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# Faculty of **Science**

Dean:
**Prof** L Warnich
BScHons, PhD (Stell)

CALENDAR 2016
PART 5

## Accuracy, liability and changes

- Stellenbosch University has taken reasonable care to ensure that the information provided in the Calendar parts is as accurate and complete as possible.
- Take note, however, that the University's Council and Senate accept no liability for any incorrect information in the Calendar parts.
- The University reserves the right to change the Calendar parts at any time when necessary.

## The division of the Calendar

- The Calendar is divided into 13 parts.
- Part 1, 2 and 3 of the Calendar contain general information applicable to all students. Make sure that you understand all provisions in Part 1 (General) of the Calendar that are applicable to you.
- Part 4 to 13 of the Calendar are the Faculty Calendar parts.

| Part | Calendar |
|---|---|
| Part 1 | General |
| Part 2 | Bursaries and Loans |
| Part 3 | Student Fees |
| Part 4 | Arts and Social Sciences |
| Part 5 | Science |
| Part 6 | Education |
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## Availability of the Calendar parts

- The printed versions of the Calendar parts are available at the University's Information Desk in the Admin A Building.
- The electronic versions of the Calendar parts are available at www.sun.ac.za/Calendar.
- There are English and Afrikaans (Part 1 to 12) copies available.

# Table of Contents

# How to use this Calendar Part

This section gives you guidelines for finding particular information in the different chapters in this Calendar part. Consult the table of contents for the page numbers of the chapters referred to below.

## 1. Where to find information

### 1.1 Prospective undergraduate students

- General Information chapter contains information about:
  - Communication with the Faculty and the University, which includes an explanation of the concept "student number" as well as relevant contact details where you can refer important enquiries to;
  - The University's Language Policy and Plan and how it is applied by the Faculty; and
  - The degree programmes that you can enrol for and the qualifications that you can obtain as well as important examination provisions that are applicable to programmes and modules.
- Undergraduate Programmes chapter contains information about:
  - The minimum admission requirements for the various study programmes;
  - The Faculty's undergraduate study programmes; and
  - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.
- Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules;
  - An explanation of the different digits used for the numbering of modules in the Undergraduate Programmes chapter;
  - Definitions of the language specifications of modules; and
  - Definitions of prerequisite pass, prerequisite and corequisite modules.
- Alphabetical list of undergraduate subjects and postgraduate programmes is available in the back of this Calendar part.

### 1.2 Prospective postgraduate students

- General Information chapter contains information about:
  - Communication with the Faculty and the University, which includes an explanation of the concept "student number" as well as relevant contact details where you can refer important enquiries to; and
  - The University's Language Policy and Plan and how it is applied by the Faculty.
- Postgraduate Programmes chapter contains information about:
  - The Faculty's postgraduate study programmes;
  - The minimum admission requirements for the various study programmes;

- Specific closing dates for applications, and other relevant information, for example selection for admission; and
- The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.

- Alphabetical list of undergraduate subjects and postgraduate programmes is available in the back of this Calendar part.

## 1.3 Registered undergraduate students

- General Information chapter contains information about:
  - Communication with the Faculty and the University with relevant contact details where you can refer important enquiries to;
  - The University's Language Policy and Plan and how it is applied by the Faculty; and
  - The granting of Dean's Concession Examinations to final-year students.
- Undergraduate Programmes chapter contains information about:
  - The Faculty's undergraduate study programmes; and
  - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.
- Subjects, Modules and Module Contents chapter contains:
  - An explanation of subjects as opposed to modules;
  - An explanation of the different digits used for the numbering of modules in the Undergraduate Programmes chapter;
  - The abbreviations and definitions used for the teaching loads of individual modules;
  - An indication at each module of what its teaching load is;
  - Definitions of the language specifications of modules, as well as an indication at each module of what its language specification is;
  - Definitions of prerequisite pass, prerequisite and corequisite modules, as well as an indication at each module which of the requisites apply to it, if any; and
  - How individual modules are assessed, especially where a module is subject to continuous or flexible assessment.
- Alphabetical list of undergraduate subjects and postgraduate programmes is available in the back of this Calendar part.

## 1.4 Registered postgraduate students

- Postgraduate Programmes chapter contains information about:
  - The Faculty's postgraduate study programmes;
  - The interruption of master's or doctoral studies; and
  - The subjects and modules that must be taken per academic year for the different study programmes, with choices where applicable.
- Alphabetical list of undergraduate subjects and postgraduate programmes is available in the back of this Calendar part.

# General Information

## 1. History and functions of the Faculty of Science

The Faculty of Science dates back to the first days of Stellenbosch University. Over the past decades it became a national and international role player in basic and applied research. Many of our teaching staff excel on an international level or have been awarded national accolades. They also play leading roles within their professional communities, either in a management capacity in professional societies or by being involved in editorial work for various leading journals.

### 1.1 History, structure and mission

#### History

The Faculty of Science is the second oldest faculty at Stellenbosch University. Courses in Mathematics and Physical Science were already part of the training offered at the former Stellenbossch Gymnasium in 1866.

With the independence of Stellenbosch University in 1918 the Faculty of Mathematics and Physical Science was established as a separate faculty where students have been able to enrol for a BSc degree. In 1957 the Faculty's name was changed to the Faculty of Science.

#### Structure

The Faculty consists of the following eight departments:

- Biochemistry;
- Botany and Zoology;
- Chemistry and Polymer Science;
- Earth Sciences;
- Mathematical Sciences (Mathematics, Applied Mathematics and Computer Science)
- Microbiology;
- Physics; and
- Physiological Sciences.

Since 2000 we compile the Faculty's study programmes in line with the Higher Education Criteria and Guidelines and we structure them in such a way that a student may obtain one or more of the following degrees:

- A BSc degree;
- An honours degree (BScHons);
- A master's degree (MSc); or
- A doctoral degree (PhD or DSc).

In addition to the study fields offered by the abovementioned eight departments, students can also obtain a BSc degree with majors such as Genetics, Operations Research, Psychology, Sport Science and Mathematical Statistics. These majors are offered by the Faculties of Education, AgriSciences, Arts and Social Sciences, and Economic and Management Sciences. In addition, the Faculty offers service modules in Science to students in the Faculties of AgriSciences, Economic and Management Sciences, Engineering, Medicine and Health Sciences, and Arts and Social Sciences.

### Mission

In line with Stellenbosch University's Vision 2030 and the National Development Plan, the Faculty of Science is committed to positioning the University as a research-focused academic institution of excellence and a respected knowledge partner. By means of quality research outputs the Faculty contributes towards building the scientific, technological and intellectual capacity of Africa, and is playing an active role in South Africa's development. The Faculty endeavours to make a substantial contribution to the National Development Plan's vision to increase the number of PhD graduates from the current 28 to 100 per million per year by 2030.

## 1.2 Teaching, research and community interaction

### Teaching

The Faculty's teaching focuses on giving all students the opportunity to develop their full potential by using the most suitable methods of teaching and by encouraging students to think like scientists. The ideal is to produce graduates who are competitive and much sought after in the work environment and who can also function as independent thinkers. To ensure the undergraduate success rate, we established initiatives such as differentiated tutor support (to cater for both outstanding students and those who need additional support), parallel-medium instruction and interpreting services. Other initiatives, such as the increased integration of Information and Communication Technology into teaching and learning, were facilitated by the Teaching and Learning Forum.

To ensure that our students can communicate effectively in a competitive national and international environment, the Faculty focuses increasingly on equipping students with the necessary scientific language and electronic communication skills. The Faculty awards various medals annually to outstanding students for their academic achievement. For a complete list of medals visit our webpage at http://www.sun.ac.za/english/faculty/science/Pages/For-Undergraduate-Students.aspx

### Research

In the Faculty of Science we believe that great teaching and quality research go hand in hand. Research is supported with modern equipment and highly trained and experienced staff. Advanced research equipment such as a DNA sequencing unit, an amino acid analysis unit and a high resolution mass spectrometry unit, managed by the University's Central Analytical Facility, are used successfully by the Faculty's researchers. The Faculty's research institutions are supported financially by the science industry and other organisations. This extensive financial support empowers the research institutions to play a leading role in basic and applied sciences on

an international level as well as to support the research of postgraduate South African and international students.

The Faculty's various centra, facilities and institutions support research on different levels. The Faculty strives for a healthy balance between basic and applied research in their various research fields, taking into consideration the needs of the regional community and South Africa at large. The Faculty advocates for a multidisciplinary approach on national and international levels and across subject, faculty and other boundaries. Research is strengthened by the eight research chairs in the Faculty. For a complete list of the research chairs visit our webpage at http://www.sun.ac.za/english/faculty/science/Documents/RESEARCH/Research Chairs.docx

### Community interaction

In addition to the Faculty's focus on teaching and research excellence, another priority is service to the community. The Faculty serves the community by promoting science education at school level. Staff and students share their scientific knowledge on both a formal and an informal basis through community interaction programmes, while the needs of and problems experienced by the wider community are addressed by means of research on specific topics.

## 2. How to communicate with the Faculty

### 2.1 Contact details of the Faculty of Science

Direct specific enquiries related to the Faculty to the following address:

Faculty of Science
Stellenbosch University
Private Bag X1
MATIELAND
7602

### 2.2 Physical address and contact details of the Dean's Office

#### Dean's physical address

2nd floor, AI Perold Building, Stellenbosch main campus

#### Contact persons and details

| Staff | Telephone number | Fax number | E-mail address |
|---|---|---|---|
| **Dean**<br>Prof L Warnich | 021 808 3071 | 021 808 3680 | lw@sun.ac.za |
| **Dean's Office**<br>Ms S Els | 021 808 3072 | 021 808 3680 | se@sun.ac.za |
| **Director: Faculty Management**<br>Ms M van den Worm | 021 808 3760 | 021 808 3680 | mvdworm@sun.ac.za |
| **Academic Coordinator**<br>Ms W Wagener | 021 808 3063 | 021 808 3680 | ww@sun.ac.za |

| | | | |
|---|---|---|---|
| **NARGA: Manager**<br>Ms I de Kock | 021 808 2682 | 021 808 3680 | idk@sun.ac.za |
| **Media and Marketing**<br>Ms WE Fourie-Basson<br>Ms JM Schoeman | 021 808 2684<br>021 808 2684 | 021 808 3680<br>021 808 3680 | science@sun.ac.za<br>science2@sun.ac.za |
| **Faculty Secretary**<br>(Enquiries about academic administration)<br>Mr BP Abels | 021 808 4832 | 021 808 3822 | bpa@sun.ac.za |
| **Faculty Officer**<br>(Enquiries about academic administration)<br>Ms CS Meyer | 021 808 2504 | 021 808 3822 | cfransman@sun.ac.za |

**For more information on the Faculty of Science, visit us at http://www.sun.ac.za/english/faculty/science/Pages/default.aspx**.

## 2.3 Contact details of Departments

| Department | Telephone number | E-mail address | Web page |
|---|---|---|---|
| **Biochemistry** | 021 808 5862 | biochair@sun.ac.za | www.sun.ac.za/biochem |
| **Botany and Zoology** | 021 808 3236 | botzoo@sun.ac.za | www.sun.ac.za/botzoo |
| **Chemistry and Polymer Science** | 021 808 2344 | ec@sun.ac.za | www.sun.ac.za/chemistry |
| **Earth Sciences** | 021 808 3219 | lcon@sun.ac.za | www.sun.ac.za/geo |
| **Mathematical Sciences**<br>Mathematics<br>Applied Mathematics<br>Computer Science | <br>021 808 3282<br>021 808 4215<br>021 808 4232 | <br>lrabie@sun.ac.za<br>mvann@sun.ac.za<br>duplessisha@sun.ac.za | http://math.sun.ac.za |
| **Microbiology** | 021 808 5847 | wendyw@sun.ac.za | http://academic.sun.ac.za/microbiology |
| **Physics** | 021 808 3391 | physoffice@sun.ac.za | www.sun.ac.za/physics |
| **Physiological Sciences** | 021 808 3146 | gas@sun.ac.za | http://academic.sun.ac.za/physiosciences |

## 2.4 Contact details of the Society for Science students

You are automatically a member of the Society for Science students if you are registered as a student for a programme in the Faculty of Science. This Society is managed by the Sciences Student Committee. For more information on the committee visit the following webpage or contact them electronically:

- http://www.sun.ac.za/english/faculty/science/for-students/sciences-student-committee
- nsk@sun.ac.za

# 3. How to communicate with the University

## 3.1 Using your student number

- The University allocates a student number to you when you apply to study at the University.
- The student number is your unique identification to simplify future communication with the University.
- Use your student number every time you communicate with the University.

## 3.2 Contact details of the University

You can send enquiries regarding your studies, bursaries and loans, and residence placements to the following address:

The Registrar
Stellenbosch University
Private Bag X1
MATIELAND
7602

You can send enquiries regarding finances and services, including services at University residences, to the following address:

The Chief Operating Officer
Stellenbosch University
Private Bag X1
MATIELAND
7602

Visit the University's website at http://www.sun.ac.za.

# 4. Language at the University

Stellenbosch University (SU) uses Afrikaans and English as languages of instruction at undergraduate level in its endeavour to promote multilingualism. The University is committed to safeguarding and developing Afrikaans further as a well-established academic language, taking into consideration this endeavour to promote multilingualism. SU also recognises English as an international academic language and a medium through which most South Africans can communicate with each other. In addition, the University provides for the development of specialist terminology and communication skills in isiXhosa, and the teaching of isiXhosa in some academic programmes for students who will need it in their careers.

Many of our modules are already presented in Afrikaans and English through parallel medium teaching and simultaneous interpretation. However, it is not possible to present the lectures of all modules fully in Afrikaans and English. The medium of teaching is therefore indicated in the relevant faculty's calendar part. More information concerning language at the University is available on the website www.sun.ac.za/language. Support for the acquisition of academic language proficiency in Afrikaans and English is provided.

- **Parallel medium:** A class is divided into separate Afrikaans and English streams. Students provide their preferred language of teaching at registration.
- **Interpreting:** Simultaneous interpretation into Afrikaans or English, depending on the lecturing language, can take place during class teaching.
- **Bilingual:** A combination of teaching in Afrikaans (approximately 50%) and English (approximately 50%) in the same class.
- **Afrikaans and English**: A small percentage of the modules are presented in either Afrikaans or English.

## 4.1 The Faculty's implementation of the Language Policy

The Faculty offers first-year modules in both English and Afrikaans respectively, that means in parallel medium classes or A and E options. In exceptional cases where class size does not allow for parallel classes, the Faculty makes provision for simultaneous interpreting in order to give both English- and Afrikaans-speaking students the opportunity of education in their preferred academic language. Due to limited facilities and timetable restrictions it is impossible to have separate practical sessions for the two language groups. We see the practical sessions as opportunities where you are exposed to an informal multilanguage environment. However, simultaneous interpreting will be used if needed. An explanation of the various language specifications of the individual modules is available in the chapter "Subjects, modules and module contents for all programmes" of this Calendar part.

The Faculty's teaching model of preference for second- and third-year students entails to a large extent independent learning and discussion groups led by lecturers, where students have the opportunity to partake in their preferred academic language (English and/or Afrikaans). The language option from the second year onwards is therefore mostly bilingual (T-option) with simultaneous interpreting in certain key modules if needed. The Faculty will support you on an individual basis, if needed, to master academic language proficiency in both English and Afrikaans. Language usage is managed in the same manner in both undergraduate and postgraduate teaching and learning.

