is intended for students in the applied statistics stream but may be taken as an elective by students in the mathematical statistics stream. Topics covered include linear and non-linear programming where students will learn to find optimal solutions by characterising problems in terms of objectives, decision variables and constraints, decision making under uncertainty through decision trees, decision rules and scenario planning, Queueing Theory simulation through modelling the operation of real world systems as they evolve over time.
Lecture times: Monday - Thursday, 3rd period
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA3041F STOCHASTIC PROCESSES & TIME SERIES
A student cannot obtain credits for both STA3030F and STA3041F.
36 NQF credits at NQF level 7
Convener: D Katshunga
Course entry requirements: STA2004F and STA2005S; MAM2000W or MAM2004H is strongly recommended. Recommended MAM2000W modules: MAM2011F - Linear Algebra (2LA), MAM 2010F - Advanced Calculus (2AC), MAM2012S - Differential Equations (2DE) and MAM2014S - Real Analysis (2RA).
Course outline:
This course forms part of the third-year major in Mathematical Statistics. It consists of two modules namely Stochastic Processes and Time Series Analysis. The Stochastic Processes module is aimed at providing introductory theory and basic applications of stochastic processes in financial modelling whilst the Time Series module introduces students to the foundations of the Box-Jenkins methodology with the intention of applying the methodology using statistical software. Details of the module content are as follows:
Stochastic processes: The module covers the general theory underlying stochastic processes and their classifications, definitions and applications of discrete Markov chains. Branching processes are examined with an emphasis on analysing probability of extinction/survival. The module also covers both discrete and continuous time counting processes for purposes constructing forecasts and backcasts. Finally, a detailed introduction to homogeneous and non-homogeneous Poisson processes is given.
Time series analysis: The module covers various topics including 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.
Lecture times: Five lectures per week, Monday - Friday, 1st period
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA3043S STATISTICAL MODELLING, MACHINE LEARNING & BAYESIAN ANALYSIS

A student cannot obtain credits for both STA3043S and (STA3047S+STA3048S)
36 NQF credits at NQF level 7
Convener: Dr E Pienaar
Course entry requirements: STA2004F and STA2005S; MAM2000W or MAM2004H is strongly recommended. Recommended MAM2000W modules: MAM2011F - Linear Algebra (2LA), MAM 2010F - Advanced Calculus (2AC), MAM2012S - Differential Equations (2DE) and MAM2014S - Real Analysis (2RA).
Course outline:
This course forms part of the third-year major in Mathematical Statistics. It consists of three modules: The first, Generalised Linear Models, introduces students to the theory and application of fitting linear models to various types of response variables with different underlying distributions. Subsequently, elementary concepts and methods in machine learning within the framework of statistical learning are explored. Finally, the Introduction to Bayesian Analysis module is dedicated to the Bayesian paradigm of statistical inference, analysis, and risk theory. The contents of the respective modules are outlined as follows:
Generalized linear models: Topics covered include: The exponential family of distributions, the GLM formulation, estimation and inference, models for continuous responses with skew distributions, logistic regression, log-linear models and Poisson regression.
Machine learning: Topics covered include: A basic introduction to statistical learning paradigms, applications of regression and classification trees, and a primer on feedforward neural networks and backpropagation.
Introduction to Bayesian Analysis: Topics covered include: use of Bayes' theorem; Bayesian statistical analysis for Bernoulli and normal sampling; empirical Bayes and credibility theory; loss and extreme value distributions; Monte Carlo methods.
Students are assessed through formal written exam plus computer assignments done under exam conditions.
Lecture times: Five lectures per week, Monday - Friday, 1st period.
DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

STA3045F ADVANCED STOCHASTIC PROCESSES & DISTRIBUTION THEORY

36 NQF credits at NQF level 7
Convener: Associate Professor T Gebbie
Course entry requirements: STA2004F, STA2005S, MAM2000W and concurrent registration for STA3041F. Recommended MAM2000W modules: MAM2011F - Linear Algebra (2LA), MAM 2010F - Advanced Calculus (2AC), MAM2012S - Differential Equations (2DE) and MAM2014S - Real Analysis (2RA). Note: A student may not register concurrently for STA3045F and CSC2001F.
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 begins by giving a brief introduction to copulas and extreme value theory, together with some applications to risk management. The rest of 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: copulas, an introduction to extreme value theory, homogenous and non-homogeneous continuous-time Markov chains, random walks, probability theory, martingales, Brownian motion, and diffusion processes.
Lecture times: Five lectures per week, Monday - Friday, 2nd period.

DP requirements: Satisfactory attendance of lectures, tutorials, practicals and tests and completion of assignments and/or class exercises as set out in course outline. Class record of at least 35%.
Assessment: Class record 30% and a 3-hour exam counting 70%. Weights will be adjusted in the case of missed assessments, as detailed in the course outline.

Postgraduate Courses

STA4007W STATISTICS AND DATA SCIENCE HONOURS
Since the code STA4007W will not carry a NQF credit value, students will be concurrently registered for STA4022W (coursework component of 120 NQF credits) and STA4023W (research project of 40 NQF credits).
160 NQF credits at NQF level 8; the combined credit value of both components.
Convener: Associate Professor G Distiller and Dr E Pienaar
Course entry requirements: The minimum requirements are (MAM1031F or MAM1004F/S or MAM1010F/S or MAM1033F) and (MAM1032S or MAM1034S), a first year semester module in Computer Science plus one of the following two sets of 3rd year courses: Applied Statistics stream: STA3030F + STA3036S/STA3022F; OR Mathematical Statistics Stream: STA3041F, STA3043S; Applicants fulfilling the minimum requirements above with an average of 65% or more for their 3rd year courses (at first attempt) for the Mathematical Statistics stream and students with an average of 70% or more for their 3rd year courses (at first attempt) for the Applied Statistics stream can be confident of admission into the programme. Applied Statistics students also need a minimum of 60% for each of the two pre-requisite courses. Students who do not achieve the requisite threshold levels in their respective streams may be considered on a case-by-case basis.
Course outline:
This honours programme teaches students the necessary data analytical and computing skills for a career in Data Science. It covers theoretical and applied statistics, supervised and unsupervised learning, statistical computing and operations research. It aims to give students a good theoretical basis and statistical computing skills through the teaching of core modules (81 NQF credits). It further exposes students to the practical application of quantitative methods in different areas through the offering of elective modules (39 NQF credits). It provides training in research through supervised project work (40 NQF credits). Elective modules vary from year to year, but typically include Portfolio Theory, Time Series Analysis, Biostatistics, Decision Modelling, Spatial Statistics.
DP requirements: Attendance of 85% of departmental seminars.
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. The student is required to obtain a mark of at least 50% in all core modules and for the individual project. The student may fail at most one elective module provided that a mark of at least 40% is obtained for that module. These component parts of the course will be combined in a final overall mark which will be reflected against the course code STA4007W, with PA (pass) entered against the coursework and project codes; each of these components must be passed separately for the award of the degree.

STA4027Z BAYESIAN COMPUTATIONAL METHODS
12 NQF credits at NQF level 8
Convener: Dr A Clark
Course entry requirements: Currently doing an Honours or Masters degree in statistics or at the discretion of the Head of Department.
Course outline:
The course aims to provide students with an introduction to the Bayesian method and the acquisition of the theory and methods required to apply Bayesian analysis to real world practical problems.

Topics included in the course are as follows: Bayesian linear regression, variable selection, mixture modelling, Markov chain Monte Carlo methods (theory and practical applications).
DP requirements: Satisfactory completion of assignments
Assessment: Assignments and Exam

STA4028Z PORTFOLIO THEORY
12 NQF credits at NQF level 8
Convener: Associate Professor T Gebbie
Course entry requirements: STA3041F, STA3043S or at the discretion of the Head of Department. STA3045F is strongly recommended.
Course outline:
The course introduces the historical development of ideas from Economics, gambling and Finance with a South African perspective for portfolio control. Data-wrangling, portfolio optimization, sequential historic back-testing and simulation, and their attribution are developed in R. The static mean-variance theoretical foundations of portfolio choice, asset pricing and notions of market equilibrium are developed from first principles. Following an operations research approach tactical and strategic portfolios are formulated to admit short-term departures from long-term equilibrium for asset allocation. The theory is used to demonstrate the Generalised Fundamental Law of Asset Management, the Roll Critique and a Bayesian Black-Litterman portfolio choice framework. Active management and its complexities due to estimation and intrinsic uncertainties are demonstrated via case-studies. Various performance measures are derived from theoretical considerations. Performance attribution is used to measure the impact of information, return, risk and performance within a sequence of single-period portfolio control decisions. There is an emphasis on understanding the implications of back-test over-fitting. The course introduces indexation methods and the integration of the developed tools within a standard portfolio management workflow. Advanced topics such as cluster-based portfolio choice, risk-parity models and machine-learning extensions may be included.
DP requirements: Satisfactory completion of assignments
Assessment: Assignments and Exam

STA4029Z ADVANCED PROBABILITY THEORY
12 NQF credits at NQF level 8
Convener: M Mavuso
Course entry requirements: Currently doing an Honours or Masters degree in statistics or at the discretion of the Head of Department.
Course outline:
The course aims to cover advanced concepts in probability and martingale theory, including products and conditioning, analysis, L2 theory of random variables, characteristic functions, convergence and uniform integrability, martingales, square integrable martingales, local martingales.
DP requirements: Class record of at least 40%
Assessment: Assignments, Class tests and Exam

Refer to the “Rules for Master’s Degrees” in the front section of this handbook for the curriculum structure of the various Master’s by coursework and minor dissertation offered by the Department of Statistical Sciences (STA). The detailed courses are presented here.

STA5000W STATISTICS DISSERTATION
180 NQF credits at NQF 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 OPERATIONAL RESEARCH DISSERTATION
180 NQF credits at NQF 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.

STA5004W STATISTICS AND DATA SCIENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Dr B Erni
Course entry requirements: STA5003W
Course outline:
On successful completion of the coursework component, students will undertake an individual, supervised research project on a suitable topic, the results of which are to be written up as a minor dissertation. The minor dissertation component of the Statistics and Data Science masters specialization is a research project based on a selected research in a methodological or applied field of Statistics or Data Science.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

STA5010W OPERATIONAL RESEARCH IN DEVELOPMENT COURSEWORK
This course may not be offered in 2025
90 NQF credits at NQF level 9
Convener: Dr R G Rakotonirainy
Course entry requirements: Entry to the course 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 one year 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 first academic year is based primarily on coursework, 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.
Assessment: This component will be assessed through class assessments and examinations. A pass for this coursework requires an average of 50% over all modules, as well as a minimum of 50% for certain modules designated as core material.

STA5011W OPERATIONAL RESEARCH IN DEVELOPMENT MINOR DISSERTATION
This course may not be offered in 2025
90 NQF credits at NQF level 9
Convener: Dr R G Rakotonirainy
Course entry requirements: STA5010W
Course outline:
On successful completion of the coursework component, students will undertake an individual, supervised applied research project on a suitable topic, the results of which are to be written up as a minor dissertation. In some cases, the project might be undertaken on a local problem at the student's home base.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each count 50% towards the degree; each must be passed separately for the award of the degree.

STA5013W STATISTICAL ECOLOGY DISSERTATION
180 NQF credits at NQF 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.

STA5014Z STUDY DESIGN & DATA ANALYSIS FOR SCIENTISTS DOING POSTGRADUATE
0 NQF credits at NQF level 9
Convener: Associate Professor R Altwegg
Course entry requirements: Co-registration for an Honours degree in a relevant discipline such as Biology, Medicine, Actuarial Science, Finance and Engineering that involves a substantial component of quantitative training, as assessed by Head of Statistical Sciences Department
Course outline:
The course aims to equip students with practical experience and skills in analysing data, using 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. There will be a half-day face-to-face workshop at the beginning of the first semester and a half-day face-to-face workshop at the beginning of the second semester.
Assessment: Assignments and tests count 50%; one 3-hour examination in November counts 50%. A sub-minimum of 40% is required for the examination.

STA5058W BIOSTATISTICS MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Successful completion of the coursework component of the Master's course in Biostatistics.
Course outline:
This course presents the research component of the Master's course in Biostatistics. The research component of the degree is based on a 90 credit dissertation. The topic of the research will be based on methodological or applied problems from the Health or Biological Sciences. Students may be based in a research unit from where the problem has originated for the duration of their research. On completion of the research component, and the preceding coursework component, students will be able to: (1) conduct collaborative research in the health sciences, (2) conduct independent research in statistical methodology for the health sciences, (3) act as statistical consultants for health sciences research, (4) be able to also work with researchers in the biological sciences.
Assessment: The minor dissertation must be presented for formal examination. The coursework and minor dissertation each counts 50% towards the degree; each must be passed separately for the award of the degree.

STA5059Z TOPICS IN BIOSTATISTICS A
15 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Previous exposure to quantitative training that will enable the student to cope with the material in the chosen module plus successful completion of pre-courses deemed necessary for the module, as assessed by Head of the Statistical Sciences Department and the module convener.
Course outline:
The aim of this module is to allow students to register for a single module that forms part of the Master's course in Biostatistics. Possible modules include Multivariate Statistics, Longitudinal Data Analysis, Survival Analysis and Design and Analysis of Experiments in the Health Sciences, Advanced Topics in Regression, Simulation and Optimisation, Machine Learning, Bayesian Decision Analysis, Infectious Disease Modelling and Structural Equation Modelling. Students will acquire skills and knowledge of statistical methodology relevant to Health Sciences Research.
Assessment: Class assignments 50%; one 3-hour examination counts 50%. A sub-minimum of 40% is required for the examination and the class assignments.

STA5060Z TOPICS IN BIOSTATISTICS B
15 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Previous exposure to quantitative training that will enable the student to cope with the material in the chosen module plus successful completion of pre-courses deemed necessary for the module, as assessed by Head of the Statistical Sciences Department and the module convener.
Course outline:
The aim of this module is to allow students to register for a single module that forms part of the MSc in Biostatistics. Possible modules include Multivariate Statistics, Longitudinal Data Analysis,

Survival Analysis and Design and Analysis of Experiments in the Health Sciences, Advanced Topics in Regression, Simulation and Optimisation, Machine Learning, Bayesian Decision Analysis, Infectious Disease Modelling and Structural Equation Modelling. Students will acquire skills and knowledge of statistical methodology relevant to Health Sciences Research.
Assessment: Class assignments 50%; one 3-hour examination counts 50%. A sub-minimum of 40% is required for the examination and the class assignments.

STA5061Z BAYESIAN DECISION MODELLING
15 NQF credits at NQF level 9
Convener: Dr A Clark
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics subject and/ or statistical background deemed sufficient by the Head of Department.
Course outline:
This module develops the Bayesian approach to inference and decision making, starting from concepts of subjective probability and subjective expected utility, and moving on to structures of Bayesian modelling for inference, computational solution of such models, and representation of complex learning and decision making processed through Bayesian Networks.
DP requirements: Completion and submission of the assignment component at a satisfactory grade (40% minimum)
Assessment: Assignments 35%. Written examination 65%. A subminimum of 40% in each of the assignments and examination is required.

STA5062Z CAUSAL MODELLING
15 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/ or statistical background deemed sufficient by the Head of Department.
Course outline:
This course introduces students to the concept of causality, causal diagrams and causal modelling. Topics to be covered include Counterfactual Theory, Directed Acyclical Graphs, Propensity Scores, Inverse Probability Weighting, Marginal Structural Models, G-estimation, Path Analysis, Confirmatory Factor Analysis, Structural Equation Modelling (SEM), Multiple Group SEM, MIMIC (Multiple Indicators and Multiple Causes) Models, Multilevel SEM, and Latent Growth Curve SEM. The course covers both the theory and the application of the methods with computer software such as R, STATA and LISREL. The course may not be offered every year.
DP requirements: 40% for the assignment component
Assessment: Assignments 40%. Written exam 60%. Sub-minimum of 40% in each of assignment and examination component.

STA5063Z DESIGN OF CLINICAL TRIALS
15 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Acceptance into Master's program in Biostatistics, or statistical background deemed sufficient by the Head of Department.
Course outline:
This module will look at the Design of Clinical Trials. Concepts of randomisation, replication and blocking will be discussed. Students will be introduced to the different phases, that is Phases I, II, III, and IV, of trial designs. Specific designs which will also be covered include, inter alia, randomised trials, dose-escalation studies, cross-over trials, PK/PD studies, designs for survival studies and multi-centre trials. The implications of the specific design for the analysis of the data will be discussed. the course may not be offered every year.

DP requirements: 40% for the assignment component
Assessment: Assignments 50%. Written exam 50%. Sub-minimum of 40% in each of assignment and examination component.

STA5064Z ECOLOGICAL STATISTICS
15 NQF credits at NQF level 9
Convener: Associate Professor R Altwegg
Course outline:
This module covers the latest statistical methods particular to ecological statistics. Topics include capture-mark-recapture models (closed and open populations, multi-state models), occupancy models, distance sampling, spatially explicit capture-recapture models, and state-space models in ecology, models for animal movement. The course may not be offered every year.
DP requirements: 40% for the assignment component
Assessment: Assignments 50%. Examination 50%. A subminimum of 40% in both the assignment and examination component is required.

STA5065Z FINANCIAL ECONOMETRICS
15 NQF credits at NQF level 9
Convener: To be advised
Course entry requirements: Acceptance into Master's programs in Advanced Analytics or Data Science and/ or statistical background deemed sufficient by the Head of Department.
Course outline:
This course examines from an advanced econometric and quantitative perspective the following key areas : Market efficiency in macro-economic markets including the JSE, bond market and short-term interest rate markets; Characteristics of the JSE and its sectors; appropriate return transformations, the notion of company specific, sector specific and market wide effects; Special focus on the R$ exchange rate; its effect on local markets (JSE and bond); causes of changes and modelling the impact on inflation; Technical modelling of bond market (Nelson-Siegel parameterisation) and the share market (Black Scholes; derivatives). The course may not be offered every year.
DP requirements: 40% for the assignment component
Assessment: Assignment - 30%. Examination, 3 hours 70%. A subminimum of 40% in each of the assignment and examination components.

STA5066Z MATHEMATICAL MODELLING FOR INFECTIOUS DISEASES
15 NQF credits at NQF level 9
Convener: Associate Professor S Silal
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/or statistical background deemed sufficient by the Head of Department.
Course outline:
This course introduces students to mathematical modelling of infectious diseases. Topics include differential equation modelling, agent based modelling, computer simulation, statistical data fitting, public health modelling, introduction to economic modelling. The course may not be offered every year.
DP requirements: 40% for the assignment component
Assessment: Assignments 40%. Written examination 60%. Sub-minimum of 40% for each of assignment and examination component.

STA5067Z LONGITUDINAL DATA ANALYSIS
15 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/or statistical background deemed sufficient by the Head of Department.
Course outline:

This course looks at advanced methods for the analysis of longitudinal data, including linear mixed effect models, generalized estimating equations, generalized linear mixed effect models, nonlinear mixed effect models, smoothing spline models, imputation methods for missing data and causal models. Both the underlying theory and the application of these models using appropriate statistical software are covered. The course may not be offered every year.
DP requirements: 40% for the assignment component
Assessment: Assignments 50%. Written exam 50%. Sub-minimum of 40% in each of assignment and examination component.

STA5068Z MACHINE LEARNING
15 NQF credits at NQF level 9
Convener: Dr E Pienaar
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/ or statistical and computing background deemed sufficient by the Head of Department.
Course outline:
This course serves as an overview of the increasingly important field of Machine Learning. Topics covered include the fundamentals of the Machine Learning Paradigm, the Vapnik-Chervonenkis Inequality, the Bias-Variance Tradeoff, Regularization, Cross-Validation, Linear and Nonlinear Dimension Reduction, Support Vector Machines, Neural Networks, Convolutional Neural Networks, and other contemporary topics in Machine Learning. The course may not be offered every year.
DP requirements: 40% for assignment and project component
Assessment: Assignments, making up the course mark, and two exams, one written and one computer-based exam. A subminimum of 40% is required for each component.

STA5069Z MULTIVARIATE STATISTICS
15 NQF credits at NQF level 9
Convener: Dr S Er
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/ or statistical background deemed sufficient by the Head of Department.
Course outline:
In this module, multivariate statistical analysis methods with associated graphical representations will be discussed. Topics to be covered include Principal Component Analysis and PCA biplots, Simple and Multiple Correspondence Analysis, Multidimensional Scaling, Cluster Analysis, Discriminant Analysis, Canonical Variate Analysis, Analysis of Distance and Biadditive Models. The course may not be offered every year.
DP requirements: 40% for assignment component
Assessment: Assignments 40%. Written examination 60%. Sub-minimum of 40% in each of assignment and examination component.

STA5070Z PROBLEM STRUCTURING AND SYSTEM DYNAMICS
15 NQF credits at NQF level 9
Convener: Dr R G Rakotonirainy
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/or statistical background deemed sufficient by the Head of Department.
Course outline:
Problem Structuring: We explore a number of tools and methods which support the initial phases of a process of enquiry or analysis. Our interest is in understanding both the epistemological basis of different approaches as well as evaluating the extent to which they add rigour and promote insight. We will be critiquing the efficacy of different approaches through a variety of case studies. System Dynamics: We discuss features that result in complexity of systems, with case studies. These are

then represented first qualitatively and then quantitatively in simulation studies using appropriate software (Vensim is proposed). The course may not be offered every year.
DP requirements: 40% for project work components.
Assessment: Problem Structuring section: project work (50%); written exam (50%). System Dynamics section: project work (40%); written exam (60%). The two sections count equally to the final grade. In each section a subminimum of 40% is required in both the project and written exam.

STA5071Z SIMULATION AND OPTIMISATION
15 NQF credits at NQF level 9
Convener: Associate Professor S Silal
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/ or statistical background as deemed sufficient by the Head of Department.
Course outline:
This module is split into three sections: Simulation (Random Number Generation, Monte Carlo Methods, Statistical Analysis of Simulated Data, Variance Reduction, Bootstrap Methods, Markov Chain Monte Carlo), Fundamentals of Linear and Nonlinear Optimization (Unconstrained and Constrained Optimization, Kuhn-Tucker Duality, Convexity, Quadratic Programming, Dynamic Programming, Stochastic Programming) and Stochastic Methods in Optimization ("No Free Lunch" Theorems, Metaheuristics, Random Search, Simulated Annealing, Evolutionary and Genetic Algorithms, Partition Algorithms). The course may not be offered every year.
DP requirements: 40% for assignment component
Assessment: Module is split into three sections. For each section, we have: Assignments: 50% Exam: 50%. A subminimum of 40% in each of the assignment and exam component is required.

STA5072Z SURVIVAL ANALYSIS
15 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/ or statistical background deemed sufficient by the Head of Department.
Course outline:
This module will look at advanced methods for the analysis of survival data. We will first review the Cox proportional hazards model. The advanced methods to be covered will include handling time-varying effects in the Cox proportional hazards model, parametric survival models, accelerated failure time model, frailty models and recurrent events models, competing risks models, extension of the Cox proportional hazards model for time-dependent variables and joint models for longitudinal and time-to-event outcomes.. Both the underlying theory and the application of these models using appropriate statistical software are covered. The course may not be offered every year.
DP requirements: 40% for the assignment component
Assessment: Assignments 50%. Written exam 50%. Sub-minimum of 40% in each of assignment and examination component.

STA5073Z DATA SCIENCE FOR INDUSTRY
15 NQF credits at NQF level 9
Convener: Associate Professor I Durbach
Course entry requirements: Acceptance into the Master's course in Data Science or quantitative background deemed sufficient by Head of Department.
Course outline:
The goal of the module is to provide an applied, hands-on overview of selected topics useful in the working world of data science that are not covered by other modules in the program. Topics fall into two themes: workflow/productivity tools and skills; and modelling. Under the workflow theme we

cover data wrangling (reading/writing data, webscraping, accessing APIs), version control with Git, and visualization and communication of data and results (ggplot2, R shiny). Under the modelling theme we cover recommender systems, text mining and basic natural language processing, and feedforward and convolutional neural networks.
DP requirements: At least 40% for the assignments section
Assessment: Assignments: 50%. Examination: 50%. A sub-minimum of 40% for each of the assignment and examination component will be required.

STA5074Z DECISION MODELLING FOR PRESCRIPTIVE ANALYTICS
12 NQF credits at NQF level 9
Convener: Dr R G Rakotonirainy
Course entry requirements: Acceptance into the Master's course in Data Science or quantitative background deemed sufficient by Head of Department.
Course outline:
This course aims to develop an understanding of the role of formal (soft and hard; deterministic and stochastic) modelling in decision support and analyses, to develop understanding of the key technologies behind decision modelling for prescriptive analytics, and to introduce new tools and techniques for analysing data in new ways in order to improve decision making.
DP requirements: None
Assessment: Assignments and Exam

STA5075Z STATISTICAL AND HIGH PERFORMANCE COMPUTING
12 NQF credits at NQF level 9
Convener: S Salau
Course entry requirements: Acceptance into the Master's course in Data Science or quantitative background deemed sufficient by Head of Department.
Course outline:
This course aims to provide students with a foundation in statistical computing for data science. The course is divided into three sections, namely Basic Programming, High Performance Computing and Simulation & Optimisation. In the first section, students will learn how to write computer programs to analyse data with the R Language and Environment for Statistical Computing. Students will then be taught how to run jobs in parallel on a remote computer cluster using a Linux command prompt. Finally, the course will introduce students to the fundamental principles and uses of simulation and optimisation.
DP requirements: None
Assessment: Assignments and Exam.