A growing number of national and international students join the Faculty of Science on postgraduate level. Therefore structured postgraduate modules are mainly taught in English. You do, however, have the choice to use Afrikaans as language of preference for assessment purposes. You are, however, encouraged as a postgraduate student to present your research project, thesis or dissertation in English because it must be submitted to an external examiner, who is usually an international expert and will not be able to assess your work if it is presented in Afrikaans.

With the implementation of the Faculty of Science's Language Plan you can expect that your lecturer:

- will orally communicate complex concepts in your home language as far as possible or, if your home language is not English or Afrikaans, in one of these two languages according to your preferred academic language. If class groups cannot be divided according to language preference, simultaneous interpreting is used to make this option possible.

- will explain complex concepts in his or her home language as far as possible or, if your lecturer's home language is not Afrikaans or English, in one of these two languages according to the lecturer's preferred academic language. A lecturer who explains complex concepts in his or her preferred academic language promotes optimal learning for students because concepts can be formulated accurately. If class groups cannot be divided according to language preference, simultaneous interpreting is used to make this option possible.

In tutorials, practicals, final-year theses/dissertations and discussion groups, one-on-one communication is used to a great extent. This will be in English or Afrikaans, depending on your preferred academic language and your lecturer's language proficiency.

## 5. Qualifications offered in the Faculty of Science

You can obtain the following qualifications, with the minimum years of study indicated, in the Faculty of Science:

| Degree | Length of degree |
|---|---|
| BSc | 3 years |
| BScHons | 1 year |
| MSc (Mathematical Sciences) (AIMS) | 3 semesters |
| MSc | 1 or 2 years |
| PhD | 2 years |
| DSc | 1 or 3 years |

**Please note:** You can follow-up the BSc degree with an honours degree in a specific subject discipline. After this an MSc and then a PhD, which are both more research focused, can follow. More information on this may be found in the chapter "Postgraduate Programmes".

## 6. Examination, promotion and Faculty provisions

6.1 Complete general provisions relating to examinations and promotions applicable to degree programmes are contained in Part 1 (General) of the University Calendar. It is important that you take note of these provisions.

6.2 Except for the provisions in section 6.1, you must also take note of the following provisions of the Faculty of Science:

- If you are already registered for a degree programme in the Faculty of Science, you cannot register for a second degree programme in another faculty.
- All class marks between 35 and 50 will be allocated in multiples of 5; the actual mark you obtained will be allocated for marks below 35 and above 50.
- You can only take modules from different years of study in the same year if the class and test timetables allow for it. If there are any clashes on any one of these timetables, you cannot take those specific modules together.

- The fact that the examination system allows you to follow modules that clash, does not automatically mean that you will be accommodated regarding class and/or test clashes.
- You can only take a module from a specific year of study provided that you are only half of the credits of a single preceding year of the subject in arrears *or* only 16 credits from a combination of two or more preceding years of the subject. Please note this rule is subject to the applicable co-requisite, prerequisite and prerequisite pass requirements and dependents on the class, test and examination timetables concerned.
- If you have followed the first year of your degree programme in the Faculty, you will only be readmitted to the rest of your degree programme if you have obtained at least a 0,50 HEMIS credit for this year in terms of the required modules of your first year. An explanation of HEMIS credits is available in the Part 1 (General) of the Calendar in the section Admission and Registration.
- If you are doing the extended degree programme, you cannot repeat modules from the first year in your second year of study. This means that poor class attendance or failing one or more modules in Year 1 will result in you not being allowed to continue with this degree programme.
- All test and examination answer sheets must be answered in ink.

### 6.3 Students with credits in arrears

If you are in your second year of study and have credits in arrears from your first year, you may only take 16 credits per semester in addition to the normal credit load of your degree programme. This provision applies to all non-final year registrations.

## 7. Rules and regulations for the Dean's Concession Examinations

7.1 An undergraduate, final-year student, who, when all the examinations have been taken and all final marks are available, is a maximum of two modules with a total credit value of no more than 32 credits in arrears for the degree, or such credit value in arrears for the degree as the individual faculties permit in highly exceptional cases (in other words, the student has taken the examination in the modules concerned and failed), may – subject to the provisions of paragraphs 7.2, 7.3 and 7.4 below – be admitted to a Dean's Concession Examination (DCE) as a concession by the Dean, in consultation with the academic department(s) concerned. Please note that you must be registered for the module(s) concerned in the specific year.

7.2 Such students shall be identified by the faculty secretary, who shall furnish the departments concerned with their names via the Dean's office. The onus shall be on the students concerned to communicate with the faculty secretary in good time (not later than 15 January) about their admission to the DCE. The DCE shall be taken at a scheduled time during the last week of January or the first week of February.

7.3 If the student fails the module in the DCE, no further DCE shall be granted.

7.4 DCEs in modules subject to continuous assessment shall be taken at the same time as referred to in paragraph 7.2 above, subject to the procedures laid down in paragraph 7.2 above.

7.5 DCEs are conducted departmentally. Students who have been granted a DCE shall ascertain timeously from the department concerned when and where the DCE in question is to be written. They shall ensure that they present themselves at such time and place.

7.6 DCEs shall be granted only with the approval of the Dean. No student shall be granted a DCE, under any circumstances, by any department. No lecturer can give an undertaking to a student in this matter.

7.7 Admission to a DCE in a module is subject to the rules of the faculty offering the module. For the rules governing DCEs in modules not offered by the Faculty of Science, consult the relevant faculty's Calendar part or the faculty secretary.

# Undergraduate Programmes

## 1. Admission requirements

### 1.1 School-leaving qualifications

For admission to the University you need:

- A National Senior Certificate or school-leaving certificate from the Independent Examination Board as certified by Umalusi with admission to bachelor's* degree studies; or
- A university exemption certificate issued by the South African Matriculation Board to students with other school qualifications.

*Admission to bachelor's degree studies requires that you obtain a mark of at least 4 (50-59%) in each of four designated university admission subjects.

### 1.2 Minimum admission requirements for BSc degree programmes

For admission to the BSc degree programmes in the Faculty, you must meet the following minimum admission requirements:

#### 1.2.1 National Senior Certificate (NSC) or Independent Examination Board (IEB) school-leaving certificate

- An average final mark of 65% in the National Senior Certificate or the school-leaving certificate from the Independent Examination Board (excluding Life Orientation);
- For degree programmes in the Physical and Mathematical Sciences, a final mark of 70% (6) for Mathematics; OR
- For degree programmes in the Biological Sciences when you take Mathematics (Bio) 124 and Physics (Bio) 134, 154, a final mark of 60% (5) for Mathematics; OR if you are planning to take Mathematics 114, 144 and Physics 114, 144, a final mark of 70% (6) for Mathematics;
- A final mark of 50% (4) for Physical Sciences (excluding the degree programme in the Mathematical Sciences where students do not take Chemistry or Physics);
- A final mark of 50% (4) for Afrikaans or English (Home Language or First Additional Language); and
- A final mark of 50% (4) for one other designated university admission subject.

#### 1.2.2 School qualifications other than the National Senior Certificate or the Independent Examination Board school-leaving certificate

- If you have a school qualification other than the National Senior Certificate or the Independent Examination Board school-leaving certificate, you must ensure that you can obtain a university exemption certificate from the South African Matriculation Board.

- You must have taken both Physics and Chemistry as school subjects if Physical Sciences are set as admission requirement.

*See the programme specific requirements as set for other school systems in the back of this Calendar part.

## 1.3 Additional requirements for all applicants

1.3.1 As a prospective student you must also complete the National Benchmark Tests (NBT), including the Mathematics component of the tests.

1.3.2 Your admission to the Faculty of Science is dependent on the availability of places per programme or programme fields of study and the Faculty follows a selection process in order to obtain enrolment targets.

1.3.3 Meeting the minimum admission requirements of the programme you are applying for does not guarantee selection for your chosen programme. The Faculty's selection policy and procedures are available at www.maties.com.

1.3.4 You must meet the combination of subject-specific admission requirements, as required by the specific programme or stream in a programme, that you are going to take. See the tables in section 1.7 below.

1.3.5 If you want to register for a programme in the Biological Sciences, take note that you may be required to work with animal- and/or human-biological material. In the case of animals it may also include primary sample collection.

### 1.3.6 Physical Sciences as school subject

- If you want to register for a programme in the Biological or Physical Sciences, you must have taken Physical Sciences as a school subject.
- If you want to register for any module in Chemistry or Physics, you must have taken Physical Sciences; or both Chemistry and Physics as a school subject(s).

### 1.3.7 Mathematics admission requirement

If you are planning to take Mathematics 114 and/or 144, or Physics 114 and/or 144, you must meet the Mathematics admission requirement as set for the programme in the Mathematical Sciences.

### 1.3.8 Life Sciences as school subject

If you want to register for a programme in the Biological Sciences, it is recommended that you must have taken Life Sciences as a school subject, although this is not an admission requirement.

## 1.4 Prospective students who are already in possession of a school-leaving certificate, as certified by Umalusi, when applying

- If you apply to the University after obtaining a school leaving certificate, your application will be considered if you meet the admission requirements that are applicable in the year that you apply.

- All applications will be considered according to the selection process. If you do not meet the admission requirements, but are busy improving your final school marks during the time that you are applying, your application will be placed on a waiting list until the improved final marks are available.

## 1.5 Admission requirements for the BSc (Extended Degree Programmes)

These programmes offer an alternative route to the programmes in the Biological, Physical and Mathematical Sciences.

If you do meet the minimum admission requirements **but one** for BSc degree programmes, you can apply for admission to the extended degree programmes. To be considered for this, the requirements are as follows:

- A final mark of 50% (4) for Afrikaans or English (Home Language or First Additional Language); and
- Physical Sciences as school subject; and
- Either an average final mark of between 55% - 64,9% in the National Senior Certificate, excluding Life Orientation; OR
- 40% (3) for Physical Sciences; OR
- For programmes in the Physical and Mathematical Sciences, a final mark of either 60% (5) for Mathematics; OR
- For programmes in the Biological Sciences, a final mark of 50% (4) for Mathematics.

The Faculty of Science selects a limited number of students for the extended BSc programmes and preference is given to socio-economically disadvantaged learners. The selection policy and procedures are available at www.maties.com.

The duration of an extended degree programme is at most one year longer than the mainstream degree programme. Take note of the following:

- During the first year of the programme your knowledge base is strengthened and your skills are developed to prepare you to enter the mainstream modules from your second year of study.
- Class attendance is compulsory and you must pass all modules in Year 1 to proceed to the next year of study.
- You cannot repeat modules from the first year in your second year of study. This means that poor class attendance or failing one or more modules in Year 1 will result in you not being readmitted to the extended degree programme.
- If you complete this degree programme successfully, you will receive a degree certificate from the University that is exactly the same as those received by mainstream students.

## 1.6 Admission to the BSc degree programme after you have already passed acknowledged subjects at another university or if you are already in possession of another degree from Stellenbosch University

To obtain a BSc degree from Stellenbosch University after you have already passed acknowledged subjects at another university or if you are already in possession of another degree from Stellenbosch University, you must meet the following requirements:

- You must have obtained a school-leaving certificate with admission to bachelor's degree studies before starting with the subjects that will possibly be acknowledged for the BSc degree;
- You must follow subjects for at least two academic years at Stellenbosch University; and
- You must obtain at least half of the total number of credits, including all final-year credits prescribed for the proposed degree, at Stellenbosch University.

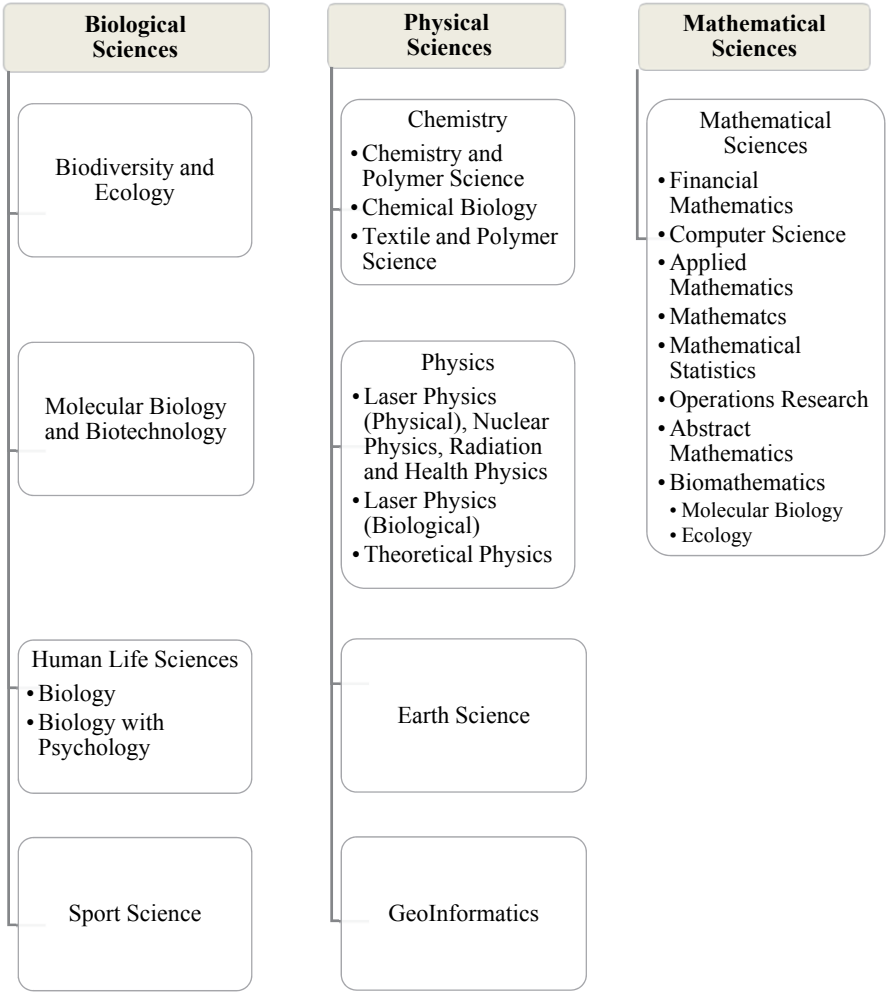
However, please note the following: The modules of the subject Computer Skills are not covered by the abovementioned provision, and must be taken at this University. The University can, however, in exceptional cases, acknowledge similar modules that you have passed at another university.

## 1.7 Summary of undergraduate programmes and admission requirements per programme

The curricula or combination of subjects that you can take for the BSc degree are represented in terms of programmes. A programme can consist of a number of prescribed curricula, where each specific curriculum is known as a stream.

The diagramme below offers a representation of the programmes and streams for the BSc degree in the Biological, Physical and Mathematical Sciences. The various programmes and their additional streams, where applicable, are set out in the blocks under the Biological, Physical and Mathematical Sciences.

## The Faculty's Programmes and Streams



The three tables below give a breakdown of the first-year curricula that must be taken for specific programmes and streams within a programme, as well as the combination of subject-specific admission requirements applicable to a specific programme or stream. Consult section 3 of this chapter for all first-year curricula with each one's applicable subjects and modules.