STA5076Z SUPERVISED LEARNING
18 NQF credits at NQF level 9
Convener: Dr S Er
Course entry requirements: Acceptance into the Master's program in Data Science or Advanced Analytics and/or statistical background deemed sufficient by Head of Department.
Course outline:
Supervised learning is a set of statistical modelling tools for predicting or estimating the relationships between predictor and target variables in complex data sets. This course covers essential concepts like the bias-variance trade-off; regularisation; variable selection procedures; and model evaluation and comparison. The modelling techniques include linear and non-linear regression; logistic regression; classification and regression trees; and ensemble techniques like random forests and gradient boosting. The course also introduces Support Vector Machines, Neural Networks, and Deep Learning principles, emphasising practical application in R to equip students with the skills needed to make informed decisions in predictive analytics.
DP requirements: None
Assessment: Six quizzes (25%) and a take-home exam on each of three sections (75%)

STA5077Z UNSUPERVISED LEARNING
12 NQF credits at NQF level 9
Convener: M Ngwenya
Course entry requirements: Acceptance into the Master's course in Data Science or quantitative background deemed sufficient by Head of Department.
Course outline:
As part of the Master's in Data Science degree this course aims to familiarise students with the statistical methodology needed to analyse relationships between variables in big data without having causal relationships with predictor and response variables. Topics covered include association rules and market basket analysis, self-organising maps, multidimensional scaling, cluster analysis, principal component analysis.
Assessment: Assignments and Exam.

STA5078Z STOCHASTIC PROCESSES
This course may not be offered every year.
15 NQF credits at NQF level 9
Convener: M Mavuso
Course entry requirements: STA4029Z, Honours course in Advanced Probability Theory or at the discretion of the Head of Department.
Course outline:
The course aims to cover advanced concepts in stochastic processes and stochastic calculus, together with some financial applications. Topics included in the course are as follows: Semimartingales, stochastic integration, Ito's formula, Feyman-Kac theorem, martingale representation, discrete trading, continuous trading.
DP requirements: Class record of at least 40%
Assessment: Assignments, Class Test and Exam.

STA5079W DATA SCIENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: Dr S Er
Course entry requirements: Successful completion of the coursework component of the Masters course in Data Science.
Course outline:
The research component of the degree is based on a 90 credit dissertation. The topic of the research will be based on an analysis of large data sets from Physics, Astronomy, Medicine, Finance or other areas of application using the methodology learnt in coursework component. Alternatively, the dissertation component may focus on methodological developments in Statistical Sciences or Computer Sciences required for the analysis of a large amount of data.

STA5086Z ADVANCED PORTFOLIO THEORY
Fifth year status, second semester, two double lectures per week (24 lectures).
15 NQF credits at NQF level 9
Convener: Associate Professor T Gebbie
Course entry requirements: Acceptance into Master's programs in Advanced Analytics or Data Science, and/or statistical background deemed sufficient by the Head of Department.
Course outline:
The course Advanced Portfolio Theory is intended to expose students to the more advanced topics in portfolio theory, portfolio management and risk management. Statistical techniques such as optimisation, simulation, spectral decomposition of the covariance matrix and robust optimisation are some of the techniques that will be utilised in the models. Notwithstanding the emphasis in this course is on the practical application of the models and theories. There will thus be an emphasis on on the qualification of these measures and parameterisation of models in a South African (and African) setting. Furthermore there will be a focus on the interpretation and linkages between the

concepts. Topics covered include: Interest rates;Equity evaluation; Portfolio risk components; risk in thinly-traded environments- the SA and African case; Advanced risk measures; systematic risk; eigenvectors; tail risk measures. Active management and the Generalised Fundamental Law. Absolute and Active Portfolio optimisation; the Black-Litterman Model; the Qualitative Model, Non-parametric Models, Robust Portfolio optimisation models including Bayesian shrinkage. Rebalancing of portfolios. Advanced performance measures. Asset pricing models. The course may not be offered every year.
Assessment: Final examination counts 60% and the assignments count the remaining 40%

STA5089F BASICS OF MATHEMATICAL STATISTICS
Preliminary block course, before start of first semester (24 lectures). This course may not be offered every year.
0 NQF credits at NQF level 9
Convener: Associate Professor F Gumedze
Course entry requirements: Acceptance into MPhil Mathematical Finance or another Master's program in Statistical Sciences.
Course outline:
This course will serve as an introduction to mathematical statistics for postgraduate students with a good mathematical background who have not studied statistics before. The course will include probability theory, distribution theory and statistical inference, including Estimation, Maximum Likelihood, Large Sample Theory; The Method of Moments, Efficiency; Hypothesis Testing; Tests for Distribution and Tests for Normality; Confidence Intervals.
DP requirements: None
Assessment: One examination counting 100% of the final mark

STA5090Z ADVANCED TOPICS IN REGRESSION
15 NQF credits at NQF level 9
Convener: Dr A Clark
Course entry requirements: Acceptance into Master's programs in Advanced Analytics, Data Science or Biostatistics, and/or statistical background deemed sufficient by the Head of Department.
Course outline:
Linear regression and generalised regression and generalised methods such as shrinkage, splines, kernel smoothing methods and wavelets. Model selection and model assessment. Principal component regression, partial least squares regression, mixture models and generalised additive models. The course may not be offered every year.
Assessment: Assignments and/or Exam

STA5091Z DATA-ANALYSIS FOR HIGH-FREQUENCY TRADING
This course may not be offered every year.
15 NQF credits at NQF level 9
Convener: Associate Professor T Gebbie
Course entry requirements: Acceptance into Master's programs in Advanced Analytics or Data Science, and/or statistical background deemed sufficient by the Head of Department.
Course outline:
The course aims to equip students with data-science skills required to manage and explore high-frequency financial market data. This includes managing large financial data-sets, carrying out statistical analysis of large data-sets and knowledge relating to the link between statistical analysis of fast large data-sets, the modeling thereof and how this can be used to understand and control real-time trading and risk systems in modern financial markets. The course aims to consolidate prior knowledge relating to the statistical properties of daily sampled financial data and to then extend this to the analysis, exploration and data-science of large data-sets relating to both limit-order data and real-time transaction data. Students will acquire skills in Understanding and Preparing Financial

Market Data; Data Science of Market Microstructure; Market Structure and Market Microstructure; Statistical Learning for Financial Market Data.

STA5092Z EXPLORATORY DATA ANALYSIS

12 NQF credits at NQF level 9

Convener: Dr S Er

Course entry requirements: Acceptance into Master's program in Data Science or Advanced Analytics and/or statistical background deemed sufficient by Head of Department.

Course outline:

As part of the MSc specialising in Data Science, this course aims to introduce the essential techniques for performing exploratory data analysis (EDA). These techniques are typically applied before formal modelling commences and allow the researcher to discover patterns, spot anomalies, test hypotheses and check assumptions with the help of summary statistics and graphical representations. Different types of data will be described and the appropriate EDA techniques for each data type will be introduced. We will distinguish between univariate and multivariate, as well as graphical and non-graphical techniques, and will teach the R syntax required for each. Presentation of an EDA with interactive elements in a dashboard environment will also be covered and assessed.

Assessment: A take-home exam on each of the three sections

STA5093W DATA SCIENCE MINOR DISSERTATION

60 NQF credits at NQF level 9

Convener: Dr S Er

Course entry requirements: Successful completion of the coursework component of the Masters course in Data Science.

Course outline:

The research component of the degree is based on a 60 credit dissertation. The topic of the research will be based on an analysis of large data sets from Physics, Astronomy, Medicine, Finance or other areas of application using the methodology learnt in coursework component.

STA6001W STATISTICAL SCIENCES THESIS

360 NQF credits at NQF 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.

STA6002W STATISTICAL ECOLOGY THESIS

360 NQF credits at NQF 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.

COURSES OFFERED BY DEPARTMENTS IN OTHER FACULTIES TOWARDS SCIENCE DEGREES

Departments in the Faculty of Commerce

COLLEGE OF ACCOUNTING

Head of College and Professor:
I Lubbe, BCom(Hons) *Johannesburg* HDTE MPhil (Higher Education Studies) *Cape Town* CA(SA)

ACC1021F ACCOUNTING FOR BUSINESS I
15 NQF credits at NQF level 5
Convener: Magon Gajewski
Course entry requirements: Admission to degree. NSC level 5 in Mathematics and level 4 in Engligh HL (or level 5 in English FAL).
Co-requisites: None.
Objective: This course aims to introduce non-accounting students to the basic principles of accounting that would benefit them in management and other roles they may fill in business in the future. The course includes a basic introduction to financial accounting and published financial statements, and management accounting. The course forms the first part of a two course pairing for non-accounting Commerce students.
Course outline:
This is an introductory course in accounting aimed at all Commerce students who are not required to complete the specialised accounting courses. The course aims to provide Commerce graduates with the necessary acumen to engage in a managerial context with the accounting function within their organisations. Commerce students are also required to complete ACC1022Z. The course is also open to students in other faculties seeking an introduction to the accounting discipline.
Lecture times: 4 lectures a week, for 12 weeks. Tutorials: 2 periods a week, for 11 weeks.
DP requirements: 75% course participation and a minimum of 38% for the April test.
Assessment: One class test in April. One final exam as part of the June exam block.

FINANCE AND TAX

Head of Department:
L Pitt, HDE *Cape Town* BCom (Hons) (Eco) *Unisa* BCom (Hons) (ES) *UJ* BB&A (Hons) MBA S*tellenbosch* MCom *Cape Town* DBL *Unisa*

FTX1005F/S MANAGERIAL FINANCE

18 NQF credits at NQF level 5
Convener: FTX1005F TBC / FTX1005S N Jwara
Course entry requirements: Matriculation mathematics, Mathematics Literacy or registration for the Post graduate diploma in Management in Entrepreneurship, Marketing Sport Management Tourism and Business Communication.
Objective: This course is designed to provide a general introduction to the study of the financial function in business, particularly in a South African environment. The course has two primary objectives: Firstly to expose students with little or no commercial or financial background to the fundamentals of the financial aspects of business and the environment in which businesses operate. The second objective is to afford the students with the opportunity of gaining as much practical experience as possible in key areas of Finance, Management Accounting and Accounting.
Course outline:
This course is designed to introduce students with little or no commercial or financial background to the fundamentals of managerial finance. Having completed the course students should have a basic understanding of accounting concepts, be able to read financial statements and perform basic (ratio) analysis of key performance areas of the business, understand the concept of time value of money, employ basic steps toward efficient working capital management and have a basic understanding of capital budgeting and valuations. The course covers the following key topics: Introduction to basic accounting concepts, understanding annual financial statements, source of finance, basic financial ratio analysis, investments, risk & return, working capital management, cost volume profit analysis, budgeting, time value of money, basic valuations, cost of capital, discounted cash flow, and capital budgeting.
Lecture times: Monday, Wednesday, Thursday & Friday: 12h00 -12h45
DP requirements: Writing all class tests. Attendance and submission of 80% of tutorials.
Satisfactory completion of the project and assignments. 40% average year mark.
Assessment: Class tests, 1-15%; 2-15%; objective tests (10% - Best 5 out of 10); 1 group project (10%); final examination (50%). ****NB. Disclaimer, Please note that this course will be run in 2024, unless less than 20 students sign up for it.***

INFORMATION SYSTEMS

Head of Department and Professor:
M Tanner BEng(Hons) *Mauritius* MCom PhD *Cape Town*

INF2006F BUSINESS INTELLIGENCE AND ANALYTICS
6 NQF credits at NQF level 6
Convener: A. Budree
Course entry requirements: INF1002 OR equivalent.
Course outline:
The course introduces students to the main features of business intelligence and business analytics, including data warehousing and data marts, decision support systems, OLAP, data mining and analytics, corporate performance management, data visualisation, real-time BI, pervasive BI, mobile BI and big data analytics. Case studies and management approaches for implementation are covered and a hands-on project requires students to produce a management report after analysing data using commercial BI software.
Lecture times: Course runs only for 3 weeks: Monday to Wednesday, 5th period, Friday 4th and 5th period
DP requirements: 80% Class attendance.
Assessment: Note: Assessment requirements for both INF2006F and INF2007F need to be met in order to pass INF2008F.

INF2009F SYSTEMS ANALYSIS
18 NQF credits at NQF level 6
Convener: A Pekane
Course entry requirements: INF1003F or equivalent or INF1003F as co-requisite.
Course outline:
INF2009F is a half course designed for students intending to major in Information Systems or Computer Science for the BCom, BBusSci or Bsc degrees. Students pursuing other computing degrees may be accepted, space permitting.
This course explores the role of the Systems Analyst in business, different approaches used in the development of information systems, and the various tools and techniques used in the specification of system requirements. It is intended to provide students with an in-depth knowledge of the systems development process, with a particular emphasis on the analysis stage of the life cycle. There is a strong practical component to the course, where students will be taught to understand and use the common tools of object-oriented systems analysis, with a particular focus on UML models.
Lecture times: Monday to Wednesday, 4th period, Practical workshops: Thursday 3rd & 4th periods OR 4th & 5th OR 8th & 9th
DP requirements: Submitted at least 80% of the coursework (80% of individual deliverables and 80% of group work). Subminimum of 45% course year-mark.
Assessment: The final grade is derived from results of the Coursework (Formative Assessment: 40% + Summative Assessment 20%) and the Final Examination (40%). Sub-minimum of 40% for the final examination.

INF2011S SYSTEMS DESIGN & DEVELOPMENT
18 NQF credits at NQF level 7
Convener: D Snyman
Course entry requirements: Minimum 45% final mark for [INF2007 or INF2008 or CSC2001 or equivalent] and INF2009 and [INF1003 or CSC1016 or equivalent]
Course outline:
This course is intended to provide students with an in-depth knowledge of the systems development process with particular emphasis on the design and implementation stages of the life cycle. There is a strong practical component to the course, where students will use object - oriented tools to design

and construct a working system. This course is designed to build on the skills acquired in INF2009F Systems Analysis.
Lecture times: Monday, Tuesday and Wednesday, 4th period, Thursday: Weekly workshop sessions 3rd to 4th OR 4th to 5th periods. Friday: Practical workshops 5th – 7th
DP requirements: Submit 80% of workshops and quizzes. Year-mark of 45%. Submitted all project work.
Assessment: The final grade is derived from the following deliverables: Coursework: 60%; Exam 40%. Subminimum 45% for the final exam.

INF3011F I.T. PROJECT MANAGEMENT
Students cannot be credited for this course and for INF3003W.
18 NQF credits at NQF level 7
Convener: G Mwalemba
Course entry requirements: INF1003F, INF2009F and at least 45% for INF2011S
Course outline:
This is a first-semester capstone course for students majoring in Information Systems (IS) and either Computer Science, Finance or Informatics who wish not only to gain an understanding of project management issues but also experience the execution of such projects. The course thus combines the theoretical elements of project management (and people management) with the practical implementation of these concepts through the completion of a team project. The course integrates practical and theoretical elements obtained and developed in other undergraduate IS courses
Lecture times: 10h00-10h45 Monday - Thursday and 10h00-11h45 Friday
DP requirements: Submission of required project work and a sub-minimum of 45% for the year mark prior to writing the final examination. In addition, students must have satisfactory attendance at tutorials and lectures.
Assessment: Coursework counts 70%. Final examination counts 30%. Sub-minimum of 40% for the final examination.

INF3012S BPM & ENTERPRISE SYSTEMS
18 NQF credits at NQF level 7
Convener: L Seymour
Course entry requirements: INF1003F, INF2009F and INF2011S
Course outline:
This course examines the role, relationship and effect IT Applications have on businesses and vice versa. It has a heavy emphasis on ERP systems, business processes and Business Process Management (BPM). Students will be exposed to methodologies and techniques to identify, model, measure and improve processes. Students will be introduced to technologies that can be used as part of process improvement initiatives as well as technologies such as ERP that impact on business processes. A group project will allow students to apply their analytical skills to improving an existing process. Students will be introduced to S/4 HANA and will acquire a basic working knowledge of the Application.
Lecture times: 11h00-11h45 Tuesday- Friday and 10h00-10h45 Thursday and Friday
DP requirements: Submission of group project and a sub-minimum of 45% for the year mark prior to writing the final examination. In addition, students must complete, make a reasonable attempt at, and submit 80% of workshops.
Assessment: Classwork 70% (workshops, class exercises, test and a group project), final examination 30%. Sub-minimum of 40% for the final examination.

INF3014F ELECTRONIC COMMERCE
18 NQF credits at NQF level 7
Convener: G Mwalemba
Course entry requirements: INF1003F, INF2009F and at least 45% for INF2011S
Course outline:

INF3014F is a course for students majoring in Information Systems (IS) as well as any other student that wish to gain an understanding of electronic commerce (e-Commerce) technologies and their usage in society. The course covers both theoretical e-Commerce issues as well as the practical skills required to develop a basic e-Commerce system. The course plays a role in facilitating students' ability to constructively develop integrated knowledge on e-Commerce, including an understanding of and the ability to apply and critically evaluate the key concepts, techniques and practices that form part of e-Commerce systems design, development, implementation and usage. The practical component includes planning, structuring, and developing e-Commerce related web applications as well as designing the user experience (UX). The practical component will culminate in a project that involves developing an e-Commerce application that addresses a real business or social need.
Lecture times: 12h00-13h45 Tuesday and Wednesday and either 13h00-14h45 or 14h00-15h45 Friday
DP requirements: Submission of tutorials, seminar, and project work as well as a subminimum of 45% for the year mark prior to writing the final examination.
Assessment: Coursework 70%. Exam 30%. Subminimum of 40% for the final examination.

Departments in the Faculty of Engineering and the Built Environment

ELECTRICAL ENGINEERING

Professor and Head of Department
MA Khan, MSc(Eng) PhD *Cape Town* SMIEEE

EEE2041F INTRODUCTION TO ELECTRICAL ENGINEERING & POWER UTILISATION

For students in the Mechanical Engineering and Mechanical & Mechatronic Engineering programmes and Computer Science.
16 NQF credits at NQF level 6
Convener: Dr S Jayalath
Course entry requirements: PHY1013F/S (MEC), MAM1021S (MEC), PHY1004W or PHY1032S (CSC), MAM1004F (>60%) and MAM1008S (>60%) or MAM1000W (CSC)
Course outline:
This course aims to develop an understanding of (a) DC circuits and networks including series and parallel circuits, Kirchhoff's laws, Mesh Analysis, Superposition Theorem, Star-to-delta and Delta-to-star Transformation, Thevenin's theorem, Maximum Power Transfer theorem, DC transients in R-L and R-C circuits; (b) Fundamentals of AC including generation, concepts of waveform, period, frequency, angular velocity, phase etc., average, peak and RMS values; (c) Single-phase AC circuit including AC through resistance (R), inductance (L) and capacitance (C), concept of reactance and impedance, phasors, single-phase AC series and parallel circuits, concept of active power, reactive power, apparent power and power factor; (d) Three-phase AC systems; (e) Magnetic circuits including definition of magnetic circuits, simple and composite magnetic circuits and magnetic circuit calculations; (f) Single-phase transformers including core construction, principle of operation, e.m.f. equation and transformation ratio, no-load and on-load operation, phasor diagram under no-load and full-load operation, exact and approximate equivalent circuits, voltage regulation, losses and efficiency and open and short circuit tests; (g) DC motors including principle of operation, e.m.f. equation, types of motors, speed and torque characteristics and speed control.

DP requirements: Please refer to the official course handout document for detailed information regarding the DP requirements for this course.
Assessment: Please refer to the official course handout document regarding the assessment criteria for this course.

EEE2042S INTRODUCTION TO ANALOGUE AND DIGITAL ELECTRONICS

For students in the Mechanical Engineering and Mechanical & Mechatronic programmes and Computer Science.
8 NQF credits at NQF level 6
Convener: Associate Professor F Nicolls
Course entry requirements: MAM1021F/S (MEC), PHY1013F/S (MEC), PHY1004W or PHY1032S (CSC), MAM1004F (>60%) and MAM1008S (>60%) or MAM1000W (CSC), DP for EEE2041F.
Course outline:
The course aims to help students understand the following concepts: (a) Introduction to Semiconductor Physics and Diode basics. (b) Diode circuit model, applications and LEDs (c) Introduction to BJTs and basic models (d) BJT amplifier circuit (only focus on common-emitter) (e) Introduction to Op Amps, op-amp ideal and practical models (f) Opamp inverting and non-inverting applications (g) Introduction to FETs, FET analogue applications (h) Simple H-bridge circuits (i)

Difference between analogue and digital applications, intro into digital electronics (j) Digital electronic continued (Boolean algebra, logic gates) (k) FET digital applications, introduction to Flip Flops (l) Basics of state machines and electronic instruments.
DP requirements: Please refer to the official course handout document for detailed information regarding the DP requirements for this course.
Assessment: Please refer to the official course handout document regarding the assessment criteria for this course.

EEE2050F EMBEDDED SYSTEMS I FOR SCIENCE STUDENTS
18 NQF credits at NQF level 6
Convener: Dr MY Abdul Gaffar
Course entry requirements: CSC1015F/S and EEE2042S
Course outline:
This course aims to give Science students majoring in Computer Engineering a strong foundation in embedded systems by introducing them to digital system fundamentals, including: information representation, Boolean algebra, logic gate behaviour, combinational and sequential digital circuits, digital building blocks and algorithmic state machines; C programming with a focus on microcontroller applications; basic microcontroller usage, including an introduction to computer architecture, general purpose input/outputs, analogue to digital convertors and basic timers.
DP requirements: Please refer to the official course handout document for detailed information regarding the DP requirements for this course.
Assessment: Please refer to the official course handout document regarding the assessment criteria for this course.

EEE3095S EMBEDDED SYSTEMS II FOR SCIENCE STUDENTS
18 NQF credits at NQF level 7
Convener: Associate Professor S Winberg
Course entry requirements: EEE2050F
Course outline:
This course focuses on embedded systems architectures, firmware and software tool stacks. This course builds on the Embedded Systems I course. Consideration for Internet of Things (IoT) is included in the form of design scenarios and project-based learning. The course is split into two parts. Part 1 (10 credits) covers: theory and practices of design and analysis through modeling and simulation of embedded systems; embedded operating systems, and methods for modelling and simulation of computer systems are studied. An introduction to Linux command line and source code version control are also taught. Part 2 (6 credits) introduces Hardware Description Language (HDL) programming and computer architecture fundamentals; and tools for developing gateware and simulating HDL designs. Part 1 practicals concern using a single board computer, deploying and using an embedded operating system, building applications using a cross-compiler tool stacks, and hardware software interfaces – the practical work culminates in Miniproject A, which requires the use of taught tools to design, analyse and implement an IoT application. Part2 practicals involve implementing a combination logic design and developing a small HDL testbench to analyse its behavior. Those completing the course for 18 credits (Computer Science students) are required to complete a more demanding Miniproject B which adds software features to the Miniproject A baseline and requires additional performance and throughput testing.
DP requirements: Please refer to the official course handout document for detailed information regarding the DP requirements for this course.
Assessment: Please refer to the official course handout document regarding the assessment criteria for this course.

Departments in the Faculty of Health Sciences

HUMAN BIOLOGY

Associate Professor and Head:
D Shamley, BSc (Medicine) BScHons(Physiotherapy) PhD *Wits* EMBA *Cape Town*

HUB2019F INTEGRATED ANATOMICAL AND PHYSIOLOGICAL SCIENCES PART A

Entrance is limited to 80 students.
24 NQF credits at NQF level 6; 60 lectures, 10 practicals.
Convener: Dr J Harbron and Assoc Professor D Lang
Course entry requirements: BIO1000F, BIO1004S and CEM1000W (or equivalent courses).
Co-requisites: An average grade of 60% or more for these two courses is recommended.
Course outline:
This course is under review and the content may change as a result.
The course introduces the concept of integrating human physiology, anatomy, cell biology and histology. It includes the study of cells and tissues, the basic anatomy and histology of the musculoskeletal, endocrine and digestive systems, and an introduction to embryology and osteology. Physiological concepts include fluid balance, cell signaling, hormone regulation, digestion, absorption and metabolism. The course consists of lectures, practical sessions and tutorials. In the practicals, students work in small groups using computers and specialised equipment to study the physiology and histology of the abovementioned organ systems. At the end of the course, students will be able to describe structure-function relationships of body systems coved in the course; apply concepts and principles taught in lectures and practical sessions to solve theoretical or real-life problems posed in tutorials, tests and examinations; follow and implement instructions in computer-simulated physiology experiments and interpret result; identify micro-anatomical organisation of organs under a microscope or in monographs; identify and name structures in anatomical specimens; and design simple experiments to determine physiologic parameters such as blood type, fluid compartment volumes, enzyme activities etc.
Lecture times: Lectures: Monday to Friday (08h00-08h45); Practicals: Mondays or Tuesdays (14h00-17h00).
DP requirements: Attendance at all practical sessions, 40% average in class tests and an average of 50% for all assignments.
Assessment: The breakdown of course marks is as follows: Class tests 30%, practical write-up 15%, assignments or tutorials 5%. Final examinations (50%) as follows: Theory examination 30%, practical examination 20%. A subminimum of 40% is required for the theory and practical examination to pass this course. Supplementary examinations, in the form of written, practical or oral assessment, may be offered to students whose overall score is 45-49%. An oral examination may be required in the case of selected students.

HUB2021S INTEGRATED ANATOMICAL AND PHYSIOLOGICAL SCIENCES PART B

Entrance is limited to 80 students
24 NQF credits at NQF level 6; 60 lectures; 10 practicals.
Convener: Assoc Professor A Gwanyanya
Course entry requirements: HUB2019F (or approved equivalent) and CEM1000W (or approved equivalent).
Course outline:
This course is under review and the content may change as a result
The course integrates aspects of human physiology, anatomy and histology of organ systems, including cardiovascular, respiratory, nervous, reproductive, urinary and immune systems. The

concept of integrating homeostasis and regulation forms the golden thread throughout this course. Homeostatic concepts covered include thermoregulation, acid-base balance, neural transduction, cardiac output and regulation, and respiration. Students are introduced to anthropology and to concepts of ageing and disease. In the practicals, students work in small groups using computers and specialised equipment to study the physiology of the nervous system, the electrical events in the contraction of cardiac muscle and the mechanics of the respiratory system. Students also examine human anatomical specimens of various organs and examine the histology of the organ systems. At the end of the course, students will have a thorough grounding in the physiological mechanisms of the nervous, urinary, cardiovascular, respiratory, reproductive, and immune systems. They will have an understanding of the basic anatomy and microanatomical organisation (histology) of key organs within the above bodily systems; will be able to integrate the concepts above in terms of understanding structure-function relationships, so as to understand the basic key elements that impact on the physiology of organs during ageing which leads to disease processes; and will be able to interpret data obtained from the various practicals.