## Biological Sciences

| **Programmes, streams in programmes and *first-year curriculum*** | **Admission requirements** |
|---|---|
| **Biodiversity and Ecology**<br>*(Curriculum 1)* | An average final mark of 65%, excluding Life Orientation<br><br>Afrikaans or English<br>(Home Language or First Additional Language) 4 |
| **Molecular Biology and Biotechnology**<br>*(Curriculum 1, or adapted curriculum 3)* | Physical Sciences 4 |
| **Human Life Sciences**<br>1 Stream: Biology<br>*(Curriculum 1, or adapted curriculum 3)*<br>2 Stream: Biology with Psychology<br>*(Curriculum 2)* | Mathematics 6<br>(If you will be taking Mathematics 114, 144 and Physics 114, 144)<br><br>**OR** |
| **Sport Science**<br>*(Curriculum specific to programme)* | Mathematics 5<br>(If you will be taking Mathematics (Bio) 124 and Physics (Bio) 134, 154) |

## Physical Sciences

| Programmes, streams in programmes and *first-year curriculum* | Admission requirements |
|---|---|
| **Chemistry**<br>1 Stream: Chemistry and Polymer Science<br>*(Curriculum 3, or 4, or 5, or 6)*<br>2 Stream: Chemical Biology<br>*(Curriculum 3)*<br>3 Stream: Textile and Polymer Science<br>*(Curriculum 3, or 4, or 5, or 6)* | An average final mark of 65%, excluding Life Orientation<br><br>Afrikaans or English<br>(Home Language or First Additional Language) 4<br><br>Physical Sciences 4<br><br>Mathematics 6 |
| **Physics**<br>1 Streams: Laser Physics (Physical), Nuclear Physics, Radiation and Health Physics<br>*(Curriculum 5, or 6, or 7)*<br>*2* Stream: Laser Physics (Biological)<br>*(Curriculum 3)*<br>3 Stream: Theoretical Physics<br>*(Curriculum 7)* | |
| **Earth Science**<br>*(Curriculum specific to programme)* | An average final mark of 65%, excluding Life Orientation<br><br>Afrikaans or English<br>(Home Language or First Additional Language) 4<br><br>Physical Sciences 4<br><br>Mathematics 6<br>(If you will be taking Mathematics 114, 144 and Physics 114, 144)<br><br>**OR**<br><br>Mathematics 5<br>(If you will be taking Mathematics (Bio) 124 and Physics (Bio) 134, 154) |
| **GeoInformatics**<br>*(Curriculum specific to programme)* | |

## Mathematical Sciences

| **Programme, streams in the programme and *first-year curriculum*** | **Admission requirements** |
|---|---|
| **Mathematical Sciences**<br>1 Stream: Financial Mathematics<br>*(Curriculum specific to programme)*<br>2 Stream: Computer Science<br>*(Curriculum specific to programme)*<br>3 Stream: Applied Mathematics<br>*(Curriculum specific to programme)*<br>4 Stream: Mathematics<br>*(Curriculum specific to programme)*<br>5 Stream: Mathematical Statistics<br>*(Curriculum specific to programme)*<br>6 Stream: Operations Research<br>*(Curriculum specific to programme)*<br>7 Stream: Abstract Mathematics<br>*(Curriculum specific to programme)* | An average final mark of 65%, excluding Life Orientation<br><br>Afrikaans or English<br>(Home Language or First Additional Language) 4<br><br>Mathematics 6<br><br>Any other school subject from the designated subject list for university admission 4<br><br>**OR**<br><br>Physical Sciences 4<br>(If you will be taking Physics or Chemistry) |
| 8 Stream: Biomathematics<br>8.1 Option 1: Molecular Biology<br>*(Curriculum specific to programme)*<br>8.2 Option 2: Ecology<br>*(Curriculum specific to programme)* | An average final mark of 65%, excluding Life Orientation<br><br>Afrikaans or English<br>(Home Language or First Additional Language) 4<br><br>Physical Sciences 4<br><br>Mathematics 6 |

## 2. The principles whereby the BSc degree programme is compiled

The three-year BSc degree programme consists of at least 24 standard semester modules (after this named standard modules) of 16 credits each, plus the modules that include the compulsory generic skills (such as Computer Skills 171, 272 and Scientific Communication Skills 172).

You must take at least 18, but preferably more, of these standard modules from the core subjects which are presented by the departments of the Biological Sciences, the grouping of the Physical Sciences (Chemistry, Physics and Earth Sciences) and the grouping of the Mathematical Sciences (Computer Science, Mathematics, Applied Mathematics, Mathematical Statistics and Operations Research). The Science Faculty Board will consider approving acknowledged equivalent modules.

The following rules regarding module combinations (plus the modules that include the compulsory generic skills) apply to the three-year BSc degree:

- First year: You must take at least 8 standard modules at first-year level.
- Second year: You must take at least 8 standard modules with at least 6 modules at second-year level.
- Third year: You must take at least 8 standard modules with at least 6 modules at third-year-level. At least 4 of these 6 standard modules must be from the core subjects, with the remaining 2 standard modules which can be at second-year level.

All three-year BSc programmes must contain at least 1 standard module in Mathematics and at least 2 standard modules, but preferably more, in the core subjects outside your major category (namely Biological, Physical or Mathematical). The Faculty's current approved first-year curricula ensure that your programme compilation meets these requirements.

For programme compilation a major is defined as follows:

- A number of approved and coherent modules with a total value of at least 64 credits at final-year level that may be comprised from different departments and that will lead to specified postgraduate studies.

**Please note:** You can follow-up the BSc degree with an BScHons degree in a specific subject discipline. After this an MSc and then a PhD, which are both more research focused, can follow. For more information regarding the postgraduate degrees refer to the chapter "Postgraduate Programmes".

# 3. First-year curricula for BSc degree programmes

The first-year curricula for the three-year BSc degree programmes is set out below, followed by the curriculum for the extended degree programmes.

## 3.1 First-year curricula for the three year BSc degree programmes

The following first-year curricula are required for BSc programmes, unless a different first-year curriculum is indicated at the specific programme curriculum. First-year curricula are numbered from 1 to 7. These numbers are used in the programme curricula to indicate which first-year curriculum you must follow for your specific programme curriculum.

**Curriculum 1 (credits = 140)**

| | |
|---|---|
| Biology | 124(16), 144(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Scientific Communication Skills | 172(8) |

**Curriculum 2 (credits = 148)**

| | |
|---|---|
| Biology | 124(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Psychology | 114(12), 144(12) |
| Scientific Communication Skills | 172(8) |

**Curriculum 3 (credits = 140)**

| | |
|---|---|
| Biology | 124(16), 144(16) or 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**Curriculum 4 (credits = 140)**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Geo-Environmental Science | 124(16), 154(16) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**Curriculum 5 (credits = 140)**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**Curriculum 6 (credits = 140)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**Curriculum 7 (credits = 140)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

## 3.2 First-year curriculum for the BSc (Extended Degree Programmes)

### Year 1 (146 credits)

*Compulsory Modules*

| | |
|---|---|
| Chemistry | 176(32) |
| Computer Skills | 176(8) |
| Physics | 176(32) |
| Scientific Communication Skills | 116(12), 146(6) |
| University Practice in the Natural Science | 176(8) |

AND

| | |
|---|---|
| Mathematics (Bio) | 176(32) **OR** |
| Mathematics | 186(32) |

AND

| | |
|---|---|
| Biology | 146(16) **OR** |
| Computer Science | 146(16) |

### Year 2, 3 and 4

Once you have successfully completed your first year in the extended degree programme, you can choose from the curricula from Year 1, 2 and 3 as per the mainstream degree programmes in the Biological, Physical and Mathematical Sciences.

# 4. Curricula for all years of study in the BSc degree programmes

- To obtain the BSc degree, you must choose a specific programme, or one of the streams of a programme, and follow and pass the prescribed curriculum (subjects and modules) of your chosen programme.
- Before making a final selection of elective modules that you want to take in a specific academic year, consult the relevant class, test and examination timetables closely. If any two of the elective modules fall within the same time slot on a particular timetable, you cannot register for both modules because they are an inadmissible combination.
- Also make sure that you meet the prescribed co-requisite, prerequisite and prerequisite pass requirements for each module you have to follow in the prescribed curriculum of your degree programme. For more information on these prerequisites, please consult the module contents in the chapter "Subjects, Modules and Module Contents for All Programmes" of this Calendar part.

The various programme curricula that can be taken for the BSc degree are set out in the following sections.

## 4.1 Programmes in the Biological Sciences

There are four programmes in the grouping of the Biological Sciences. Consult the sections below for more information on each one of the programmes as well as the various streams where applicable.

### 4.1.1 Biodiversity and Ecology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 5

*Continued Study Possibilities*

This programme leads to:

- An honours programme in Biodiversity and Ecology and the honours programme leads to a master's programme in Botany or Zoology.
- An honours programme in Applied Plant Physiology.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

## 1st year (140 credits)

*Compulsory Modules*

**Curriculum 1**

| | |
|---|---|
| Biology | 124(16), 144(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Scientific Communication Skills | 172(8) |

## 2nd year (128 credits)

*Compulsory Modules*

**(credits = 96)**

| | |
|---|---|
| Biodiversity and Ecology | 212(16), 214(16), 224(16), 244(16), 254(16), 264(16) |

**plus**

*Elective Modules*

Choose one of the following two subjects. You must take both modules of your chosen subject.

**(credits = 32)**

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Genetics | 214(16), 244(16) |

## 3rd year (128 credits)

*Compulsory Modules*

| | |
|---|---|
| Biodiversity and Ecology | 315(16), 324(16), 334(16), 344(16), 345(16), 354(16), 364(16) |
| Conservation Ecology | 314(16) |

### 4.1.2 Molecular Biology and Biotechnology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6 (*If you will be taking Mathematics 114, 144 and Physics 114, 144)*

OR

- Mathematics – 5 (If you will be taking Mathematics (Bio) 124 and Physics (Bio) 134, 154)

*Continued Study Possibilities*

3rd-year major study possibilities lead to:

- Major subject 1 leads to an honours programme in Biochemistry.
- Major subject 2, option 1 is required for admission to the honours programme in Genetics.
- Major subject 2, option 2 is recommended for admission to the honours programme in Plant Biotechnology.
- Major subject 3 leads to an honours programme in Microbiology.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

Choose one of the curricula below.

**Curriculum 1**

| | |
|---|---|
| Biology | 124(16), 144(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Adapted Curriculum 3**

| | |
|---|---|
| Biology | 124(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

## 2nd year (136 credits)

*Compulsory Modules*

**(credits = 120)**

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Biometry | 211(8) |
| Genetics | 214(16), 244(16), 245(16)<br>Genetics 245 is recommended for admission to the honours programme in Plant Biotechnology. |
| Microbiology | 214(16), 244(16) |

**plus**

*Elective Modules*

Choose one of the following two modules.

**(credits = 16)**

| | |
|---|---|
| Chemistry | 214(16) |
| Genetics | 215(16)<br>Genetics 215 is recommended for admission to the honours programme in Plant Biotechnology. |

## 3rd year (128 credits)

*Compulsory Modules*

Choose two major subjects. You must take all four modules of your chosen major subjects.

**Major subject 1**

| | |
|---|---|
| Biochemistry | 315(16), 324(16), 345(16), 365(16) |

**Major subject 2, option 1**

| | |
|---|---|
| Genetics | 314(16), 324(16), 344(16), 354(16) |

**Major subject 2, option 2**

| | |
|---|---|
| Genetics | 314(16), 315(16), 344(16), 345(16) |

**Major subject 3**

| | |
|---|---|
| Microbiology | 314(16), 324(16), 354(16), 364(16) |

### 4.1.3 Human Life Sciences

This programme consists of two streams, namely Biology and Biology with Psychology.

#### 4.1.3.1 Stream: Biology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6 (*If you will be taking Mathematics 114, 144 and Physics 114, 144)*

OR

- Mathematics – 5 (If you will be taking Mathematics (Bio) 124 and Physics (Bio) 134, 154)

*Continued Study Possibilities*

- This stream leads to an honours programme in Physiological Sciences.
- If you take applicable elective modules, this stream also leads to an honours programme in Anatomy, Biochemistry and Genetics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

Choose one of the curricula below.

**Curriculum 1**

| | |
|---|---|
| Biology | 124(16), 144(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Adapted Curriculum 3**

| | |
|---|---|
| Biology | 124(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

## 2nd year (136 credits)

*Compulsory Modules*

**(credits =104)**

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Biometry | 211(8) |
| Genetics | 214(16), 244(16) |
| Physiology | 214(16), 244(16) |

**plus**

*Elective Modules*

Choose one of the following subjects. You must take both modules of your chosen subject.

**(credits = 32)**

| | |
|---|---|
| Anatomy | 214(16), 244(16)<br>A maximum of 30 students will be selected on merit for Anatomy 214 and 244.<br>To be considered, you must obtain a 60% average for the first year, with 60% for Biology 124 and 60% for Biology 154.<br>The Faculty of Medicine and Health Sciences can, however, decide not to select any students in a particular year. |
| Microbiology | 214(16), 244(16) |

## 3rd year (128 credits)

*Compulsory Modules*

**(credits = 64)**

| | |
|---|---|
| Physiology | 314(16), 334(16), 344(16), 364(16) |

**plus**

*Elective Modules*

Choose one of the following subjects. You must take all four modules of your chosen subject.

**(credits = 64)**

| | |
|---|---|
| Anatomy | 314(16), 324(16), 344(16), 364(16) |
| Biochemistry | 315(16), 324(16), 345(16), 365(16) |
| Genetics | 314(16), 324(16), 344(16), 354(16) |

### 4.1.3.2 Stream: Biology with Psychology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 5

*Continued Study Possibilities*

- This stream leads to an honours programme in Physiological Sciences or Psychology.
- If you take the extra elective modules Genetics 324 and 354, this stream can lead to an honours programme in Genetics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (148 credits)**

*Compulsory Modules*

**Curriculum 2**

| | |
|---|---|
| Biology | 124(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Psychology | 114(12), 144(12) |
| Scientific Communication Skills | 172(8) |

**2nd year (128 credits)**

*Compulsory Modules*

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Genetics | 214(16), 244(16) |
| Physiology | 214(16), 244(16) |
| Psychology | 213(8), 223(8), 243(8), 253(8) |

**3rd year (144 credits)**

*Compulsory Modules*

| | |
|---|---|
| Genetics | 314(16), 344(16) |
| Physiology | 314(16), 334(16), 344(16), 364(16) |
| Psychology | 314(12), 324(12), 348(24) |

### 4.1.4 Sport Science

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 5

*Special Provisions:*

- Selection for the programme is done according to clear guidelines, which are based on both academic and non-academic merits. If you are selected, you must complete a medical history form. If you are declared medically unfit, you will not be allowed to register for the compulsory practical modules (such as Kinesiology 182).
- You must obey the prescribed regulations regarding clothing. You can obtain more information on these rules from the Department of Sport Science at the beginning of the academic year.
- You must attend all practical classes. The Department of Sport Science requires a minimum of 40% for each component of the practical classes. You must pass all practical and theoretical modules with 50%.

*Continued Study Possibilities*

This programme leads to:

- An honours programme in Biokinetics.
- An honours programme in Sport Science, Specialisation: Performance Sport.
- An honours programme in Sport Science, Specialisation: Kinder Kinetics.
- An honours programme in Physiological Sciences.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

| | |
|---|---|
| Biology | 124(16), 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Kinesiology | 162(8), 182(8)<br>Kinesiology 162 is a prerequisite pass requirement for Sport Science 262.<br>Kinesiology 182 is a prerequisite pass requirement for Movement Education, Sport and Recreation 282. |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |
| Scientific Communication Skills | 172(8) |

### 2nd year (128 credits)

*Compulsory Modules*

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Movement Education, Sport and Recreation | 212(8), 222(8), 242(8), 282(8) |
| Physiology | 214(16), 244(16) |
| Sport Science | 222(8), 232(8), 252(8), 262(8) |

### 3rd year (134 credits)

*Compulsory Modules*

**(credits = 110)**

| | |
|---|---|
| Kinesiology | 312(8), 332(8), 342(8), 352(8), 372(8) |
| Physiology | 314(16), 334(16), 344(16), 364(16) |
| Sport Science | 382(6) |

**plus**

*Elective Modules*

Choose one of the following subjects. You must take both modules of your chosen subject.

**(credits = 24)**

| | |
|---|---|
| Applied Kinesiology (Adapted Physical Activity) | 324(12), 344(12) |

**or**

| | |
|---|---|
| Applied Kinesiology (Sport Coaching) | 313(12), 353(12) |

**or**

| | |
|---|---|
| Applied Kinesiology (Fitness Industry) | 314(12), 352(12) |

## 4.2 Programmes in the Physical Sciences

There are four programmes in the grouping of the Physical Sciences. Consult the sections below for more information on each one of the programmes as well as the various streams where applicable.

### 4.2.1 Chemistry

This programme consists of three streams, namely Chemistry and Polymer Science; Chemical Biology; and Textile and Polymer Science.

#### 4.2.1.1 Stream: Chemistry and Polymer Science

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Chemistry, Microbiology or Polymer Science.
- If applicable elective modules are taken as indicated in Option 1, this stream also leads to an honours programme in Applied Mathematics, Computer Science, Earth Sciences, Mathematics or Physics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

Choose one of the curricula below.

**Curriculum 3**

| | |
|---|---|
| Biology | 124(16), 144(16) of 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 4**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Geo-Environmental Science | 124(16), 154(16) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 5**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 6**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

## 2nd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Chemistry | 214(16), 234(16), 254(16), 264(16) |
| Computer Skills | 272(5) |

**plus**

*Elective Modules*

Choose modules to the value of 64 credits from the following subjects.

**(credits = 64)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Biochemistry | 214(16), 244(16) |
| Computer Science | 214(16), 244(16) |
| Genetics | 214(16), 244(16) |

| | |
|---|---|
| Geology | 224(16), 254(16) |
| Mathematics | 214(16), 244(16), 278(32) |
| Microbiology | 214(16), 244(16) |
| Physics | 224(16), 254(16) |
| Textile Science | 254(16) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Chemistry | 314(16), 324(16), 344(16), 364(16) |
| Computer Skills | 372(5) |

**plus**

*Elective Modules*

### Option 1: (credits = 64)

Choose one of the following subjects. You must take all modules of your chosen subject.

| | |
|---|---|
| Mathematics | 314(16), 324(16), 344(16), 365(16) |
| Physics | 314(16), 334(16), 342(8), 352(8), 384(16)<br>Because of practical class clashes, Physics 384 may only be taken with other Physics modules in the same timetable slot and not with modules in other subjects. |

The following additional elective modules are recommended but currently clash on the timetable with compulsory modules and can only be taken in exceptional cases (e.g. by repeaters) and with the permission of the departments concerned:

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Computer Science | 314(16), 334(16), 344(16), 354(16) |
| Geology | 314(16), 324(16), 344(16), 354(16) |
| Microbiology | 314(16), 324(16), 354(16), 364(16) |

**or**

### Option 2: (credits = 64)

| | |
|---|---|
| Applied Chemistry | 324(16), 344(16) |

**plus**

Choose modules to a minimum value of 32 credits from one of the subjects below.

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 364(16) |
| Mathematics | 314(16), 324(16), 344(16), 378(32) |
| Microbiology | 314(16), 324(16), 364(16) |
| Physics | 314(16), 334(16), 342(8), 352(8), 384(16)<br>Because of practical class clashes, Physics 384 may only be taken with other Physics modules in the same timetable slot and not with modules of other subjects. |
| Textile Science | 314(16), 344(16) |

#### 4.2.1.2 Stream: Chemical Biology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Chemistry or Biochemistry.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

**Curriculum 3**

| | |
|---|---|
| Biology | 124(16), 144(16) of 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**2nd year (133 credits)**

*Compulsory Modules*

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Chemistry | 214(16), 234(16), 254(16), 264(16) |
| Computer Skills | 272(5) |
| Microbiology | 214(16), 244(16) |

### 3rd year (133 credits)

*Compulsory Modules*

| | |
|---|---|
| Biochemistry | 315(16), 324(16), 345(16), 365(16) |
| Chemistry | 314(16), 324(16), 344(16), 364(16) |
| Computer Skills | 372(5) |

#### 4.2.1.3 Stream: Textile and Polymer Science

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Chemistry.
- It also leads to an honours programme in Polymer Science, Stream: Polymer Science, or Stream: Textile and Polymer Science.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

### 1st year (140 credits)

*Compulsory Modules*

Choose one of the curricula below.

**Curriculum 3**

| | |
|---|---|
| Biology | 124(16), 144(16) of 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 4**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Geo-Environmental Science | 124(16), 154(16) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 5**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 6**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

## 2nd year (Minimum 133, maximum 137 credits)

*Special provision*

It is expected that you gain at least two weeks' practical experience in the textile industry during the holidays in your second year.

*Compulsory Modules*

**(credits = 85)**

| | |
|---|---|
| Chemistry | 214(16), 234(16), 254(16), 264(16) |
| Computer Skills | 272(5) |
| Textile Science | 254(16) |

**plus**

*Elective Modules*

Choose modules to a minimum value of 48 credits and a maximum value of 52 credits from the subjects below. It is important that you ensure before registration that your chosen modules do not have timetable clashes with compulsory modules.

**(credits = minimum 48, maximum 52)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Biochemistry | 214(16), 244(16) |
| Economics | 114(12), 144(12) and Business Management 113(12) |
| Microbiology | 214(16), 244(16) |
| Physics | 224(16), 254(16) |

### 3rd year (133 credits)

*Special Provision*

It is expected that you gain at least two weeks' practical experience in the textile industry during the holidays in your third year.

*Compulsory Modules*

**(credits = 117)**

| | |
|---|---|
| Applied Chemistry | 324(16), 344(16) |
| Chemistry | 314(16), 344(16), 364(16) |
| Computer Skills | 372(5) |
| Textile Science | 314(16), 344(16) |

**plus**

*Elective Modules*

Choose one of the following modules. It is important that you ensure before registration that your chosen module does not have timetable clashes with compulsory modules.

**(credits = 16)**

| | |
|---|---|
| Chemistry | 324(16)<br>Chemistry 324 is compulsory for admission to honours programmes in Polymer Science and Chemistry. |
| Financial Management | 214(16) |
| Logistics Management | 214(16) |

### 4.2.2 Physics

This programme consists of the following streams, namely Laser Physics (Physics), Nuclear Physics, Radiation and Health Physics; Laser Physics (Biological); and Theoretical Physics.

#### 4.2.2.1 Streams: Laser Physics (Physical), Nuclear Physics, Radiation and Health Physics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

3rd-year module study possibilities lead to the following:

- **Option 1 modules** lead to an honours programme in Physics and also to an honours programme in Applied Mathematics or Chemistry.
- **Option 2 modules** lead to an honours programme in Physics and also to an honours programme in Physical and Mathematical Analysis.
- **Option 3 modules** lead to an honours programme in Physical and Mathematical Analysis and also to an honours programme in Mathematics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

Choose one of the curricula below.

**Curriculum 5**

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 6**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |

| | |
|---|---|
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 7**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

### 2nd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Mathematics | 214(16), 244(16) |
| Physics | 224(16), 254(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

Choose from the following modules depending on the first year curriculum you followed. Take into consideration the additional major subject modules that you will be taking in your third year.

**(credits = 64)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Chemistry | 214(16), 234(16), 254(16), 264(16) |
| Computer Science | 214(16), 244(16) |
| Physics | 214(16), 244(16)<br>If you take Physics 214 and 244 you can switch to the Stream: Theoretical Physics in your third year. See section 4.2.2.3 below for that stream. |

### 3rd year

You can choose from the following three options:

### Option 1: (Minimum 133 credits, maximum 141 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Physics | 314(16), 334(16), 342(8), 352(8), 384(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose one of the following options depending on the elective modules that you took in your second year.

**(credits = 64)**

| | |
|---|---|
| Chemistry | 314(16), 324(16), 344(16), 364(16) |

**or**

| | |
|---|---|
| Applied Mathematics | 324(16), 354(16), 364(16) AND |
| Mathematics | 324(16) |

### Option 2: (Minimum 133, maximum 141 credits)

*Compulsory Modules*

**(credits = 101)**

| | |
|---|---|
| Applied Mathematics | 364(16) |
| Physics | 314(16), 334(16), 342(8), 344(16), 352(8), 384(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose modules to a minimum value of 32 credits and a maximum value of 40 credits from the list below.

**(credits = minimum 32, maximum 40)**

| | |
|---|---|
| Applied Mathematics | 324(16), 354(16) |
| Computer Science | 314(16), 315(16), 334(16), 344(16) |
| Mathematics | 314(16), 324(16), 325(16), 365(16), 378(32) |
| Physics | 372(8) |

### Option 3: (133 credits)

*Compulsory Modules*

| | |
|---|---|
| Mathematics | 314(16), 324(16), 344(16), 365(16)<br>**OR**<br>314(16), 324(16), 378(32) |
| Physics | 314(16), 334(16), 342(8), 352(8), 344(16) |
| Scientific Computing | 372(5) |

#### 4.2.2.2 Stream: Laser Physics (Biological)

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Physics.
- It also leads to an honours programme in Physical and Mathematical Analysis.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

### 1st year (140 credits)

*Compulsory Modules*

**Curriculum 3**

| | |
|---|---|
| Biology | 124(16), 144(16) of 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

### 2nd year (133 credits)

*Compulsory Modules*

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Chemistry | 234(16), 254(16) of 264(16) |
| Mathematics | 214(16), 244(16) |
| Physics | 224(16), 254(16) |
| Scientific Computing | 272(5) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 101)**

| | |
|---|---|
| Applied Mathematics | 364(16) |
| Biochemistry | 315(16) |
| Physics | 314(16), 334(16), 342(8), 352(8), 384(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose one of the following two subjects. You must take both modules of your chosen subject.

**(credits = 32)**

| | |
|---|---|
| Chemistry | 314(16), 324(16) |
| Physiology | 214(16), 244(16) |

### 4.2.2.3 Stream: Theoretical Physics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Theoretical Physics.
- If applicable elective modules are taken, this stream also leads to an honours programme in Physics or Physical and Mathematical Analysis.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

### 1st year (140 credits)

*Compulsory Modules*

**Curriculum 7**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

### 2nd year (133 credits)

*Compulsory Modules*

**(credits = 101)**

| | |
|---|---|
| Mathematics | 214(16), 244(16) |
| Physics | 214(16), 224(16), 244(16), 254(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

Choose one of the following two subjects. You must take both modules of your chosen subject.

**(credits = 32)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Computer Science | 214(16), 244(16) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 101)**

| | |
|---|---|
| Applied Mathematics | 364(16) |
| Mathematics | 324(16) |
| Physics | 314(16), 334(16), 342(8), 344(16), 352(8) OR 372(8) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose modules to a value of 32 credits from the following list depending on the elective modules you took in your second year.

**(credits = 32)**

| | |
|---|---|
| Applied Mathematics | 324(16), 354(16) |
| Computer Science | 314(16), 315(16), 334(16) |
| Mathematics | 314(16), 325(16), 365(16), 378(32) |
| Physics | 384(16) |

### 4.2.3 Earth Science

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6 *(If you are planning to take Physics 114, 144 and/or Mathematics 114, 144)*

OR

- Mathematics – 5 (If you are planning to take Mathematical (Bio) 124 and Physics (Bio) 134, 154)

*Continued Study Possibilities*

- This programme leads to an honours programme in Earth Sciences.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (148 credits)**

*Compulsory Modules*

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Earth Science Field Skills | 172(8) |
| Geo-Environmental Science | 124(16), 154(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

Choose one of the following three subject combinations.

**Subject Combination 1**

| | |
|---|---|
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |

**or**

**Subject Combination 2**

| | |
|---|---|
| Biology | 124(16) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |

**or**

**Subject Combination 3**

| | |
|---|---|
| Mathematics | 114(16), 144(16) |
| Physics (Bio) | 134(16), 154(16) |

### 2nd year (133 credits)

*Compulsory Modules*

**(credits = 101)**

| | |
|---|---|
| Computer Skills | 272(5) |
| Earth Science Field Skills | 272(16) |
| Environmental Geochemistry | 214(16) |
| Geography and Environmental Studies | 214(16) |
| Geology | 224(16), 244(16), 254(16) |

**plus**

*Elective Modules*

Choose modules to the value of 32 credits from the subjects below.

**(credits = 32)**

| | |
|---|---|
| Biology | 144(16) |
| Chemistry | 234(16), 254(16), 264(16) |
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Geography and Environmental Studies | 265(16) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 85)**

| | |
|---|---|
| Computer Skills | 372(5) |
| Earth Science Field Skills | 374(16) |
| Geology | 314(16), 324(16), 344(16), 354(16) |

**plus**

*Elective Modules*

Choose modules to the value of 48 credits from the subjects below, of which at least 16 credits must be on third-year level.

**(credits = 48)**

| | |
|---|---|
| Biodiversity and Ecology | 224(16) |
| Chemistry | 234(16), 254(16), 264(16) |
| Environmental Geochemistry | 314(16) |
| Geographical Information Technology | 311(16), 312(16), 341(16), 342(16) |
| Geography and Environmental Studies | 358(16) |
| Soil Science | 214(16) |

### 4.2.4 GeoInformatics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6 *(If you are planning to take Mathematics 114, 144 and Physics 114, 144)*

OR

- Mathematics – 5 (If you are planning to take Mathematics (Bio) 124 and Physics (Bio) 134, 154)

*Continued Study Possibilities*

- This programme leads to an honours programme in GeoInformatics. If you complete this BSc and BScHons (four years in total), you will automatically be able to register as a Professional Geographical Information Science Practitioner in training.
- If applicable elective modules are taken, this programme also leads to an honours programme in Computer Science or Socio-Informatics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

| | |
|---|---|
| Computer Skills | 171(4) |
| Geo-Environmental Science | 124(16), 154(16) |
| Scientific Communication Skills | 172(8) |

**plus**

| | |
|---|---|
| Computer Science | 114(16), 144(16) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |

**or**

| | |
|---|---|
| Biology | 124(16) |
| Chemistry | 124(16), 144(16) |
| Mathematics (Bio) | 124(16) |
| Physics (Bio) | 134(16), 154(16) |

### 2nd year (127 credits)

*Compulsory Modules*

**(credits = 95)**

| | |
|---|---|
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Geography and Environmental Studies | 214(16) |
| Scientific Computing | 272(5) |
| Socio-Informatics | 262(8) |
| Statistical Methods | 176(18) |

**plus**

*Elective Modules*

Choose one of the following subjects.

**(credits = 32)**

| | |
|---|---|
| Computer Science | 214(16), 244(16) |

**or**

| | |
|---|---|
| Socio-Informatics | 224(16), 254(16) |

### 3rd year (minimum 133, maximum 141 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Geographical Information Technology | 311(16), 312(16), 341(16), 342(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose modules to a minimum value of 64 credits and a maximum value of 72 credits from the modules below. Your choice depends on there being no timetable clashes. If you are considering an honours programme in Computer Science or Socio-Informatics, then you must take all modules for the relevant field of study.