Lecture times: Lectures: Monday to Friday (08h00-08h45); Practicals 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: The final mark comprises class tests (30%); practicals, assignments and tutorials (20%); and final examinations (50%), consisting of a written theory exam (30%) and a practical (20%). A subminimum of 40% is required for the theory and practical examination to pass this course. Supplementary examinations, in the form of written, practical or oral assessment, may be offered to students whose overall score is between 45% and 49%. An oral examination may be required in the case of selected students.

HUB3006F APPLIED HUMAN BIOLOGY

36 NQF credits at NQF level 7

Convener: Associate Professor AN Bosch and Dr D Rae

Course entry requirements: HUB2019F; and HUB2021S or equivalent. Entry into this course requires a subminimum of 40% average for the Physiology component of HUB2017H and PTY2000S.

Objective: Understanding the physiology pertaining to exercise and performance with a view to furthering study at the Honours level.

Course outline:

This course is under review and the content may change as a result.

The semester theme is "Living, working and playing". Topics dealt with include metabolism and homeostasis, sports nutrition and metabolism, obesity and diabetes, muscle physiology, cardio-respiratory physiology, sporting performance, exercise physiology, thermoregulation, and physiology in extreme environments. At the end of the course students should have a good understanding of the physiology related to movement, sport and exercise. They should understand physiological control, the basics of the physiological components underlying athletic performance, and energy balance and key components of sports nutrition. In addition, they should have a good understanding of the cardiovascular system, muscle function, and the effect of exercise on health, particularly diabetes and obesity. Students will prepare a seminar topic which will be presented as a PowerPoint presentation towards the end of the semester, during the "practical" time slot.

DP requirements: Attendance at all practicals, (including tutorials and seminar presentations held during the "practical" time slot), 40% average in class tests and an average of 50% for all assignments.

Assessment: Class tests (30%); practicals including assignments/seminar presentation (20%) and examinations (written theory and practical theory) (50%). A subminimum of 40% is required for the theory and practical examinations to pass this course. A subminimum of 40% is required for the theory and practical examination to pass this course. Supplementary examinations in the form of written, practical or oral assessment, may be offered to students whose overal score is 45 - 49%. An oral examination may be required in the case of selected students.

HUB3007S HUMAN NEUROSCIENCES

36 NQF credits at NQF level 7

Convener: Dr R Dangarembizi

Course entry requirements: HUB3006F (or approved equivalent). Exceptions are at the discretion of the convener.

Objective: To obtain a good grasp of core theoretical and practical concepts of human neurophysiological function.

Course outline:

This course is under review and the content may change as a result.

This 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, vision and pain perception, eating disorders, mechanisms of learning and the development of memory. At the end of the course, students should be able to apply knowledge gained and practical skills acquired to solve problems in neurophysiology; read and critically evaluate neuroscience literature; apply knowledge of human physiology in medical fields in the general market place; use acquired skills in assisting with undergraduate practical demonstrations; and teach the basics of human physiology.

Lecture times: Five 45-minute lectures per week, 1st period, Monday to Friday.

DP requirements: Attendance at all practicals, 40% average mark for class tests and an average of 50% for all assignments.

Assessment: Class tests (30%); practicals including assignments/seminar presentation (20%) and examinations (written theory and practical theory) (50%). A subminimum of 40% is required for the theory and practical examinations to pass this course. A subminimum of 40% is required for the theory and practical examination to pass this course. Supplementary examinations in the form of written, practical or oral assessment, may be offered to students whose overall score is 45 - 49%. An oral examination may be required in the case of selected students.

INTEGRATIVE BIOMEDICAL SCIENCES

Associate Professor and Head of Department:
DT Hendricks, BScHons (Medicine) PhD *Cape Town*

IBS5004Z BIOINFORMATICS FOR HIGH-THROUGHPUT BIOLOGY
15 NQF credits at NQF level 9
Convener: TBC
Course outline:
This course is aimed to introduce students to bioinformatics techniques related to processing, analysis and interpretation of high-throughput biological data. It will cover the analysis of next generation sequence data of different types (metagenomic, RNA-Seq and full genome); statistical analysis of NGS in relation to metadata associated with it; phylogenetic analysis of sequence data; and medical population genetics from NGS or array data. The students who complete the course will be skilled both in handling big biological data sets, and in their downstream interpretation.

IBS5005W DATA SCIENCE MINOR DISSERTATION
90 NQF credits at NQF level 9
Convener: TBC
Course outline:
The research component of the degree is based on a 90 credit dissertation. The topic of the research will be based on an analysis of large data sets from Computational Biology.

PATHOLOGY

Professor and Head (UCT/NHLS joint staff):
K Pillay, MBChB, FCPath (SA), FRCPath(UK), MMed Anat Path (UCT). Paediatric Pathology

PTY2001S INFECTIOUS DISEASE AND VACCINES (FACULTY OF SCIENCE)

Entrance is limited to 30 students.
24 NQF credits at NQF level 6
Convener: Associate Professor W Burgers and Doctor S Hadebe
Course entry requirements: BIO1000F, BIO1004S, CEM1000W, MAM1004F and STA1007S or MAM1000W (or equivalent)
Course outline:
The course aims to introduce students to the burden of infectious disease in South Africa and Africa, foundational epidemiological concepts (including epidemics and outbreaks) and public health, the micro-organisms (including bacteria, viruses, fungi and parasites) of importance to human health and disease, and their classification, as well as the prevention, control and treatment of infectious disease, with a focus on vaccines, integrated with an introduction to the human immune system.
Lecture times: Lectures: Monday to Friday, 2nd period; Practical's: Fridays (14h00-17h00)
DP requirements: Attendance at all practical and tutorial sessions, 40% average in class tests and an average of 50% for all assignments.
Assessment: The breakdown of course marks is as follows: the class record counts 60% (consisting of practicals, quizzes and assignments; and one 3-hour final examination written in November (40%). The class record consists of weekly quizzes (20%), practical write-ups (20%) and assignments (20%). Supplementary examinations, in the form of written assessment, may be offered to students whose overall score is 45-49%.

PTY3010F PATHOGENESIS AND TREATMENT OF INFECTIOUS DISEASES (FACULTY OF SCIENCE)

36 NQF credits at NQF level 7
Convener: Doctor MR Abrahams (Division of Medical Virology) and Doctor C Moodley (Division of Medical Microbiology)
Course entry requirements: PTY2001S (or equivalent). This course is offered only in the 1st semester, therefore students who fail the course will need to repeat the following year.
Course outline:
The course aims to provide the conceptual basis for understanding pathogenic bacteria, fungi, viruses and parasites, and particularly address the fundamental mechanisms of how they cause disease in humans. A successful pathogen is able to invade the host and escape it's immune defences. Building on PTY2001S, the parts of the immune system that are important in resisting infection will be covered. Examples of the wide range of ways in which pathogens evade immune responses will be discussed. Another important way in which we combat pathogens is through antimicrobial therapy for bacterial, viral, fungal and parasitic infections. Knowledge of the life cycles of pathogens enables us to identify targets for developing treatments. Antimicrobial resistance is an emerging threat. Students will learn about the mechanisms of antimicrobial resistance and novel approaches to combat this, as well as the role of antimicrobial stewardship. Students will be able to describe fundamental process that drive how pathogens cause disease and immune evasion, and how understanding pathogen life-cycles enables us to target treatment and control infections. Through blended learning, practical sessions, field visits and interaction with experts in public health and infectious diseases, this course aims to introduce students to a variety of different career avenues.
DP requirements: 40% average in class tests or quizzes, and an average of 50% for assignments. Attendance at all practicals, field trips and tutorials. Submission of at least 80% of assignments.
Assessment: The breakdown of course marks is as follows: the class record counts 60%; and one 3-hour final examination written in June counts 40%. The class record consists of class tests and/or

quizzes (20%), practical reports and tutorials (20%) and assignments (20%). Supplementary examinations, in the form of written assessment, may be offered to students whose overall score is 45-49%.

INTER-FACULTY UNITS

AFRICAN CENTRE FOR CITIES (ACC)

Professor and Director:
E Pieterse, BA Hons *UWC* MA Development Studies *ISS* PhD *LSE*
Associate Professor and Deputy Director:
A Tucker, BA Hons MPhil PhD *Cantab*
Research and Academic Staff:
M Brown-Luthango, BSocSc Hons MSocSc *Cape Town* DPhil *Stell*
J O Chukumwa, BSc MSc *Lagos*
L R Cirolia, BA *Berkeley* MCRP PhD *Cape Town*
G Haysom, MPhil *Stell* PhD *Cape Town*
L Nkula-Wenz, Dipl (MA equivalent) DPhil *Münster*
N Odendaal, NDip (TRP) *ML Sultan* BA *UNISA* MTRP *UND* PhD *Witwatersrand* RTPI
A Selmeczi, MA PhD *Central European*
R Sitas, BA *Cape Town* BA Hons *UKZN* MA *DUT* PhD *Cape Town*
C Skinner, BSocSci *Cape Town* MSc *Natal*
W Smit, BSc MCRP PhD *Cape Town*
Z Sogoni, BSocSci MTRP *UKZN*
L Tshuwa, BSc Hons (URP) MSc (URP) *Witwatersrand*
A Weimann, BSocSci Hons MSocSci *Cape Town*
Head of Operations:
I Najaar, BCom *UWC*
Senior Finance Officer:
M Joubert
Administrative Staff:
F Bennet
A Gierdien
U Ismail
S Jeppie
M Meyer
Communications Officers:
T Moiloa, BSP (Hons) MURP *UFS*
K Phetlhu, Dip PR *UJ*

The African Centre for Cities (ACC) was established in 2007 as a UCT signature research theme cutting across three Faculties (Engineering & the Built Environment, Science and Humanities). The mission of ACC is to facilitate critical urban research and policy discourse for the promotion of vibrant, democratic and sustainable urban development in the global South. ACC researchers undertake research and policy work on a wide range of urban issues in Cape Town, South Africa, Africa and the global South, and collaborate with a number of other institutions across the globe (for example, African Mayoral Leadership Initiative). Over the past decade, ACC has established an impressive international profile and reputation as a dynamic home for analysis of urban issues and policies. ACC also runs two interdisciplinary urban studies teaching programmes (MPhil in Southern Urbanism and MPhil in Sustainable Urban Practice) to help build a new generation of urbanists who are able to deal with the challenges faced by cities in the global South.

AFRICAN CLIMATE AND DEVELOPMENT INITIATIVE (ACDI)

Professor, Director:
G Ziervogel, PhD *Oxon*
Lecturer and Course Convener:
M Norton, PhD *Cape Town*
Honorary Research Associates/Affiliates:
J Cullis, PhD *Colorado at Boulder*
K Lawal, PhD *Cape Town*
R Odoulami, PhD *Akure*
N Simpson, PhD *Cape Town*
E Tyler, PhD *Cape Town*
Honorary Professor:
S Shackleton, PhD *Rhodes*
Associated Researchers:
R Altwegg, PhD *Zurich*
M Cole, PhD *Oxon*
J Enqvist, PhD *Stockholm*
B Hewitson, PhD *Penn State*
A Marquard PhD *Cape Town*
J Thorn, PhD *Oxon*
M Visser, PhD *Gothenburg*
P Wolski, PhD *ITC*
Chief Research Officer:
C Trisos, PhD *Oxon*
Senior Research Fellows:
J de Groot, PhD *Plymouth*
P Holden, PhD *Cape Town*
B Rennkamp, PhD *Twente*
D Sparks, PhD *Cape Town*
Research Fellows:
N Methner, PhD *Cape Town*
A Taylor, PhD *Cape Town*
Postdoctoral Fellows:
A Meyer, PhD *Federal do Paraná*
C Matiza, PhD *UKZN*
C Mungenge, PhD *Rhodes*
D Sibanda, PhD *UWC*
E Odoom, PhD *Ghana*
F Atkins, PhD *Cape Town*
J Bhanye, PhD *Zimbabwe*
L Zvobgo, PhD *Cape Town*
O Ogunniyi, PhD *UKZN*
T Gintamo, PhD *UWC*
V Moyo, PhD *Stell*
Administrative Staff:
K Fosseus, BNur *Cape Town*
R Karriem
Y Arosi, BTech *CPUT*
T Manyekwane, Dip *TUT*
F Malinga, MSc *Stell*
M Blumberg

ACDI is an inter- and transdisciplinary research and training institute that brings together academics across UCT, NGOs, business, civil society and government to co-produce and test new insights, evidence and innovations that will help to solve Africa's climate and development challenges. ACDI's transdisciplinary focus provides a multi-layered perspective on climate change and development that merges interdisciplinary expertise from specialists working in collaboration with society to solve complex problems within these fields.

ACDI convenes a one-year coursework Master's in Climate Change & Sustainable 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 Master's includes core modules focusing on Climate and Development, Mitigation and Adaptation, and optional courses across a spectrum of disciplines, including Business Sustainability, Biodiversity, Climate Prediction and Environmental Law.

For more information on ACDI and its activities, see http://acdi.uct.ac.za/

The Department of Environmental & Geographical Sciences section in this Handbook may be referred to for detailed course outlines.

ELECTRON MICROSCOPE UNIT

Professor and Director:
R D Knutsen, BSc PhD *Cape Town*
Research Officers:
N Hanief, BSc Hons MSc(Eng) *Cape Town*
J D Woodward, BSc Hons *Cape Town* MSc *UWC* PhD *Cape Town*
Principal Technical Officers:
M A Jaffer, BSc Hons *Cape Town*
M A Woodward, BSc(Eng) *Cape Town*
Chief Scientific Officer:
S von Willingh, BSc Hons MSc(Eng) *Cape Town*
Technical Officer:
S Karriem

The Electron Microscope Unit is housed in the New Engineering Building, Madiba Circle 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 Thermo Fisher Scientific Nova NanoSEM with accessories including X-ray analyser and electron backscattered diffraction pattern analysis, and a TESCAN Mira Raman integrated SEM that supports EBSD and Electron Beam Lithography. The Unit has three Transmission Electron Microscopes namely the 200 kV Tecnai TF20 FEGTEM equipped with a direct electron detector, the Tecnai G²20 energy-filter (EF)TEM equipped with a LaB6 filament and a CCD camera. Both instruments are equipped for Cryo-EM. The third TEM is a Tecnai Osiris, an analytical TEM instrument optimised for high speed and high sensitivity EDX measurements in STEM mode with four windowless Super-X SDD EDX detectors integrated into the pole piece. The Unit also houses a FEI QEMSCAN, and a nanolitre pipetting robot for crystallization trials. Light microscopy facilities include a WiTec Raman confocal microscope. There are preparative facilities for molecular and cellular biology and for hard materials as well as computers and software for data analysis.

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 www.emu.uct.ac.za.

MARINE AND ANTARCTIC RESEARCH CENTRE FOR INNOVATION AND SUSTAINABILITY (MARIS)

This inter-faculty Centre is hosted in the Department of Biological Sciences.

Director:
M Vichi, MSc *Bologna* PhD *Oldenburg*
Deputy Directors:
A Jarre, MSc *Kiel* PhD *Bremen (AWI)*
R A Verrinder, MSc(Eng) *Cape Town* MIEEE
Scientific Steering Committee:
S Fawcett, MA PhD *Princeton*
T Rampai, MSc *Cape Town* PhD *Witwatersrand*
E Rocke (Chair), MSc *Vienna* PhD *Hong Kong*
Early Career Researchers' Representatives:
M Mangatane, BSc Hons *Cape Town*
S Moos, BScEng *Cape Town*
Communications:
L Nefdt, MSc *Cape Town*
Administrators:
S Lamfiti, Dipl Financial Management *False Bay College*
N Tom, Advanced Dipl Management *UWC*

UCT academic participants (in alphabetical order)
Department of Biological Sciences: Louise Gammage, Astrid Jarre, Natasha Karenyi, Marieke Norton, Lynne Shannon
Department of Chemical Engineering: Tokoloho Rampai
Department of Civil Engineering: Keith MacHutchon
Department of Electrical Engineering: Amit Mishra, Robyn Verrinder
Department of Oceanography: Katye Altieri, Sarah Fawcett, Marcello Vichi

The Centre is an aggregator of competence and expertise which considers academic and technological knowledge in relation to societal benefits, with the overarching aim of enhancing the production of knowledge and human capacity in marine and Antarctic research. This is achieved through collaborative national and international research projects generated by the academic participants and various partners; support of students and their integration into the academic environment, particularly supporting interdisciplinarity to address complex problems in interconnected marine systems; the development of technological and innovative solutions for interdisciplinary marine problems; the promotion and maintenance of post-graduate training courses including interdisciplinary curricula. The Centre is structured around inter-related science foci: Antarctic and Southern Ocean Research, Marine Research on the southern African margin, and Innovation in Chemical, Materials and Observational Engineering.

MARIS convenes a one-year coursework Master's in Applied Ocean Sciences, which is joint between the Department of Biological Sciences and the Department of Oceanography. This course provides interdisciplinary training in treating the most applied aspects of oceanography and marine biology, with the aim to become future ocean professionals. It is designed for both recent graduates as well as those with some years' experience and who wish to gain skills to operate in the ocean services sector, with a focus on operational and conservational activities, food, water quality and recreation, preservation and other aspects of the Blue Economy. The Department of Biological Sciences' section in this Handbook can also be referred to for detailed course outlines.

Partnerships
Internal and external partnerships are under development**.**

For more information on MARIS and the AOS Master's course, please see the website www.ma-re.uct.ac.za; email info.maris@uct.ac.za

SCHEDULE OF COURSES

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	THE HUMAN PLANET: PREHISTORY TO PRESENT	5 M to Th	By arrangement; F 5th	None
AGE2011S	HUMAN EVOLUTION	3 M to Th	One per week, by arrangement	See departmental entry
AGE2012F	THE FIRST PEOPLE	3 M to Th	One per week, by arrangement	See departmental entry
AGE3006H	DIRECTED READING & RESEARCH	By arrangement	None	See departmental entry
AGE3011F	THE ROOTS OF RECENT AFRICAN IDENTITY	4 M to Th	One per week, by arrangement	See departmental entry
AGE3012S	GLOBAL DIASPORAS & THE ARCHAEOLOGY OF THE HISTORICAL PAST	4 M to Th	One 2-hour prac per week, by arrangement	See departmental entry
AGE3013H	ARCHAEOLOGY IN PRACTICE	See departmental entry	None	See departmental entry
AST1000S	INTRODUCTION TO ASTRONOMY	5 M to F	W 14h00-17h00	None
AST2002H	ASTROPHYSICS	2 M to F (Term 2 & 4)	W 14h00-17h00	See departmental entry
AST2003H	ASTRONOMICAL TECHNIQUES	2 M to F (Term 1 & 3)	W 14h00-17h00	See departmental entry
AST3002F	STELLAR ASTROPHYSICS	2 M to F	W 14h00-17h00	See departmental entry
AST3003S	GALACTIC & EXTRAGALACTIC ASTROPHYSICS	2 M to F	W 14h00-17h00	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	2 M to F	One prac a week, F 14h00-	See departmental entry

			17h00	
BIO1004S	BIOLOGICAL DIVERSITY	5 M to F	One prac a week, M,Tu,W, or Th 14h00-17h00	See departmental entry
BIO2014F	PRINCIPLES OF ECOLOGY & EVOLUTION	2 M to F	M 14h00-17h00	BIO1000F/H, BIO1004S, DP for STA1007S
BIO2015S	VERTEBRATE DIVERSITY & FUNCTIONAL BIOLOGY	2 M to F	Th 14h00-17h00	BIO1000F/H, BIO1004S
BIO2016S	INVERTEBRATE DIVERSITY & FUNCTIONAL BIOLOGY	3 M to F	W 14h00-17h00	BIO1000F/H, BIO1004S
BIO2017F	PLANT DIVERSITY & FUNCTIONAL BIOLOGY	3 M to F	W 14h00-17h00	BIO1000F/H, BIO1004S

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, approved 2000-level semester Science course.
BIO3014S	CONSERVATION: GENES, POPULATIONS & BIODIVERSITY	2 M to F	M 14h00-17h00	See departmental entry
BIO3017S	MARINE RESOURCES	3 M to F	Th 14h00-17h00	See departmental entry
BIO3018F	ECOLOGY AND EVOLUTION	5 M to F	Tu 14h00-17h00	BIO2014F
BIO3019S	QUANTITATIVE BIOLOGY	5 M to F	Tu 14h00-17h00	BIO2014F, approved 2000-level Science STA or MAM course
CEM1000W	CHEMISTRY 1000	2 or 4 M to W, F	Prac: Tu or Th or F, 14h00-17h00/Tut: 2 or 4 Thu	See departmental entry
CEM1009H	CHEMISTRY 1009	4 W to F	Prac: W 14h00-17h00/ Tut: 4 Th	See departmental entry
CEM1010H	CHEMISTRY 1010	4 M to W, F	Prac: Wed 14h00-17h00/ Tut: 4 Th	CEM1009H
CEM2005W	INTERMEDIATE CHEMISTRY	3 M to F	Prac: Th 14h00-17h00 EBE Tu 14h00-17h00/ Tut: 6 by arrangement	See departmental entry
CEM3005W	CHEMISTRY 3005	3 M to F	Two pracs per week W and F,	See departmental entry

			14h00-17h00	
CSC1010H	COMPUTER SCIENCE 1010	5 M to F	Th 14h00-17h30	See departmental entry
CSC1011H	COMPUTER SCIENCE 1011	4 M to Th	M 14h00-16h00	CSC1010H, MAM1005H
CSC1015F/S	COMPUTER SCIENCE 1015	4 or 5 M to F	M, Tu, W or Th 14h00-16h00 or 16h00-18h00	See departmental entry
CSC1016S	COMPUTER SCIENCE 1016	4 or 5 M to F	M, Tu or W, 14h00-16h00 or 16h00-18h00	CSC1015F
CSC2001F	COMPUTER SCIENCE 2001	2 M to F	One prac per week, M,Tu,W,Th or F 14h00-18h00	CSC1015F, CSC1016S or CSC1010H, CSC1011H
CSC2002S	COMPUTER SCIENCE 2002	2 M to F	One prac per week, M,Tu,W,Th or F 14h00-18h00	CSC2001F
CSC2041F	INTRODUCTION TO AI 1: KNOWLEDGE REPRESENTATION	3 M to F	One prac per week, M,Tu,W,Th or F 14h00-18h00	CSC1015F/S, CSC1016S, MAM1031F, MAM1032S, (MAM1019H or STA1000X or MAM1008S)
CSC2042S	INTRODUCTION TO AI 2: MACHINE LEARNING	3 M to F	One prac per week, M,Tu,W,Th or F 14h00-18h00	CSC1015F/S, CSC1016S, MAM1031F or MAM1004F
CSC3002F	COMPUTER SCIENCE 3002	2 M to F	Two pracs per week, M,Tu,W,Th or F 14h00-18h00	CSC2001F, CSC2002S and ((MAM1004F+MAM1008S) or MAM1000W or equivalent). CSC2004Z is required if CSC2002S was passed after 2017.
CSC3003S	COMPUTER SCIENCE 3003	2 M to F	Two pracs per week, M,Tu,W,Th or F 14h00-18h00	See Departmental entry
CSC3022F	C++ AND MACHINE LEARNING	3 M to F	Two pracs per week, by arrangement	As for CSC3002F

EGS1007S	HUMAN & PHYSICAL SYSTEMS	2 M to F	M or Tu or Th, 14h00-17h00	See departmental entry
EGS2013F	THE PHYSICAL ENVIRONMENT	5 M to F	F 14h00-17h00	GEO1009F or EGS1004S
EGS2015S	SOCIETY & SPACE	5 M to F	M 14h00-17h00	See departmental entry
EGS3012S	ATMOSPHERIC SCIENCE	1 M to F	Tu or W, 14h00-17h00	See departmental entry
EGS3021F	SUSTAINABILITY & ENVIRONMENT	3 M to F	W 14h00-17h00	See departmental entry

EGS3022S	GEOGRAPHIC THOUGHT	4 M to F	W 14h00-17h00	EGS2014S
EGS3023F	ANTHROPOCENE ENVIRONMENTS IN PERSPECTIVE	5 M to F	Th 14h00-17h00	EGS2013F
GEO1006S	INTRO TO MINERALS, ROCKS & STRUCTURE	5 M to F	F 14h00-17h00	See departmental entry
GEO1009F	INTRO TO EARTH & ENVIRONMENTAL SCIENCES	2 M to F	One prac a week, 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, PHY1031F or equivalent
GEO2005X	FIELD GEOLOGY & GEOLOGICAL MAPPING	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	INTEGRATED ANAT & PHYSIO SCIENCES A	1 M to F	M or Tu, 14h00-17h00	CEM1000W (or equivalent), BIO1000W
HUB2021S	INTEGRATED ANAT & PHYSIO SCIENCES B	1 M to F	M or Tu, 14h00-17h00	HUB2019F or equivalent
HUB3006F	APPLIED HUMAN BIOLOGY	1 M to F	W or Th, 14h00-17h00	HUB2021S
HUB3007S	HUMAN NEUROSCIENCES	1 M to F	W or Th, 14h00-17h00	HUB3006F or equivalent
MAM1031F	MATHEMATICS 1031	1 or 3, M to F	By arrangement	See departmental entry
MAM1032S	MATHEMATICS 1032	1 or 3, M to F	By arrangement	See departmental entry
MAM1033F	MATHEMATICS 1033	1 or 3, M to F	By arrangement	See departmental entry
MAM1034S	MATHEMATICS 1034	1 or 3, M to F	By arrangement	See departmental entry
MAM1004F	MATHEMATICS 1004	1 M to F	M or W 14h00-16h00	See departmental entry
MAM1004S	MATHEMATICS 1004	Meridian M to F	By arrangement M or W	See departmental entry
MAM1005H	MATHEMATICS 1005	1 or 3 M to F	F 8h00-9h00, M 14h00-	See departmental entry