**(credits = minimum 64, maximum 72)**

| | |
|---|---|
| Computer Science | 314(16), 334(16), 344(16), 354(16) |
| Socio-Informatics | 314(18), 334(18), 354(18), 364(18) |

## 4.3 Programme in the Mathematical Sciences

This programme consists of eight different streams, namely Financial Mathematics; Computer Science; Applied Mathematics; Mathematics; Mathematical Statistics; Operations Research; Biomathematics and Abstract Mathematics.

### 4.3.1 Stream: Financial Mathematics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other subject from the designated list for university admission – 4

*Continued Study Possibilities*

- This stream leads to an honours programme in Mathematics if you take Mathematics as a major.
- It also leads to an honours programme in Mathematical Statistics if you take Mathematical Statistics as a major.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (124 credits)**

*Compulsory Modules*

**(credits = 124)**

| | |
|---|---|
| Actuarial Science | 112(8) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Economy | 114(12), 144(12) |
| Mathematics | 114(16), 144(16) |
| Probability Theory and Statistics | 144(16) |
| Scientific Communication Skills | 172(8) |

**2nd year (minimum 125 credits)**

*Compulsory Modules*

**(credits = 109)**

| | |
|---|---|
| Actuarial Science | 274(24) |
| Financial Risk Management | 212(8), 242(8) |
| Mathematical Statistics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

**(credits = minimum 16)**

Choose modules to a minimum value of 16 credits from the list below. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Computer Science | 214(16), 244(16) |
| Economics | 214(16), 244(16) |
| Mathematics | 278(32) |
| Operations Research | 214(16), 244(16) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Chemistry | 234(16), 254(16) |
| Financial Accounting | 288(32) |
| Music Technology | 222(8), 252(8) |

## 3rd year (133 credits)

*Compulsory Modules*

**(credits = 85)**

| | |
|---|---|
| Financial Mathematics | 378(32) |
| Mathematical Statistics | 318(32) |
| Mathematics | 324(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose one of the following subjects. You must take all modules of your chosen subject.

**(credits = 48)**

| | |
|---|---|
| Mathematical Statistics | 344(16), 354(16), 364(16) |
| Mathematics | 314(16), 344(16), 365(16) |

### 4.3.2 Stream: Computer Science

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other school subject from the designated subject list for university admission – 4

OR

- Physical Sciences – 4 (If you are planning to take Physics or Chemistry)

*Continued Study Possibilities*

- This stream leads to an honours programme in Computer Science.
- If applicable elective modules are taken, this stream also leads to honours programmes in Applied Mathematics, Economics, Genetics, Mathematics and Operations Research.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (minimum 132, maximum 140 credits)**

*Compulsory Modules*

**(credits = 108)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Skills | 171(4) |
| Computer Science | 114(16), 144(16) |
| Mathematics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

Choose modules to a minimum value of 24 credits and a maximum value of 32 credits from the list below. Your choice depends on there being no timetable clashes.

**(credits = minimum 24, maximum 32)**

| | |
|---|---|
| Biology | 124(16), 144(16) or 154(16) |
| Chemistry | 124(16), 144(16) |
| Economics | 114(12), 144(12) |
| General Linguistics | 178(24) |
| Geo-Environmental Science | 124(16), 154(16) |

| | |
|---|---|
| Music Technology | 112(6), 142(6)<br>Due to possible timetable clashes, Music Technology 112 and 142 are not necessarily available every year in this programme. If you want to register for these modules, then you have to apply in writing to the Department of Music in advance. |
| Physics | 114(16), 144(16) |

## 2nd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Computer Science | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

Choose one of the following two subjects. You must take both modules of your chosen subject.

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |

**plus**

*Elective Modules*

**(credits = 64)**

Choose modules to a minimum value of 32 credits from the list below. Please note that the modules below have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Mathematical Statistics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Operations Research | 214(16), 244(16) |
| Physics | 214(16), 224(16), 244(16), 254(16) |

You may choose additional modules to a maximum value of 32 credits from the list below to reach your required credit total. Your choice depends on there being no timetable clashes and that you meet the prerequisites for the modules.

| | |
|---|---|
| Biomathematics | 214(16) |
| Chemistry | 234(16), 254(16) |
| Economics | 214(16), 244(16) |
| General Linguistics | 278(32) |
| Genetics | 214(16), 244(16) |

| | |
|---|---|
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Geography and Environmental Studies | 214(16) |
| Mathematics | 278(32) |
| Music Technology | 222(8), 252(8) |

*Please note:* You can also choose the module below as elective module if you have completed your first year **before 2016**. This elective module has a prerequisite module that is an elective module in your first year.

| | |
|---|---|
| Financial Accounting | 288(32) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Computer Science | 314(16), 334(16), 344(16), 354(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

**(credits = 64)**

Choose modules from the list below that follow on your second-year modules to reach the required credit total. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Biomathematics | 314(16), 344(16), 374(16) |
| Chemistry | 324(16), 364(16) |
| Computer Science | 315(16), 364(16) |
| Economics | 318(24), 348(24) |
| General Linguistics | 379(48) |
| Genetics | 314(16), 324(16), 344(16), 354(16) |
| Mathematical Statistics | 318(32), 344(16), 354(16) |
| Mathematics | 314(16), 324(16), 325(16), 344(16), 345(16), 365(16), 378(32) |
| Music Technology | 379(48) |
| Operations Research | 314(16), 324(16), 344(16), 354(16) |
| Physics | 314(16), 334(16), 384(16) |

*Please note:* You can also choose the module below as elective module if you have completed your first year **before 2016**. This elective module has a prerequisite module that is an elective module in your second year.

| | |
|---|---|
| Financial Accounting | 389(48) |

The following additional elective modules are proposed but currently clash on the timetable with compulsory modules and can only be taken in exceptional cases (e.g. by repeaters) and with the permission of the Department of Mathematical Sciences.

| | |
|---|---|
| Financial Mathematics | 378(32) |
| Mathematical Statistics | 364(16) |
| Physics | 342(8), 344(16), 352(8) |

### 4.3.3 Stream: Applied Mathematics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other school subject from the designated list for university admission – 4

OR

- Physical Sciences – 4 *(If you are planning to take Physics or Chemistry)*

*Continued Study Possibilities*

- This stream leads to an honours programme in Applied Mathematics.
- If applicable elective modules are taken, this stream also leads to honours programmes in Biomathematics, Computer Science, Economics, Mathematics, and Operations Research.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (minimum 132, maximum 140 credits)**

*Compulsory Modules*

**(credits = 76)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

**(credits = 56 to 64)**

Choose at least one of the following two subjects. You must take both modules of your chosen subject, thus 32 credits.

| | |
|---|---|
| Computer Science | 114(16), 144(16) |
| Physics | 114(16), 144(16) |

**plus**

Choose additional modules to a minimum value of 24 credits from the list below to reach the required credit total. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Biology | 124(16), 144(16) or 154(16) |
| Chemistry | 124(16), 144(16) |
| Economics | 114(12), 144(12) |
| General Linguistics | 178(24) |
| Geo-Environmental Science | 124(16), 154(16) |
| Music Technology | 112(6), 142(6)<br>Due to possible timetable clashes, Music Technology 112 and 142 are not necessarily available every year in this programme. If you want to register for these modules, then you have to apply in writing to the Department of Music in advance. |

### 2nd year (minimum 125, maximum 133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

**(credits = 56 to 64)**

Choose modules to a minimum value of 32 credits from the list below.

| | |
|---|---|
| Biomathematics | 214(16) |
| Computer Science | 214(16), 244(16) |
| Mathematical Statistics | 214(16), 244(16) |
| Operations Research | 214(16), 244(16) |
| Physics | 214(16), 224(16), 244(16), 254(16) |

**plus**

Choose additional modules to a maximum value of 32 credits from the list below to reach the required credit total. Your choice depends on there being no timetable clashes. Please note that the modules in the list below have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Chemistry | 234(16), 254(16) |
| Economics | 214(16), 244(16) |
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Geography and Environmental Studies | 214(16) |
| Mathematics | 278(32) |
| Music Technology | 222(8), 252(8) |

*Please note:* You can also choose the module below as elective module if you have completed your first year **before 2016**. This elective module has a prerequisite module that is an elective module in your first year.

| | |
|---|---|
| Financial Accounting | 288(32) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose any of the modules below that follow your second-year modules. Your choice depends on there being no timetable clashes.

**(credits = 64)**

| | |
|---|---|
| Biomathematics | 314(16), 344(16), 374(16) |
| Chemistry | 324(16), 364(16) |
| Computer Science | 314(16), 315(16), 334(16), 344(16), 354(16), 364(16) |
| Economics | 318(24), 348(24) |
| Financial Mathematics | 378(32) |
| Geography and Environmental Studies | 358(16) |
| Mathematics | 314(16), 324(16), 325(16), 344(16), 345(16), 365(16), 378(32) |
| Music Technology | 379(48) |
| Operations Research | 314(16), 324(16), 344(16), 354(16) |
| Physics | 314(16), 342(8), 344(16), 352(8), 384(16) |

*Please note:* You can also choose the module below as elective module if you have completed your first year **before 2016**. This elective module has a prerequisite module that is an elective module in your second year.

| | |
|---|---|
| Financial Accounting | 389(48) |

The following additional elective modules are proposed but currently clash with compulsory modules on the timetable and can only be taken in exceptional cases (e.g. by repeaters) and with the permission of the Department of Mathematical Sciences.

| | |
|---|---|
| Chemistry | 344(16), 364(16) |
| Mathematical Statistics | 318(32), 344(16), 354(16), 364(16) |
| Physics | 334(16) |

### 4.3.4 Stream: Mathematics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other school subject from the designated list for university admission – 4

OR

- Physical Sciences – 4 (If you are planning to take Physics or Chemistry)

*Continued Study Possibilities*

- This stream leads to an honours programme in Mathematics.
- If applicable elective modules are taken, then this stream also leads to honours programmes in Applied Mathematics, Biomathematics, Computer Science, Economics, Genetics, Mathematical Statistics, Operations Research, and Physics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (minimum 132, maximum 140 credits)**

*Compulsory Modules*

**(credits = 44)**

| | |
|---|---|
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

Choose modules to a minimum value of 88 credits and a maximum value of 96 credits from the following subjects. Your choice depends on there being no timetable clashes.

**(credits 88 to 96)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Biology | 124(16), 144(16), OR 154(16) |
| Chemistry | 124(16) AND 144(16) |
| Computer Science | 114(16) AND 144(16) |
| Economy | 114(12) AND 144(12) |
| General Linguistics | 178(24) |
| Physics | 114(16) AND 144(16) |
| Probability Theory and Statistics | 114(16) |

## 2nd year (133 credits)

*Compulsory Modules*

**(credits = 37)**

| | |
|---|---|
| Mathematics | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

**(credits = 96)**

Choose modules to a minimum value of 64 credits from the list below.

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Biomathematics | 214(16) |
| Computer Science | 214(16), 244(16) |
| Mathematical Statistics | 214(16), 244(16) |
| Operations Research | 214(16), 244(16) |
| Physics | 214(16), 224(16), 244(16), 254(16) |

You can choose additional modules to a maximum value of 32 credits from the list below to reach the required credit total. Your choice depends on there being no timetable clashes. Please note that modules in the list below have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Chemistry | 234(16), 254(16) |
| Economics | 214(16), 244(16) |
| General Linguistics | 278(32) |
| Genetics | 214(16), 244(16) |
| Mathematics | 278(32) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Financial Accounting | 288(32) |
| Geography and Environmental Studies | 214(16) |
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Music Technology | 222(8), 252(8) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Mathematics | 314(16), 324(16), 344(16), 365(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

**(credits = 64)**

Choose any of the modules to the value of 64 credits from the list below that follow your second-year modules. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Biomathematics | 314(16), 344(16), 374(16) |
| Chemistry | 324(16), 364(16) |
| Computer Science | 314(16), 315(16), 334(16), 344(16), 354(16), 364(16) |
| Economics | 318(24), 348(24) |
| Financial Mathematics | 378(32) |
| General Linguistics | 379(48) |
| Genetics | 314(16), 324(16), 344(16), 354(16) |
| Mathematical Statistics | 318(32), 344(16), 354(16), 364(16) |
| Mathematics | 325(16), 345(16), 378(32) |
| Operations Research | 324(16), 354(16) |
| Physics | 314(16), 334(16), 342(8), 344(16), 352(8), 384(16) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your second year.

| | |
|---|---|
| Financial Accounting | 389(48) |
| Music Technology | 379(48) |

The following additional elective module is proposed but currently clash on the timetable with compulsory modules and can only be taken in exceptional cases (e.g. by repeaters) and with the permission of the Department of Mathematical Sciences.

| | |
|---|---|
| Operations Research | 314(16), 344(16) |

### 4.3.5 Stream: Mathematical Statistics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other school subject from the designated list of subjects for university admission – 4

OR

- Physical Sciences – 4 (If you are planning to take Physics or Chemistry)

*Continued Study Possibilities*

- This stream leads to an honours programme in Mathematical Statistics.
- If applicable elective modules are taken, this stream also leads to honours programmes in Biomathematics, Computer Science, Economics, Genetics, Mathematics or Operations Research.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

**(credits = 76)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

Choose any modules from the list below to reach your required credit total. Your choice depends on there being no timetable clashes.

**(credits = 64)**

| | |
|---|---|
| Biology | 124(16), 144(16) OR 154(16) |
| Chemistry | 124(16) AND 144(16) |
| Computer Science | 114(16) AND 144(16) |
| Economy | 114(12) AND 144(12) |
| Geo-Environmental Science | 124(16) AND 154(16) |
| Physics | 114(16) AND 144(16) |

## 2nd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Mathematical Statistics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

**(credits = 64)**

Choose modules to a minimum value of 32 credits from the list below.

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Biomathematics | 214(16) |
| Computer Science | 214(16), 244(16) |
| Operations Research | 214(16), 244(16) |
| Physics | 224(16), 254(16) |

You can choose additional modules to a maximum value of 32 credits from the list below to reach the required credit total. Your choice depends on there being no timetable clashes. Please note that the modules in the list below have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Economics | 214(16), 244(16) |
| Genetics | 214(16), 244(16) |
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Geography and Environmental Studies | 214(16) |
| Mathematics | 278(32) |
| Physics | 224(16), 254(16) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Financial Accounting | 288(32) |
| General Linguistics | 278(32) |
| Music Technology | 222(8), 252(8) |

## 3rd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Mathematical Statistics | 318(32), 344(16), 364(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

**(credits = 64)**

Choose any modules to the value of 64 credits from the list below that follow on your second-year modules. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Biomathematics | 314(16), 344(16), 374(16) |
| Computer Science | 314(16), 315(16), 334(16), 344(16), 364(16) |
| Economics | 318(24), 348(24) |
| Financial Mathematics | 378(32) |
| Genetics | 314(16), 324(16), 344(16), 354(16) |
| Geography and Environmental Studies | 358(16) |
| Mathematics | 314(16), 324(16), 325(16), 344(16), 345(16), 365(16), 378(32) |
| Operations Research | 314(16), 324(16), 344(16), 354(16) |
| Physics | 314(16), 344(16), 384(16) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your second year.

| | |
|---|---|
| Financial Accounting | 389(48) |
| Music Technology | 379(48) |

The following additional elective modules are proposed but currently clash on the timetable with compulsory modules and can only be taken in exceptional cases (e.g. by repeaters) and with the permission of the Department of Mathematical Sciences.

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Computer Science | 354(16) |
| Physics | 334(16), 342(8), 352(8) |

### 4.3.6 Stream: Operations Research

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other school subject from the designated list for university admission – 4

OR

- Physical Sciences – 4 (If you are planning to take Physics or Chemistry)

*Continued Study Possibilities*

- This stream leads to an honours programme in Operations Research.
- If applicable elective modules are taken, then this stream also leads to honours programmes in Applied Mathematics, Biomathematics, Computer Science, Economics, Genetics, Mathematical Statistics and Physics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (minimum 132, maximum 140 credits)**

*Compulsory Modules*

**(credits = 76)**

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

**(credits = 56 to 64)**

Choose at least one of the following two subjects. You must take both modules of your chosen subject, thus 32 credits.

| | |
|---|---|
| Computer Science | 114(16), 144(16) |
| Physics | 114(16), 144(16) |

**plus**

You can choose more modules to a minimum value of 24 credits and a maximum of 32 credits from the list below to reach your required credit total. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Biology | 124(16), 144(16) OF 154(16) |
| Chemistry | 124(16), 144(16) |
| Economics | 114(12), 144(12) |
| Geo-Environmental Science | 124(16), 154(16) |

### 2nd year (133 credits)

*Compulsory Modules*

**(credits = 37)**

| | |
|---|---|
| Operations Research | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

**(credits = 96)**

Choose modules to a minimum value of 64 credits from the list below.

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Biomathematics | 214(16) |
| Computer Science | 214(16), 244(16) |
| Mathematical Statistics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Physics | 214(16), 224(16), 244(16), 254(16) |

You can choose additional modules to a maximum value of 32 credits from the list below to reach your required credit total. Your choice depends on there being no timetable clashes. Please note that the modules on the list below have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Economics | 214(16), 244(16) |
| Genetics | 214(16), 244(16) |
| Geographical Information Technology | 211(16), 241(16), 242(16) |
| Geography and Environmental Studies | 214(16) |
| Mathematics | 278(32) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your first year.

| | |
|---|---|
| Financial Accounting | 288(32) |
| General Linguistics | 278(32) |
| Music Technology | 222(8), 252(8) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Operations Research | 314(16), 324(16), 344(16), 354(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

**(credits = 64)**

Choose any of the modules from the list below that follow on your second-year modules. Your choice depends on there being no timetable clashes.

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Biomathematics | 314(16), 344(16), 374(16) |
| Computer Science | 314(16), 334(16), 344(16), 354(16) |
| Economics | 348(24) |
| Financial Mathematics | 378(32) |
| Genetics | 314(16), 324(16), 344(16), 354(16) |
| Mathematical Statistics | 318(32), 344(16), 354(16), 364(16) |
| Mathematics | 378(32) |
| Physics | 314(16), 334(16), 342(8), 344(16), 352(8), 384(16) |

*Please note:* You can also choose the modules below as elective modules if you have completed your first year **before 2016**. These elective modules have prerequisite modules that are elective modules in your second year.

| | |
|---|---|
| Financial Accounting | 389(48) |
| General Linguistics | 379(48) |
| Music Technology | 379(48) |

The following additional elective modules are proposed but currently clash on the timetable with compulsory modules and can only be taken in exceptional cases (e.g. by repeaters) and with the permission of the Department of Mathematical Sciences.

| | |
|---|---|
| Economics | 318(24) |
| Computer Science | 315(16), 364(16) |
| Geography and Environmental Studies | 358(16) |
| Mathematics | 314(16), 324(16), 325(16), 344(16), 345(16), 365(16) |

### 4.3.7 Stream: Abstract Mathematics

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Mathematics – 6
- Any other school subject from the list of designated subjects for university admission – 4

OR

- Physical Sciences – 4 (If you are planning to take Physics or Chemistry)

*Continued Study Possibilities*

- This stream leads to an honours programme in Mathematics.
- If applicable elective modules are taken, then this stream also leads to honours programmes in Applied Mathematics, Biochemistry, Chemistry, Computer Science, Genetics and Physics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

*Please note:* Mathematics is a compulsory major subject in your third year in this stream. Your second major subject is dependent on the curriculum that you choose for your first year.

**1st year (credits = 140)**

*Compulsory Modules*

**Currikulum 3** (if you are planning to take Biochemistry, Chemistry, Genetics or Physics as second major subject)

| | |
|---|---|
| Biology | 124(16), 144(16) OR 154(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 5** (if you are planning to take Chemistry, Computer Science or Physics as second major subject)

| | |
|---|---|
| Chemistry | 124(16), 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 6** (if you are planning to take Applied Mathematics, Chemistry or Physics as second major subject)

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

**or**

**Curriculum 7** (if you are planning to take Applied Mathematics, Computer Science or Physics as second major subject)

| | |
|---|---|
| Applied Mathematics | 144(16) |
| Computer Science | 114(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 114(16) |
| Scientific Communication Skills | 172(8) |

### 2nd year (minimum 133, maximum 149 credits)

*Compulsory Modules*

**(credits = 69)**

| | |
|---|---|
| Mathematics | 214(16), 244(16), 278(32) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

Choose modules to a minimum value of 64 credits and a maximum value of 80 credits from the list below. You must take all modules of your chosen subject(s). Your choice is determined by the second major subject you are planning to take in your third year and depends on there being no timetable clashes.

**(credits = minimum 64, maximum 80)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Biochemistry | 214(16), 244(16) |
| Biometry | 211(16) |
| Chemistry | 214(16), 234(16), 254(16), 264(16) |
| Computer Science | 214(16), 244(16) |
| Genetics | 214(16), 244(16) |
| Physics | 224(16), 254(16) |

### 3rd year (133 credits)

*Compulsory Modules*

**(credits = 37)**

| | |
|---|---|
| Mathematics | 378(32) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

**(credits = 96)**

Choose any of the subject combinations below that follow on your second-year modules. You must take all the modules of your chosen subjects. Your choice depends on there being no timetable clashes.

**If you are planning to take Biochemistry as second major subject**

| | |
|---|---|
| Biochemistry | 315(16), 324(16), 345(16), 365(16) |
| Mathematics | 325(16), 345(16) |

**or**

**If you are planning to take Chemistry as second major subject**

| | |
|---|---|
| Chemistry | 314(16), 324(16), 344(16), 364(16) |
| Mathematics | 314(16), 344(16) |

**or**

**If you are planning to take Physics as second major subject**

| | |
|---|---|
| Mathematics | 325(16), 365(16) |
| Physics | 314(16), 334(16), 342(8), 352(8), 384(16) OF<br>314(16), 334(16), 342(8), 344(16), 372(8) if you are planning to specialise in Theoretical Physics. |

**or**

**If you are planning to take Genetics as second major subject**

| | |
|---|---|
| Genetics | 314(16), 324(16), 344(16), 354(16) |
| Mathematics | 325(16), 344(16) |

**or**

**If you are planning to take Computer Science as second major subject**

| | |
|---|---|
| Computer Science | 314(16), 334(16), 344(16), 354(16) |
| Mathematics | 314(16), 345 (16) |

**or**

**If you are planning to take Applied Mathematics as second major subject**

| | |
|---|---|
| Applied Mathematics | 314(16), 324(16), 354(16), 364(16) |
| Mathematics | 324(16), 344(16) |

**or**

**If you are planning to take only Mathematics as major subject**

| | |
|---|---|
| Mathematics | 314(16), 324(16), 325(16), 344(16), 345(16), 365(16) |

### 4.3.8 Stream: Biomathematics

This stream offers two options. See the sections below for more information on the two options.

#### 4.3.8.1 Option 1: Molecular Biology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Biomathematics.
- If applicable elective modules are taking, this stream also leads to an honours programme in Biochemistry.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

**1st year (140 credits)**

*Compulsory Modules*

**(credits = 124)**

| | |
|---|---|
| Biology | 124(16) |
| Chemistry | 124(16), 144(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16) |
| Probability Theory and Statistics | 144(16) |
| Scientific Communication Skills | 172(8) |

**plus**

*Elective Modules*

Choose one of the following modules.

**(credits = 16)**

| | |
|---|---|
| Computer Science | 114(16) |
| Physics | 144(16) |

### 2nd year (minimum 133, maximum 149 credits)

*Compulsory Modules*

**(credits = 117)**

| | |
|---|---|
| Biochemistry | 214(16), 244(16) |
| Biomathematics | 214(16) |
| Genetics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

**(credits = minimum 16, maximum 32)**

Choose at least one other module to the value of 16 credits from the Mathematical Sciences. Your choice depends on there being no timetable clashes.

### 3rd year (minimum 133, maximum 149 credits)

*Compulsory Modules*

**(credits = 117)**

| | |
|---|---|
| Biochemistry | 315(16), 324(16), 345(16), 365(16) |
| Biomathematics | 314(16), 344(16), 374(16) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

**(credits = minimum 16, maximum 32)**

Choose at least one more module to the value of 16 credits from the Mathematical Sciences. Your choice depends on admission requirements and there being no timetable clashes.

## 4.3.8.2 Option 2: Ecology

*Specific Admission Requirements*

- Afrikaans or English (Home Language or First Additional Language) – 4
- Physical Sciences – 4
- Mathematics – 6

*Continued Study Possibilities*

- This stream leads to an honours programme in Biomathematics.
- If applicable elective modules are taken, then this stream also leads to an honours programme in Mathematical Statistics.

For more information on admission to the honours programme you are considering, please consult the relevant honours programme's details in the chapter "Postgraduate Programmes" of this Calendar part.

### 1st year (140 credits)

*Compulsory Modules*

| | |
|---|---|
| Biology | 124(16), 144(16), 154(16) |
| Computer Skills | 171(4) |
| Mathematics | 114(16), 144(16) |
| Physics | 114(16), 144(16) |
| Probability Theory and Statistics | 144(16) |
| Scientific Communication Skills | 172(8) |

### 2nd year (minimum 133, maximum 149 credits)

*Compulsory Modules*

**(credits = 117)**

| | |
|---|---|
| Biodiversity and Ecology | 214(16), 264(16) |
| Biomathematics | 214(16) |
| Mathematical Statistics | 214(16), 244(16) |
| Mathematics | 214(16), 244(16) |
| Scientific Computing | 272(5) |

**plus**

*Elective Modules*

Choose at least one of the following modules. Your choice depends on there being no timetable clashes.

**(credits = minimum 16, maximum 32)**

| | |
|---|---|
| Applied Mathematics | 214(16), 244(16) |
| Mathematics | 278(32) |

### 3rd year (minimum 133, maximum 149 credits)

*Compulsory Modules*

**(credits = 101)**

| | |
|---|---|
| Biodiversity and Ecology | 324(16) |
| Biomathematics | 314(16), 344(16), 374(16) |
| Mathematical Statistics | 318(32) |
| Scientific Computing | 372(5) |

**plus**

*Elective Modules*

Choose at least two or at the most three of the following modules. Your choice depends on there being no timetable clashes.

**(credits = minimum 32, maximum 48)**

| | |
|---|---|
| Applied Mathematics | 354(16), 364(16) |
| Biodiversity and Ecology | 364(16)<br>Biodiversity and Ecology 364 and Mathematical Statistics 344 clash on the timetable and cannot be taken together. |
| Mathematical Statistics | 344(16), 364(16)<br>If you are planning to take both Mathematical Statistics 344 and 364, then you can also register for Mathematical Statistics 354(16) if you are considering an honours programme in Mathematical Statistics. |
| Mathematics | 325(16), 345(16), 378(32) |

# Postgraduate Programmes

For more information on the Faculty's postgraduate programmes, consult the University's Postgraduate Prospectus or the departmental websites.

## 1. Summary of postgraduate programmes

The undergraduate programmes offered in the Faculty of Science lead to the following postgraduate programmes in the Faculty of Science and in other faculties:

| Postgraduate Programme | Offered by Faculty of Science | Offered by other Faculties |
|---|---|---|
| BScHons (Biological Sciences) | Biochemistry; Biodiversity and Ecology; Microbiology; Physiological Sciences | *Faculty of AgriSciences:* Applied Plant Physiology; Genetics; Plant Biotechnology; Plant Pathology; Wine Biotechnology *Faculty of Arts and Social Sciences:* Psychology *Faculty of Education*: Biokinetics; Sport Science |
| BScHons (Physical Sciences) | Chemistry; Earth Sciences; Physics; Polymer Science; Theoretical Physics | *Faculty of Arts and Social Sciences:* GeoInformatics |
| BScHons (Mathematical Sciences) | Applied Mathematics; Computer Science; Mathematics; Physical and Mathematical Analysis | *Faculty of Economic and Management Sciences:* Mathematical Statistics; Operations Research |
| MSc (Biological Sciences) | Biochemistry; Botany; Exercise Science; Microbiology; Physiological Sciences; Zoology | *Faculty of AgriSciences:* Entomology; Genetics; Plant Biotechnology; Wine Biotechnology *Faculty of Arts and Social Sciences:* Clinical Psychology and Community Counselling; Psychology *Faculty of Education*: Sport Science |

| | | |
|---|---|---|
| MSc (Physical Sciences) | Chemistry; Geology; Polymer Science; Physics | *Faculty of Arts and Social Sciences:*<br>Geography and Environmental Studies; GeoInformatics |
| MSc (Mathematical Sciences) | Applied Mathematics; Computer Science; Mathematics; Physical and Mathematical Analysis | *Faculty of Economic and Management Sciences:*<br>Mathematical Statistics; Operations Research |
| PhD | Applied Mathematics; Biochemistry; Botany; Chemistry; Computer Science; Geology; Mathematics; Microbiology; Physical and Mathematical Analysis; Physics; Physiological Sciences; Polymer Science; Zoology | *Faculty of AgriSciences:*<br>Entomology; Genetics; Plant Biotechnology; Wine Biotechnology<br>*Faculty of Arts and Social Sciences:*<br>Geography and Environmental Studies; Psychology<br>*Faculty of Economic and Management Sciences:*<br>Mathematical Statistics; Operations Research |
| DSc | Applied Mathematics; Biochemistry; Botany; Chemistry; Computer Science; Geology; Mathematics; Microbiology; Physics; Physiological Sciences; Polymer Science; Zoology | *Faculty of AgriSciences:*<br>Entomology; Genetics; Wine Biotechnology |

# 2. General information on the postgraduate programmes

## 2.1 BScHons degree

2.1.1 The degree BScHons can be awarded to you if you –

2.1.1.1 have obtained a Bachelor's degree approved by Senate for this purpose and upon written application, were admitted to the BScHons programme; and

2.1.1.2 have been registered as a student of the University for at least one year (after obtaining the Bachelor's degree), have passed the prescribed written examination and successfully completed an oral examination.

2.1.2 The BScHons programme is taken in one of the majors of the BSc according to the provisions of the BSc programme. Students, who followed a BSc programme that does not lead to a BScHons programme, may be accepted to a BScHons programme provided

that the BScHons programme can only begin after an examination in the required subject or subjects was successfully completed.

2.1.3 An average final mark of at least 60% in the major or prescribed modules in the final year of study is required for admission to a BScHons programme in the major in question. If you do not comply with this requirement, you may only be accepted to a BScHons programme if a recommendation has been made by the department concerned and with the special approval of the Faculty Committee of the Faculty of Science.

2.1.4 Specific provisions concerning BScHons programmes in specific subjects are given under the module content of the applicable subjects.

2.1.5 BScHons students are not allowed to take any additional third-year subject that includes practical work in the first year of the BScHons. However, if the BScHons programme concerned does not require practical work, you can, depending on the approval of the Faculty Board, be allowed to take an additional third-year subject.