			16h00	
MAM1006H	MATHEMATICS 1006	1, three days per week	1, two days per week	See departmental entry
MAM1008S	INTRODUCTION TO DISCRETE MATHEMATICS	1 or 3 M and W	By arrangement	See departmental entry

MAM1019H	FUNDAMENTALS OF MATHEMATICS	Meridian	M, W 13h00-14h00	See departmental entry
MAM1043H	MODELLING & APPLIED COMPUTING	2 M to F	One hour per week	See departmental entry
MAM1044H	DYNAMICS	2 M to F	Every second F 14h00-16h00	See departmental entry
MAM2010F	ADVANCED CALCULUS (2AC)	5 Tu and F	Th or F 14h00-16h00	See departmental entry
MAM2011F	LINEAR ALGEBRA (2LA)	5 M, W and Thu		See departmental entry
MAM2012S	DIFFERENTIAL EQUATIONS (2DE)	4 Tu, W and F	Th or F 14h00-16h00	See departmental entry
MAM2013S	INTRODUCTORY ALGEBRA (2IA)	5 Tu, W and F	Th or F 14h00-16h00	See departmental entry
MAM2014S	REAL ANALYSIS (2RA)	4 M and Thu; or 5 M, W and Thu	Th or F 14h00-16h00	See departmental entry
MAM2040F	ORDINARY DIFFERENTIAL EQUATIONS (2OD)	3 M to F	Th 14h00-16h00	See departmental entry
MAM2041F	NUMERICAL ANALYSIS (2NA)	3 M to F	Th 14h00-16h00	See departmental entry
MAM2042S	NON-LINEAR DYNAMICS (2ND)	See departmental entry	Th 14h00-16h00	See departmental entry
MAM2043S	BOUNDARY-VALUE PROBLEMS (2BP)	3 M to F	Th 14h00-16h00	See departmental entry
MAM3010F	METRIC SPACES (3MS)	5 M to F	F 09h00-10h00 or 14h00-15h00	See departmental entry
MAM3011F	MODERN ABSTRACT ALGEBRA (3AL)	5 M to F	Th 14h00-16h00	See departmental entry
MAM3012F/S	DISCRETE MATHEMATICS (3DM)	4 M to F	See departmental entry	See departmental entry
MAM3013S	TOPICS IN ALGEBRA (3TA)	5 M to F	Th 14h00-16h00	See departmental entry
MAM3014S	TOPICS IN ANALYSIS (3TN)	5 M to F	Th 13h00-15h00	See departmental entry
MAM3015F/S	COMPLEX ANALYSIS (3CA)	4 M to F	Th 13h00-14h00 or	See departmental entry

			14h00-15h00	
MAM3042F/S	ADVANCED NUMERICAL METHODS (3AN)	3 M to F	Th 14h00-16h00	See departmental entry
MAM3043F/S	METHODS OF MATHEMATICAL PHYSICS (3MP)	3 M to F	Th 14h00-16h00	See departmental entry
MAM3044F/S	FUNCTIONS OF A COMPLEX VARIABLE (3CV)	3 M to F	See departmental entry	See departmental entry
MAM3045F/S	INTRODUCTION TO GENERAL RELATIVITY (3GR)	3 M to F	See departmental entry	See departmental entry
MAM3046F/S	FLUID DYNAMICS (3FD)	6 M-Tu; 5 Th	Th 12h00-14h00	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	Th or F 14h00-17h00	MCB2020F, MCB2021F
MCB3012Z	RESEARCH PROJECT IN MOLECULAR & CELL BIOLOGY	None	Two afternoons per week	See departmental entry
MCB3023S	MOLECULAR EVOLUTIONARY GENETICS & DEVELOPMENT	4 M to F	One per week by arrangement	See departmental entry
MCB3024S	DEFENCE & DISEASE	5 M to F	One per week by arrangement	See departmental entry
MCB3025F	STRUCTURAL & CHEMICAL BIOLOGY	5 M to F	M or Tu 14h00-17h00	See departmental entry
MCB3026F	MOLECULAR GENETICS & GENOMICS	4 M to F	Th or F 14h00-17h00	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
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

PHY2004W	INTERMEDIATE PHYSICS	4 M to F	Prac M 14h00-17h00 Tut Tu 14h00-16h00	See departmental entry
PHY3004W	ADVANCED PHYSICS	4 M to F	Prac M 14h00-17h00 Tut Tu 14h00-16h00	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
SEA3004F	OCEAN & ATMOSPHERE DYNAMICS	3 M to F	M 14h00-17h00	See departmental entry
STA1000F AND STA1000S	INTRODUCTORY STATISTICS	See departmental entry	By arrangement	See departmental entry
STA1006S	MATHEMATICAL STATISTICS I	4 M to F	One per week by arrangement	See departmental entry
STA1007S	INTRODUCTORY STATISTICS FOR SCIENTISTS	1 M to F	One per week by arrangement	See departmental entry
STA2004F	STATISTICAL THEORY & INFERENCE	1 M to F	One per week by arrangement	MAM1000W or equivalent and STA1006S
STA2005S	LINEAR MODELS	1 M to F	One per week by arrangement	DP for STA2004F
STA2007F/S/H	STUDY DESIGN & DATA ANALYSIS FOR SCIENTISTS	See departmental entry	One per week by arrangement	See departmental entry
STA2020F	APPLIED STATISTICS	1 or 5 M to Th	One per week by arrangement	See departmental entry
STA2020S	APPLIED STATISTICS	7 M to Th	F 08h00-09h00	See departmental entry
STA2030S	STATISTICAL THEORY	1 M to Th	By arrangement	See departmental entry
STA3022F	APPLIED MULTIVARIATE DATA ANALYSIS	4 M to Th	By arrangement	See departmental entry
STA3030F	STATISTICAL INFERENCE & MODELLING	1 M to Th	By arrangement	See departmental entry
STA3036S	OPERATIONAL RESEARCH TECHNIQUES	3 M to Th	By arrangement	See departmental entry
STA3041F	STOCHASTIC PROCESSES & TIME SERIES	1 M to F	Tutorials and practicals by arrangement	See departmental entry
STA3043S	STATISTICAL	1 M to F	Two per week	See departmental

	MODELLING, MACHINE LEARNING & BAYESIAN ANALYSIS		by arrangement	entry
STA3045F	ADVANCED STOCHASTIC PROCESSES & DISTRIBUTION THEORY	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
First period, first semester			
BIO3002F	MARINE ECOSYSTEMS	1	W 14h00-17h00
HUB2019F	INTERGRATED ANATOMY & PHYSIO SCIENCES A	1	M or Tu, 14h00-17h00
HUB3006F	APPLIED HUMAN BIOLOGY	1	W or Th, 14h00-17h00
MAM1031F	MATHEMATICS 1031	1/3	By arrangement
MAM1033F	MATHEMATICS 1033	1/3	By arrangement
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
STA3030F	STATISTICAL INFERENCE & MODELLING	1	By arrangement
STA3041F	STOCHASTIC PROCESSES & TIME SERIES	1	By arrangement
First period, second semester			
EGS3012S	ATMOSPHERIC SCIENCE	1	Tu or W, 14h00-17h00
HUB2021S	INTERGRATED ANATOMY & PHYSIO SCIENCES B	1	M or Tu, 14h00-17h00
HUB3007S	HUMAN NEUROSCIENCES	1	W or Th, 14h00-17h00
MAM1032S	MATHEMATICS 1032	1/3	By arrangement
MAM1034S	MATHEMATICS 1034	1/3	By arrangement
MAM1008S	INTRODUCTION TO DISCRETE MATHEMATICS	1/3	By arrangement
STA1000S	INRODUCTORY STATISTICS	1	One per week by arrangement
STA1007S	BIONUMERACY	1	One per week by arrangement
STA2005S	LINEAR MODELS	1	One per week by arrangement
STA2030S	STATISTICAL THEORY	1	By arrangement
STA3043S	STATISTICAL MODELLING, MACHINE LEARNING & BAYESIAN ANALYSIS	1	Two tutorials per week by arrangement
Second period, first semester			
AST2002H	ASTROPHYSICS	2	W 14h00-17h00
AST2003H	ASTRONOMICAL TECHNIQUES	2	W 14h00-17h00
AST3002F	STELLAR ASTROPHYSICS	2	W 14h00-17h00

BIO1000H	CELL BIOLOGY	2	F 14h00 – 17h00
BIO2014F	PRINCIPLES OF ECOLOGY & EVOLUTION	2	M 14h00-17h00
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	M to F 14h00-18h00
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	By arrangement
STA3045F	ADVANCED STOCHASTIC PROCESSES & DISTRIBUTION THEORY	2	By arrangement

Second period, second semester			
AST3003S	GALACTIC & EXTRAGALACTIC ASTROPHYSICS	2	W 14h00-17h00
BIO1000H	CELL BIOLOGY	2	F 14h00 – 17h00
BIO2015S	VERTEBRATE DIVERSITY & FUNCTIONAL BIOLOGY	2	Th 14h00- 17h00
BIO3014S	CONSERVATION: GENES, POPULATIONS & BIODIVERSITY	2	M 14h00-17h00
CSC2002S	COMPUTER SCIENCE 2002	2	M to F 14h00-18h00
CSC3003S	COMPUTER SCIENCE 3003	2	M to F 14h00-18h00
EGS1007S	HUMAN & PHYSICAL SYSTEMS	2	M, Tu or Th 14h00-17h00
GEO2004S	PHYSICAL GEOLOGY	2	W 14h00-17h00
GEO3001S	STRATIGRAPHY & ECONOMIC GEOLOGY	2	Tu and Th, 14h00-17h00

Third period, first semester			
AGE2012F	THE FIRST PEOPLE	3	One per week by arrangement
BIO2017F	PLANT DIVERSITY AND FUNCTIONAL BIOLOGY	3	W 14h00-17h00
CEM2005W	INTERMEDIATE CHEMISTRY	3	Th 14h00-17h00
CEM3005W	CHEMISTRY 3005	3	W and F, 14h00-17h00
CSC2041F	INTRODUCTION TO AI 1: KNOWLEDGE REPRESENTATION	3	One prac per week, M,Tu,W,Th or F 14h00-18h00
CSC3022F	C++ AND MACHINE LEARNING	3	Two per week by arrangement
EGS3021F	SUSTAINABILITY & ENVIRONMENT	3	W 14h00-17h00
MAM1031F	MATHEMATICS 1031	1/3	By arrangement
MAM1033F	MATHEMATICS 1033	1/3	By arrangement

MAM1005H	MATHEMATICS 1005	1/3	By arrangement
MAM2040F	ORDINARY DIFFERENTIAL EQUATIONS (2OD)	3	Th 14h00-16h00
MAM2041F	NUMERICAL ANALYSIS (2NA)	3	Th 14h00-16h00
MAM3042F	ADVANCED NUMERICAL METHODS (3AN)	3	Th 14h00-16h00
MAM3043F	METHODS OF MATHEMATICAL PHYSICS (3MP)	3	Th 14h00-16h00
MAM3044F	FUNCTIONS OF A COMPLEX VARIABLE (3CV)	3	See departmental entry
MAM3045F	INTRODUCTION TO GENERAL RELATIVITY (3GR)	3	See departmental entry
PHY1004W	MATTER & INTERACTIONS	3	Tu 14h00 to 17h00
PHY1023H	PRINCIPLES OF PHYSICS A	3	Tu 14h00-17h00
PHY1031F	GENERAL PHYSICS A	3	M, W or Th 14h00-17h00
SEA3004F	OCEAN & ATMOSPHERE DYNAMICS	3	M 14h00-17h00

Third period, second semester			
AGE2011S	HUMAN EVOLUTION	3	By arrangement
BIO2016S	INVERTEBRATE DIVERSITY & FUNCTIONAL BIOLOGY	3	W 14h00-17h00
BIO3017S	MARINE RESOURCES	3	Th 14h00-17h00
CSC2042S	INTRODUCTION TO AI 2: MACHINE LEARNING	3	One prac per week, M,Tu,W,Th or F 14h00-18h00
MAM1032S	MATHEMATICS 1032	1/3	By arrangement
MAM1034S	MATHEMATICS 1034	1/3	By arrangement
MAM1008S	INTRODUCTION TO DISCRETE MATHEMATICS	3	By arrangement
MAM2042S	NON-LINEAR DYNAMICS (2ND)	3	Th 14h00-16h00
MAM2043S	BOUNDARY-VALUE PROBLEMS (2BP)	3	Th 14h00-16h00
MAM3042S	ADVANCED NUMERICAL METHODS (3AN)	3	Th 14h00-16h00
MAM3043S	METHODS OF MATHEMATICAL PHYSICS (3MP)	3	Th 14h00-16h00
MAM3044S	FUNCTIONS OF A COMPLEX VARIABLE (3CV)	3	See departmental entry
MAM3045S	INTRODUCTION TO GENERAL RELATIVITY (3GR)	3	See departmental entry
PHY1032S	GENERAL PHYSICS B	3	M, W or Th 14h00-17h00
STA3036S	OPERATIONAL RESEARCH TECHNIQUES	3	M to F