## 2.2 MSc degree

2.2.1 The MSc degree can be awarded to you if you –

2.2.1.1 have obtained an honours degree approved by Senate for this purpose and upon written application, have been admitted to the proposed MSc programme; and

2.2.1.2 have followed an approved programme of research or advanced study of at least one year after obtaining the BScHons degree) at this University or at any other place approved by Senate; and

2.2.1.3 have submitted a satisfactory thesis or assignment, depending on the requirements of the department concerned, and have completed an oral examination.

2.2.2 Specific provisions concerning MSc programmes in specific subjects are given in the module content of the subjects concerned.

2.2.3 MSc students are not allowed to take any additional third-year subject that includes practical work in the first year of the MSc. However, if the MSc programme concerned does not require practical work, you can, depending on the approval of the Faculty Board, be allowed to take an additional third-year subject.

**Please note:** For the regulations regarding attendance, examiners, thesis requirements, submission and binding of theses, etcetera, consult the section "Postgraduate Qualifications" in Part 1 (General) of the University's Calendar.

## 2.3 PhD degree

2.3.1 The PhD degree can be awarded to you if you –

2.3.1.1 have obtained a Master's degree approved by Senate for this purpose, or have achieved a level of competence in a particular field of study that Senate considers suitable for the purpose, and upon written application been accepted by Senate to the PhD programme; and

2.3.1.2 have followed an approved programme of research and possible supplementary study, which may include a period of research at another place approved by

Senate, for at least two years after obtaining the above-mentioned Master's degree or after gaining the above-mentioned level of competence; and

2.3.1.3 have submitted a satisfactory dissertation; and

2.3.1.4 have completed an oral examination.

**Please note:** For the regulations regarding attendance, examiners, dissertation requirements, submission and binding of dissertations, etcetera, consult the section "Postgraduate Qualifications" in Part 1 (General) of the University's Calendar.

## 2.4 DSc degree

2.4.1 As a candidate for the DSc degree you must –

2.4.1.1 have conducted advanced, original research or creative work, to the satisfaction of the University, in the field of the natural sciences;

2.4.1.2 have submitted original work(s) of a high standard that has already been published, on a central theme, making a substantial contribution of high quality, in the view of Senate, to the enrichment of knowledge in the field of the natural sciences; and

2.4.1.3 have completed an oral examination to the satisfaction of the University.

2.4.2 If you already hold a PhD degree from the Faculty of Science or any other qualification that Senate considers an equivalent, then you must –

2.4.2.1 have been registered at this University for the DSc degree for at least one academic year before the degree can be awarded to you and at least five years must have passed after obtaining the PhD degree, or another degree or qualification that is considered to be equally acceptable, before being awarded the DSc degree; and

2.4.2.2 have notified the Registrar in writing of the intention to be a candidate for the degree at least one year before presenting yourself for the degree and provided the title(s) and scope of the proposed work(s). Once Senate accepts the application, a supervisor and examiners will be appointed.

2.4.3 If you hold an MSc degree from the Faculty of Science or any other qualification that the Senate considers an equivalent, you must –

2.4.3.1 have been registered at this University for the DSc degree for at least three academic years before the degree can be awarded to you and at least seven years must have passed after obtaining the MSc degree, or another degree that is considered an equivalent, before being awarded the DSc degree; and

2.4.3.2 have notified the Registrar in writing of the intention to be a candidate for the degree at least three years before presenting yourself as a candidate and provided the title(s) and scope of the proposed work(s). Once Senate accepts the application, a supervisor and examiners will be appointed.

2.4.4 You must submit one copy of the work(s) that you want to present per examiner before 1 September (if you want to graduate in December), or before 1 December of the previous year (if you want to graduate in March) at the University office. The copies must be accompanied by a written statement that it is your original work and that the work has not been submitted to this or any other university for the purpose of obtaining any degree. If a substantial part of the submitted work was published under your name and that of another author, then you must submit satisfactory testimony detailing which part of the work was done by you. Furthermore you must mention who started the work, under whose supervision the work was done, who did the work, processed and submitted it to paper, and, if applicable, what part of the work was submitted to any university for the purposes of obtaining a degree.

## 3. Interruption of master's or doctoral studies

### 3.1 Acceptable reasons for interruption of studies

All requests for the interruption of your studies must be supported by appropriate supporting documents, such as a letter of appointment, work assignment, medical certificate(s), financial statement(s), affidavit, etcetera. The following possible reasons for the interruption of master's or doctoral studies serve as acceptable guidelines when dealing with these requests:

3.1.1 Work situation;

3.1.2 Medical reasons;

3.1.3 Financial reasons; or

3.1.4 Highly special personal circumstances if thoroughly and convincingly supported.

### 3.2 Procedure to apply for permission to interrupt studies

3.2.1 Any applications for permission to interrupt master's or doctoral studies must reach the faculty secretary on or before 30 April of the year concerned. No applications will be considered after 30 April of the academic year concerned.

3.2.2 Permission to interrupt studies will be considered on the recommendation of the supervisor and the chairperson of the department concerned.

3.2.3 Applications that are approved according to the internal procedure of each faculty must be entered in the next report of communication of the Faculty Board to Senate.

3.2.4 Permission to interrupt studies will be approved for a period of at least one year.

3.2.5 Approval to interrupt master's studies is normally given only once and for a period of only one year.

3.2.6 Approval to interrupt doctoral studies is normally given only twice for a period of one year each or given only once for a period of two years during the duration of the studies.

## 4. Conversion from master's to doctoral studies

In deserving cases, and with regard to your best interests as a student, the Faculty Board can consider and recommend that your registration for the MSc degree (which includes a thesis) be converted to registration for the PhD degree, provided that –

4.1 you have shown exceptional progress with conducted research after at least one year's study. The application for conversion must be done within 18 months of registration for the MSc and is limited to exceptional students who can be assessed on tangible outputs. Also see point 4.4 below;

4.2 in the course of the work done for your MSc study new and original insights have emerged that deserve further research at a doctoral level. The conversion of the study requires more than simply increasing the volume of data and also more than adding techniques to address the questions that were formulated at the start of the MSc. There must be clear evidence of a conceptual expansion or intellectual leap from the MSc;

4.3 the work done for the master's study exceeds the conventional MSc study in terms of scope and cannot reasonably be separated into an MSc component and a PhD component;

4.4 the outputs, which can be incremental, may include:

- 4.4.1 excellent progress as evident from the six-month evaluations and/or an annual report;
- 4.4.2 conference participation (either oral or poster presentations);
- 4.4.3 peer-reviewed publications in journals of high quality (including those in review/in press); and
- 4.4.4 some other acceptable form of peer evaluation;

4.5 the proposal for the conversion of MSc to PhD studies is initiated by the supervisor, who makes a request in writing to the relevant departmental chair. If the chair supports the request, the request is presented to the Dean in writing. If the supervisor is also the departmental chair, the request is made directly and in writing to the Dean. After approval by the Dean, the department appoints a committee of three or four members whose subject expertise equips them to judge the request. It is preferable that one of the members is not a staff member of Stellenbosch University. After consulting with the supervisor, you must (i) compile a report of the progress you made with the master's study and (ii) submit a written PhD research proposal that justifies the expansion of the philosophical or conceptual component of the study. As with new PhD studies, you will be required to defend the research proposal in an oral presentation. The committee will consider the oral presentation, the progress report and the PhD research proposal and make a recommendation for consideration by the Faculty Board;

4.6 you must be registered for at least three years in the instance of an MSc after an honours degree before the PhD degree can be awarded. At least one of those years you must be registered for the PhD degree;

4.7 in cases where written examinations are required for the master's study in question, you must have taken and passed all examinations before the PhD degree is awarded to you; and

4.8 tuition fees will not be adjusted retrospectively after the conversion.

# 5. Postgraduate programmes per department

## 5.1 Department of Biochemistry

### 5.1.1 BScHons in Biochemistry

*Programme Code*

11053 – 778 (120)

*Specific Admission Requirements*

- An applicable BSc degree with Biochemistry 214, 244, 315, 324, 345 and 365 or equivalent third-year Biochemistry modules.
- An average final mark of at least 60% for third-year Biochemistry.
- Proficiency in both written and spoken English.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Programme Structure*

The honours programme in Biochemistry is compiled annually and consists of a research project (741(60)), a seminar (742(10)) and five modules of ten credits each on topics selected by the Department from modules 711-718 below. This selection is compulsory for the students of the particular year.

*Duration of Programme*

The duration of the programme is normally one year and begins two weeks before the general start of classes.

*Programme Content*

The following modules are used to compile the honours programme annually.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11412 | 711 | 10 | Practical Protein Biochemistry | 1 |
| 11413 | 712 | 10 | Steroid Hormones | 1 |
| 11414 | 713 | 10 | Cytochrome P450 | 1 |
| 11415 | 714 | 10 | Systems Biology | 1 |
| 11416 | 715 | 10 | Gene Expression | 1 |
| 11419 | 716 | 10 | Advanced Metabolism | 1 |
| 11418 | 717 | 10 | Specialised Topics | 1 |
| 11420 | 718 | 10 | Chemical Biology Topics | 1 |
| 54895 | 741 | 60 | Research project (Biochemistry) | 2 |
| 18325 | 742 | 10 | Seminar | 2 |

*Assessment and Examination*

The programme is assessed continuously and the final mark is calculated as a weighted mark according to the credit values of each module.

### 5.1.2 MSc in Biochemistry

*Programme Code*

11053 – 878(180)

*Specific Admission Requirements*

- An applicable BScHons degree or other qualification approved by the Senate.
- Lecturers may require supplementary studies from you.

*Programme Content*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66206 | 818 | 180 | Thesis Biochemistry | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral presentation. An oral examination may also be required.

### 5.1.3 PhD in Biochemistry

*Programme Code*

11053 – 978 (360)

*Programme Description*

For the PhD degree a dissertation that contains the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

### 5.1.4 DSc in Biochemistry

*Programme Code*

11053 – 998 (360)

*Programme Description*

For the DSc degree a number of published scientific papers of exceptional standard, which contributed significantly to the knowledge and expansion of Biochemistry, are required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

## 5.2 Department of Botany and Zoology

### 5.2.1 BScHons in Biodiversity and Ecology

*Programme Code*

53953 – 778 (120)

*Specific Admission Requirements*

- A BSc degree approved by the Departmental Postgraduate and Academic Committees, with an average final mark of at least 60% for the appropriate modules at third-year level.
- Supplementary work may be prescribed by the Department depending on your background.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*General Programme Information*

The primary aim of the BScHons programme in Biodiversity and Ecology is to provide students with training and experience of the process of identifying research questions, making original discoveries in science and effectively communicating the findings. You will also receive practical training in relevant modern experimental techniques and be exposed to theoretical training in a number of biological sub-disciplines. The programme provides an effective bridging year if you are interested in pursuing advanced postgraduate degrees in various biological fields, but also provides you with key skills applicable to different market-orientated career choices. The programme places emphasis on three aspects in the educational process:

- The development of a satisfactory knowledge base;
- The development of a wide-ranging practical and theoretical capability; and
- The development of a professional scientific-methodological and ethical approach.

The programme includes theoretical work, seminars, practical tasks, independent research work and independent consultation of the broader biological literature. An honours student, it is required from you to attend departmental seminars and to serve as an undergraduate demonstrator.

*Programme Structure*

The programme consists of three components:

- A research project;
- A generic scientific skills module; and
- Theoretical topics in biodiversity science.

*Duration of Programme*

The minimum duration of the programme is one year and begins with the start of the academic year.

*Programme Content*

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66184 | 715 | 24 | Generic Scientific Skills | 2 |
| 55867 | 717 | 60 | Research Project | Both |
| 12249 | 796 | 36 | Theoretical Topics in Biodiversity Sciences | Both |

*Assessment and Examination*

- Assessment includes two oral examinations, written examinations, assignments, book reviews, seminars, a research project and a poster on the research project, and the production of a popular article.
- For successful completion of the honours programme, you must complete the generic scientific skills module, a module on theoretical topics in biodiversity science and a research project.
- You must pass each of the three components with a final mark of at least of 50%.

### 5.2.2 Postgraduate Programmes in Botany

#### 5.2.2.1 MSc in Botany

*Programme Code*

59404 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Biodiversity and Ecology or an approved equivalent qualification.
- The Department may also require supplementary study such as formal classes and/or seminars on specific aspects from you.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Description*

Independent research on an approved subject as determined by the supervisor(s) and leading to a thesis is required.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66303 | 818 | 180 | Thesis Botany | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral examination.

#### 5.2.2.2 PhD in Botany

*Programme Code*

59404 – 978 (360)

*Programme Description*

A publication-ready dissertation containing the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

#### 5.2.2.3 DSc in Botany

*Programme Code*

59404 – 998 (360)

*Programme Description*

For this degree, published research articles of a high international standard that contribute to the enrichment of knowledge in Botany, are required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.2.3 Postgraduate Programmes in Zoology

#### 5.2.3.1 MSc in Zoology

*Programme Code*

59412 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Biodiversity and Ecology or an approved equivalent qualification.
- The Department may require supplementary studies such as formal classes and/or seminars on specific aspects.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Content*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66338 | 818 | 180 | Thesis Zoology | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral examination.

#### 5.2.3.2 PhD in Zoology

*Programme Code*

59412 – 978 (360)

*Programme Description*

A publication ready dissertation containing the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

#### 5.2.3.3 DSc in Zoology

*Programme Code*

59412 – 998 (360)

*Programme Description*

For this degree, published research articles of a high international standard that significantly contribute to the enrichment of knowledge in Zoology, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

## 5.3 Department of Chemistry and Polymer Science

### 5.3.1 Postgraduate Programmes in Chemistry

#### 5.3.1.1 BScHons in Chemistry

*Programme Code*

11479 – 778 (120)

*Specific Admission Requirements*

- A BSc degree with Chemistry as major.
- An average final mark of at least 60% for Chemistry 3 and pass marks in Mathematics 114 and 144.
- The departmental committee that gives final approval for admission can impose additional requirements, for example if you performed poorly in a particular module.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Duration of Programme*

The programme normally extends over one year and usually begins one week before the general start of classes.

*Programme Content*

The programme consists of the following compulsory modules.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10382 | 711 | 20 | Analytical techniques | 1 |
| 10638 | 712 | 20 | Organic chemistry | 1 |
| 10462 | 713 | 20 | Physical chemistry | 1 |
| 10384 | 714 | 20 | Inorganic chemistry | 1 |
| 56030 | 741 | 10 | Special topics in Chemistry | 2 |
| 63258 | 744 | 30 | Research project in Chemistry | 2 |

*Assessment and Examination*

All modules in this honours programme, with the exception of the research project, are assessed through a combination of theory, practical work and an examination. The research project is assessed based on submission of a final research report and an oral presentation. The final mark is calculated as a weighted mark according to the credit value of each module. To obtain this honours degree you must achieve a final mark of 50% and pass each module with 50%.

### 5.3.1.2 MSc in Chemistry

*Programme Code*

11479 – 878 (180)

*Specific Admission Requirements*

- An applicable BScHons degree or other qualification as approved by the Senate.

*Programme Content*

An independent research project on an approved topic as determined by your supervisor(s) and leading to a thesis, is required. Supplementary studies as determined by the supervisor(s) may also be required.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66214 | 818 | 180 | Thesis Chemistry | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral presentation.