Fourth period, first semester			
AGE3011F	THE ROOTS OF RECENT AFRICAN IDENTITIES	4	By arrangement
CEM1000W	CHEMISTRY 1000	2/4	Tu, Th or F, 14h00-17h00
CEM1009H	CHEMISTRY 1009	4	W 14h00-17h00
CEM1010H	CHEMISTRY 1010	4	W 14h00- 17h00

CSC1011H	COMPUTER SCIENCE 1011	4	M 14h00-16h00
CSC1015F	COMPUTER SCIENCE 1015	4/5 (1 per week)	M, Tu, W or Th 14h00-16h00 or 16h00-18h00
MAM3012F	DISCRETE MATHEMATICS (3DM)	4	See departmental entry
MAM3015F	COMPLEX ANALYSIS (3CA)	4	Th 13h00-14h00 or 14h00-15h00
MCB2020F	BIOLOGICAL INFORMATION TRANSFER	4	Th or F 14h00-17h00
MCB3026F	MOLECULAR GENETICS & GENOMICS	4	Th or F 14h00-17h00
PHY2004W	INTERMEDIATE PHYSICS	4	M 14h00-17h00 and Tu 14h00-16h00
PHY3004W	ADVANCED PHYSICS	4	M 14h00-17h00 and Tu 14h00-16h00
SEA2004F	PRINCIPLES OF OCEANOGRAPHY	4	Tu 14h00-17h00
STA3022F	APPLIED MULTIVARIATE DATA ANALYSIS	4	By arrangement

Fourth period, second semester			
AGE3012S	GLOBAL DIASPORAS & THE ARCHAEOLOGY OF THE HISTORICAL PAST	4	By arrangement
CEM1010H	CHEMISTRY 1010	4	W 14h00- 17h00
CSC1015S	COMPUTER SCIENCE 1015	4/5 (1 per week)	M, Tu, W or Th 14h00-16h00 or 16h00-18h00
CSC1016S	COMPUTER SCIENCE 1016	4/5	M, Tu or W 14h00-17h30
EGS3022S	GEOGRAPHIC THOUGHT	4	W 14h00-17h00
MAM2012S	DIFFERENTIAL EQUATIONS (2DE)	4	Th or F 14h00-16h00
MAM2014S	REAL ANALYSIS (2RA)	4	Th or F 14h00-16h00
MAM3012S	DISCRETE MATHEMATICS (3DM)	4	See departmental entry
MAM3015S	COMPLEX ANALYSIS (3CA)	4	Th 13h00-14h00 or 14h00-15h00
MCB2023S	FUNCTIONAL GENETICS	4	Th or F 14h00-17h00
MCB3023S	MOLECULAR EVOLUTIONARY GENETICS & DEVELOPMENT	4	By arrangement
PHY2004W	INTERMEDIATE PHYSICS	4	M 14h00-17h00 and Tu 14h00-16h00
PHY3004W	ADVANCED PHYSICS	4	M 14h00-17h00 and Tu 14h00-16h00
SEA2005S	MARINE SYSTEMS	4	Tu 14h00-17h00
STA1006S	MATHEMATICAL STATISTICS I	4	By arrangement

Fifth period, first semester			
BIO1000F	CELL BIOLOGY	5	M, Tu, W or Th 14h00-17h00
BIO3018F	ECOLOGY & EVOLUTION	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
EGS3023F	ANTHROPOCENE	5	Th 14h00-17h00

	ENVIRONMENTS IN PERSPECTIVE		
MAM2010F	ADVANCED CALCULUS (2AC)	5	Th or F, 14h00-16h00
MAM2011F	LINEAR ALGEBRA (2LA)	5	Th or F, 14h00-16h00
MAM3010F	METRIC SPACES (3MS)	5	F 09H00-10H00; 14h00-15h00
MAM3011F	MODERN ABSTRACT ALGEBRA (3AL)	5	Th 14h00-16h00
MAM3046F	FLUID DYNAMICS (3FD)	5 Th	Th 12h00-14h00
MCB2021F	MOLECULAR BIOSCIENCE	5	M or Tu 14h00-17h00
MCB3025F	STRUCTURAL & CHEMICAL BIOLOGY	5	M or Tu 14h00-17h00
STA2020F	BUSINESS STATISTICS	5	By arrangement

Fifth period, second semester			
AGE1002S	THE HUMAN PLANET: PREHISTORY TO PRESENT	5	F 12h00-13h00
AST1000S	INTRODUCTION TO ASTRONOMY	5	W 14h00-17h00
BIO1004S	BIOLOGICAL DIVERSITY	5	M, Tu, W, or Th 14h00-17h00
BIO3019S	QUANTITATIVE BIOLOGY	5	Tu 14h00-17h00
CSC1015S	COMPUTER SCIENCE 1015	4/5	M, Tu or W 14h00- 17h30
CSC1016S	COMPUTER SCIENCE 1016	4/5	M, Tu or W 14h00-17h30
EGS2015S	SOCIETY & SPACE	5	M 14h00-17h00
GEO1006S	INTRODUCTION TO MINERALS, ROCKS & STRUCTURE	5	F 14h00-17h00
MAM2013S	INTRODUCTORY ALGEBRA (2IA)	5	Th or F 14h00-16h00
MAM2014S	REAL ANALYSIS (2RA)	5	Th or F 14h00-16h00
MAM3013S	TOPICS IN ALGEBRA (3TA)	5	Th 14h00-16h00
MAM3014S	TOPICS IN ANALYSIS (3TN)	5	Th 13h00-15h00
MAM3046S	FLUID DYNAMICS (3FD)	5 Th	Th 12h00-14h00
MCB2022S	METABOLISM AND BIOENGINEERING	5	M or Tu 14h00-17h00
MCB3024S	DEFENCE & DISEASE	5	By arrangement

Various			
AGE3006H	DIRECTED READING & RESEARCH	By arrangement	None
MAM1019H	FUNDAMENTALS OF MATHEMATICS	Meridian	W 13h00-14h00
MAM1004S	MATHEMATICS 1004	Meridian	By arrangement
MAM3046F/S	FLUID DYNAMICS (3FD)	Meridian M-Tu	Th 12h00-14h00
STA1000F/S	INTRODUCTORY STATISTICS	See departmental entry	By arrangement
STA2007F/S/H	STUDY DESIGN & DATA ANALYSIS FOR SCIENTISTS	By arrangement	By arrangement

ADDITIONAL INFORMATION

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:

1983: G M Branch (Zoology)
1984: J H Webb (Mathematics)
1986: B R Davies (Zoology)
1990: H S T Driver (Physics)
1992: J J Conradie (Mathematics)
1992: J E Parkington (Archaeology)
1994: J R Moss (Chemistry)
1996: M J Hall (Archaeology)
1996: M D Picker (Zoology)
1997: N Morrison (Mathematics)
1998: A N Rynhoud (Mathematics)
1998: J A Thomson (Microbiology)
1998: I V Barashenkov (Mathematics)
1998: J U M Jarvis (Zoology)
1999: T Egan (Chemistry)
2000: D L Reid (Geological Sciences)
2001: V Abratt (Molecular & Cell Biology)
2002: J W Lutjeharms (Ocean & Atmosphere Science)
2002: S Oldfield (Environmental & Geographical Science)
2002: A Buffler (CHED/Physics)
2003: D W Gammon (Chemistry)
2004: B Davidowitz (CHED/Chemistry)
2004: S Mundree (Molecular & Cell Biology)
2006: R R Ackermann (Archaeology)
2008: J O'Riain (Zoology)
2009: G Marsden (Computer Science)
2011: G Smith (Chemistry)
2012: Z Woodman (Molecular & Cell Biology)
2014: J Gain (Computer Science)
2014: S Wheaton (Physics)
2015: A West (Biological Sciences)
2016: D Erwin (Mathematics & Applied Mathematics)
2016: J Shock (Mathematics & Applied Mathematics)
2016: M Lacerda (Statistical Sciences)
2017: G Leigh (Physics)
2018: J Murugan (Mathematics & Applied Mathematics)
2018: A Schauerte (Mathematics & Applied Mathematics)
2022: P Anderson (Environmental & Geographical Science)

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 Griffiths, Mrs M L Branch and Dr L E Beckley	*Two Oceans - A guide to the Marine life of Southern Africa 1995*
Professor B Warner	*Cataclysmic Variable Stars 1997*
Dr P Bruyns	*Stapeliads of Southern Africa & Madagascar 2008*

The University of Cape Town's Open Textbook Award

Associate Professor Maria Keet	*An Introduction to Ontology Engineering 2021*

Prizes

(Further information regarding the value of prizes may be obtained from the Faculty Office.)

Alistair Stephen Memorial Award
Awarded for the best Honours project in Chemistry.

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 second year student in Computer Science who proceeds to third year Computer Science; the best third year student in Computer Science who proceeds to Honours in Computer Science; the best Honours student; and 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 the best PhD thesis in the faculty.

Merck Prize
Best student in Molecular & Cell Biology Honours.

Physics Departmental Prize
Awarded to the SB016 student who achieved the best (passing) grade in PHY2004W.

Purcell Memorial Prize
Awarded for the best MSc or PhD dissertation dealing with a zoological subject.

Roberts Award
Awarded to the best student in third-year Chemistry who will be proceeding to Honours in the Department.

Sandy Perez Memorial Award
Awarded to a third year Physics student who achieved the greatest improvement in the final grade between second-year and third-year Physics at UCT, and who intends to register for Physics Honours at UCT.
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.

Ivor Lewin Memorial Scholarship Tenure 1 year
Awarded to the best student in second-year Physics, registered in the Faculty of Science, who will be proceeding to third-year Physics.

Myer Levinson (Emdin) Scholarship Tenure 2 years
Awarded to candidates who have obtained the BSc Hons degree in the first class and who propose 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 Awards

A class award 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 award 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 NQF credits:
For the regular BSc degree (SB001):
first year: 144 credits
second year: 132 credits, including at least 96 senior course credits
third year: 144 credits, of which at least 120 NQF credits must be at level 7
For the extended BSc degree (SB016):
first year: 72 credits
second year: 72 credits
third year: 132 credits, including at least 96 senior course credits
fourth year: 144 credits, of which at least 120 NQF credits must be at level 7
(b) have passed all courses in the year;
(c) not be repeating courses;
(d) have obtained a weighted average of 70% or above 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 https://mb.usaf.ac.za/
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:

- 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 exceptions

- 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
- 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
- Professional Communication courses do 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.

- TDP (Theatre, Dance & Performance) courses which count towards the major in Theatre & Dance (Humanities handbook) may be taken for credit. The list currently includes TDP1027F, TDP1045S, TDP2010F, TDP2011S, TDP3010F, TDP3018S.
- FIN (Fine Art) courses which are recognised as part of the BA and BSocSc degrees (Humanities handbook) may be taken for credit. The list currently includes FIN1006F, FIN1009S, FIN2029F, FIN2028S, FIN3026F, FIN3027S, FIN3028F and FIN3029S. Studiowork courses will not be recognised.

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

CSC1017F counts as a half course if result is 70% or more (CX CSC1015F)
GEO1008F counts as a Science half credit, but credit will not be given for both GEO1008F and GEO1006S

MAM1010F/S or MAM1110F/S counts as a half course credit (CR MAM1031F).
MAM1012F/S or MAM1112F/S counts as a half course credit (CR MAM1032S).
MAM1010F/S or MAM1110F/S counts as a half course credit if result is 70% or more (CX MAM1031F).
MAM1012F/S or MAM1112F/S counts as a half course credit if result is 70% or more (CX MAM1032S).
MAM1020F/S or MAM1023F/S counts as a half course credit (CR MAM1031F).
MAM1021F/S or MAM1024F/S counts as a half course credit (CR MAM1032S).
MAM1020F/S or MAM1023F/S counts as a half course credit if result is 60% or more (CX MAM1031F).
MAM1021F/S or MAM1024F/S counts as a half course credit if result is 60% or more (CX MAM1032S).
CR for MAM1031F and MAM1032S is NOT sufficient for entry to MAM2010F and MAM2011F.
CX for MAM1031F and MAM1032S is sufficient for entry to MAM2010F and MAM2011F.
MAM2083F/S counts as credit for only MAM2010F (CX MAM2010F).
MAM2084F/S counts as credit for both MAM2011F and MAM2012S (CX MAM2011F and MAM2012S).
For students who have passed MAM2083F and MAM2084S, entry to third-year MAM courses will be determined on an individual basis and may be subject to concurrent registration with second-year courses.
The same applies to MAM2085F/S which are the Aspect versions of MAM2083F/S.
PHY1012F/S (16 credits) counts as a half course if result is 70% or more; PHY1012F/S (18 credits) counts as a half course (CX PHY1031F)
PHY1013F/S (16 credits) counts as a half course if result is 70% or more; PHY1013F/S (18 credits) counts as a half course (CX PHY1032S)
PHY1012F/S plus PHY1013F/S (16 or 18 credits) 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 (16 credits) plus PHY1013F/S (16 credits) count as half course credit if both are passed with an average mark for the two courses of less than 75%
STA1100S count as a half course (CX STA1000F/S)
STA1106H count as a half course (CX STA1006S)
STA3047S plus STA3048S count as a half course (CX STA3043S)

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