### 5.3.1.3 PhD in Chemistry

*Programme Code*

11479 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent, original research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

### 5.3.1.4 DSc in Chemistry

*Programme Code*

11479 – 998 (360)

*Programme Description*

For the DSc degree a body of already published scientific work(s) of a high standard that have made a significant and outstanding contribution to the enrichment of knowledge in Chemistry, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.3.2 Postgraduate Programmes in Polymer Science

#### 5.3.2.1 BScHons in Polymer Science

*Programme Code*

40789 – 778 (120)

*Specific Admission Requirements*

- A BSc degree with Chemistry as major and an average final mark of at least 60% for Chemistry 3, or a BEng degree (Chemical Engineering).
- If you have not done at most one of the third-year modules (Chemistry 314, 324, 344 or 364) due to the specific requirements of the BSc degree in question, the Department will take your final marks of the other main subject(s) of the degree programme in question into consideration.
- The departmental committee gives final approval for admission and may impose additional requirements.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Duration of Programme*

The programme normally extends over one year and begins one week before the normal start of classes.

*Programme Content*

This programme has two streams, namely Polymer Science, and Textile and Polymer Science. The curricula of the two streams are set out below.

**Polymer Science stream**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10382 | 711 | 20 | Analytical techniques | 1 |
| 10490 | 712 | 20 | Advanced Analytical Polymer Science | 1 |
| 10658 | 724 | 20 | Polymer Chemistry | 1 |
| 10463 | 744 | 15 | Physical Polymer Science | 2 |
| 11421 | 754 | 15 | Special Topics in Polymer Science | 2 |
| 64440 | 714 | 30 | Research Project in Polymer Science | 2 |

**Textile and Polymer Science stream**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10382 | 711 | 20 | Analytical techniques | 1 |
| 10490 | 712 | 20 | Advanced Analytical Polymer Science | 1 |
| 10658 | 724 | 20 | Polymer Chemistry | 1 |
| 10463 | 744 | 15 | Physical Polymer Science | 2 |
| 12237 | 764 | 15 | Special Topics in Textile Science | 2 |
| 12236 | 734 | 30 | Research Project in Polymer Science | 2 |

*Assessment and Examination*

All modules in this honours programme, with the exception of the research project, are assessed through a combination of theory, practical work and an examination. The research project is assessed based on submission of a final research report and an oral presentation. The final mark is calculated as a weighted mark according to the credit value of each module. To obtain this honours degree you must achieve a final mark of 50% and pass each module with 50%.

### 5.3.2.2 MSc in Polymer Science

*Programme Code*

40789 – 878 (180)

*Programme Description*

An independent research project on an approved topic as determined by your supervisor(s) and leading to a thesis, is required. Supplementary studies as determined by the supervisor(s) may also be required.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66230 | 818 | 180 | Thesis Polymer Science | Both |

*Assessment and Examination*

On completion of the research, you must submit a thesis for examination to the satisfaction of the examiners and complete an oral examination.

### 5.3.2.3 PhD in Polymer Science

*Programme Code*

40789 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent, original research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

### 5.3.2.4 DSc in Polymer Science

*Programme Code*

40789 – 998 (360)

*Programme Description*

For the DSc degree a body of already published scientific work(s) of a high standard that have made a significant and outstanding contribution to the enrichment of knowledge in Polymer Science, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

## 5.4 Department of Earth Sciences

### 5.4.1 BScHons in Earth Sciences

*Programme Code*

12918 – 778 (120)

*Specific Admission Requirements*

- A BSc degree with Geology as major.
- An average final mark of at least 65% for Geology 3.
- If you obtained an average final mark of 55 – 64% for Geology 3, you will be considered for honours. However, the Department of Earth Sciences can decide to evaluate all applications individually.
- If you have obtained a final mark between 55 and 59% for Geology 3 and you are recommended by the Department for admission to the honours programme, you must also be approved by the Faculty Board of the Faculty of Science.
- Basic computer skills.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Programme Structure*

The honours programme in Earth Sciences is composed of three compulsory modules, a research project and two further modules from one of two streams. The streams are:

- Applied Geology; and
- Environmental Geochemistry.

The content of each of these modules is further divided into sections at the departmental level and may vary from year to year. The Department can decide not to offer a given module or stream depending on staff availability and student numbers. The specific content of streams and modules for each year is provided before the start of the honours year. You can take elements of different modules in consultation with your supervisors and the honours co-ordinator.

*Duration of Programme*

The duration of the programme is one year, starting on the first weekday in February.

*Programme Content*

*Compulsory modules*

**(credits = 80)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 12240 | 771 | 15 | Geology of Southern Africa | Both |
| 12241 | 772 | 15 | Research Methods in Earth Sciences | Both |
| 12242 | 773 | 15 | Special Topics in Earth Science | Both |
| 54895 | 795 | 35 | Research project | Both |

*Choose one of the following streams*

**Stream A – Applied Geology (credits = 40)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 12243 | 712 | 20 | Concepts in Crustal Evolution | 1 |
| 12247 | 742 | 20 | Economic Geology | 2 |

**Stream B – Environmental Geochemistry (credits = 40)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 12244 | 714 | 20 | Hazardous Waste Site Assessment | 1 |
| 12275 | 744 | 20 | Environmental Systems | 2 |

*Assessment and Examination*

All modules in this honours programme, with the exception of the research project, are assessed through a combination of theory, practical work and an examination. The research project is assessed based on submission of your final research report and an oral presentation. To obtain the honours degree you must pass all modules with a 50% sub-minimum.

### 5.4.2 MSc in Geology

*Programme Code*

13374 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Geology or an approved equivalent qualification.
- Supplementary studies may be required from you before beginning research.

*Programme Content*

An independent research project on a specific topic that may entail field research/laboratory research, as determined by your supervisor(s) and leading to a thesis, is required.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66273 | 818 | 180 | Thesis Geology | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral examination.

### 5.4.3 PhD in Geology

*Programme Code*

13374 – 978 (360)

*Programme Description*

A dissertation that is the product of your personal and independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

### 5.4.4 DSc in Geology

*Programme Code*

13374 – 998 (360)

*Programme Description*

A compilation of scientific publications contributing substantially and at a high level to the body of knowledge in Geology, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

## 5.5 Department of Mathematical Sciences

### 5.5.1 Division: Mathematics

#### 5.5.1.1 BScHons in Mathematics

*Programme Code*

21539 – 797 (128)

*Programme Description*

This honours programme has a focus in Mathematics or Biomathematics. The minimum credit requirement per focus area is 128.

*Specific Admission Requirements*

- A BSc degree with Mathematics as major or an equivalent qualification.
- A final mark of at least 60% for Mathematics 3.
- For the Biomathematics focus, you must have a BSc degree approved by the Biomathematics programme committee with an average mark of at least 60% for the relevant third-year modules.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Promotion Rules*

In order to obtain this agree you need to:

- achieve an average (weighted according to the credit values of the nine modules) of at least 50%;
- achieve at least 50% in each 16 credit first semester module, as well as in the project;
- achieve at least 50% in each of at least two of the four 8 credit second semester modules; and
- achieve a subminimum of 45% in (each of) the remaining second semester module(s).

*Programme Structure*

A programme will be developed for you as student depending on your background and preferences. You can, with the permission of the Mathematics Division, take a maximum of the equivalent of half of the programme outside the Mathematics Division. In each semester you must take honours modules to the value of at least 64 credits. In the second semester one of these modules is a research project. The modules you choose give a focus to the BScHons in Mathematics. This focus will be discussed with you to design an appropriate curriculum.

More information about the honours programme is available on the website of the Department of Mathematical Sciences at http://mathsci.sun.ac.za.

*Duration of Programme*

The duration of the programme is one year and begins in the first week of February.

*Programme Content*

The following table contains the modules for the focus in **Mathematics.**

*First Semester*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10378 | 711 | 16 | Algebra (PP Mathematics 314 or 378) | 1 |
| 11202 | 712 | 16 | Functional Analysis and Measure Theory (PP Mathematics 365 or 378) | 1 |
| 62987 | 713 | 16 | Real and Complex Analysis (PP Mathematics 324, 365) | 1 |
| 62871 | 714 | 16 | Set Theory and Topology (PP Mathematics 365 or 378) | 1 |

*Second Semester*

Depending on the interest shown and the availability of lecturers the following modules will be presented.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11493 | 747 | 8 | Algebraic Number Theory | 2 |
| 11494 | 748 | 8 | Computational Algebra | 2 |
| 20405 | 749 | 8 | Wavelet analysis | 2 |
| 66389 | 751 | 8 | Functional Analysis II | 2 |
| 66397 | 752 | 8 | Measure Theory II | 2 |
| 64400 | 753 | 8 | Category Theory | 2 |
| 66419 | 754 | 8 | Logic | 2 |
| 66427 | 755 | 8 | Concrete Mathematics | 2 |
| 66435 | 756 | 8 | Topics in Algebra | 2 |
| 12250 | 757 | 8 | Complex Analysis II | 2 |
| 12251 | 758 | 8 | Hilbert Spaces | 2 |
| 12252 | 759 | 8 | Topological Vector Spaces | 2 |

Additional *capita selecta* modules are offered each year, subject to the research interests of students, teachers and visiting academics. These modules will be announced in the first semester. Visit the departmental website at http://mathsci.sun.ac.za for the current offering of modules.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 62928 | 741 | 8 | Capita selecta I | 2 |
| 62979 | 742 | 8 | Capita selecta II | 2 |
| 62936 | 743 | 8 | Capita selecta III | 2 |
| 11204 | 744 | 8 | Capita selecta IV | Both |
| 63002 | 745 | 8 | Capita selecta V | 2 |
| 11203 | 760 | 8 | Advanced Analysis | 2 |
| 12550 | 761 | 8 | Advanced Abstract Algebra | 2 |
| 12551 | 762 | 8 | Number theory | 2 |
| 56847 | 763 | 8 | Financial Mathematics I | 2 |
| 56847 | 765 | 8 | Financial Mathematics 2 | 2 |

An honours project that introduces you to a research theme is completed in the second semester.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 62944 | 746 | 32 | Mathematics: Honours project | 2 |

The following table contains the modules for the focus in **Biomathematics.**

*First Semester* (Specific modules are offered in collaboration with the African Institute for Mathematical Sciences – AIMS)

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11779 | 721 | 16 | Computational and discrete methods in Bio-Mathematics | Both |
| 11780 | 722 | 16 | Non-linear Dynamical Systems in Bio-Mathematics | Both |
| 11781 | 723 | 8 | Advanced Topics in Bio-Mathematics I | Both |
| 11782 | 724 | 8 | Advanced Topics in Bio-Mathematics II | Both |
| 11785 | 725 | 8 | Selected topics from biological sciences | Both |
| 11786 | 726 | 8 | Selected topics from biomedical sciences | Both |

These modules are offered in collaboration with the African Institute for Mathematical Sciences at their building in Muizenberg.

*Second Semester*

You complete an honours project on a research topic involving the application of mathematical, computational and/or statistical methods to analyse and solve problems in biological sciences, environmental sciences and biomedical sciences.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11787 | 747 | 32 | Biomathematics: Honours project | Both |
| 12553 | 748 | 16 | Advanced Topics in Biomathematics III | 2 |
| 12554 | 749 | 8 | Advanced Topics in Biomathematics IV | 2 |

**plus**

*Elective Modules*

**(8 credits)**

You can take any honours module in consultation with the Biomathematics programme committee and if it complies with specific prerequisites.

### 5.5.1.2 MSc in Mathematics

*Programme Code*

21539 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Mathematics or an approved equivalent qualification.
- The Department can require supplementary studies in consultation with you and your supervisor.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Description*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11201 | 818 | 180 | Thesis Mathematics | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis to the satisfaction of the examiners and do an oral examination.

*Enquiries*

Contact the chair of the Department of Mathematical Sciences for more information on the MSc degree in Mathematics.

### 5.5.1.3 PhD in Mathematics

*Programme Code*

21539 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

#### 5.5.1.4 DSc in Mathematics

*Programme Code*

21539 – 998 (360)

*Programme Description*

For this degree published scientific work(s) of a high standard, which have made a substantial and outstanding contribution to the knowledge of Mathematics, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.5.2 Division: Applied Mathematics

#### 5.5.2.1 BScHons in Applied Mathematics

*Programme Code*

20710 – 797 (128)

*Specific Admission Requirements*

- A BSc degree with Applied Mathematics as major or another qualification recognised as equivalent by the Senate.
- An average final mark of at least 60% for Applied Mathematics 3.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Duration of Programme*

The duration of the programme is one year and begins with the start of the academic year.

*Programme Content*

The minimum credits required are 128. You can take some modules at other departments with the permission of the Division Applied Mathematics. The following modules are offered:

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10381 | 781 | 16 | Analytical methods of Applied Mathematics | Both |
| 36323 | 776 | 16 | Numerical methods | Both |
| 10643 | 774 | 16 | Partial Differential Equations (Students who have taken Applied Mathematics 364 are not allowed to take Partial Differential Equations 774 as well). | Both |
| 10542 | 782 | 16 | Graph Theory | 2 |
| 62782 | 784 | 16 | Coding Theory | Both |
| 10728 | 794 | 16 | Tensor Analysis | 2 |

| | | | | |
|---|---|---|---|---|
| 62820 | 775 | 16 | Numerical Simulation of Fluids | Both |
| 62839 | 791 | 16 | Porous media | Both |
| 62812 | 773 | 16 | Numerical Modelling | Both |
| 64572 | 793 | 16 | Digital Image Processing | 2 |
| 62847 | 792 | 16 | Computer Vision | 2 |
| 62855 | 796 | 16 | Statistical Pattern Recognition | Both |
| 11380 | 711 | 10 | X-ray Tomography | Both |
| 12253 | 761 | 8 | Capita selecta I | 2 |
| 12255 | 762 | 8 | Capita selecta II | 2 |
| 12256 | 763 | 16 | Capita selecta III | 2 |
| 12257 | 764 | 16 | Capita selecta IV | 2 |
| 10557 | 772 | 32 | Research Project in Applied Mathematics | Both |

The Research Project in Applied Mathematics is compulsory. Not all other modules will necessarily be offered every year and the Division can decide to make certain modules compulsory.

*Assessment and Examination*

All modules are assessed continuously. To obtain this honours degree you must achieve a final mark of at least 50% in each module, including the project.

### 5.5.2.2 MSc in Applied Mathematics

*Programme Code*

20710 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Applied Mathematics or an approved equivalent qualification.
- The Department can require supplementary studies from you which may be considered when calculating your final mark.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Description*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66354 | 818 | 180 | Thesis Applied Mathematics | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis to the satisfaction of the examiners and do an oral examination.

#### 5.5.2.3 PhD in Applied Mathematics

*Programme Code*

20710 – 978 (360)

*Programme Description*

A dissertation containing the results of your original research on a topic in Applied Mathematics is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

#### 5.5.2.4 DSc in Applied Mathematics

*Programme Code*

20710 – 998 (360)

*Programme Description*

For this degree previously published work(s) of a high standard which make a substantial and outstanding contribution to the enrichment of knowledge in Applied Mathematics, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.5.3 Division: Computer Science

#### 5.5.3.1 BScHons in Computer Science

*Programme Code*

18139 – 797 (128)

*Programme Description*

This Honnours programme has two streams, namely Computer Science and Data Science. The minimum credits required per stream are 128.

*Specific Admission Requirements*

- A Bachelors degree with Computer Science as major, or an equivalent qualification.
- An average final mark of at least 60% for Computer Science 3.
- For the Stream Data Science, Mathematical Statistics 2, or an equivalent qualification is also required.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Programme Structure*

**Stream Computer Science**

This stream consists of 6 modules of 16 credits each, as well as a compulsory programming project of 32 credits. At most two modules may be taken from related departments with the permission of the Department of Mathematical Sciences (Division Computer Science). Not all modules are necessarily offered each year.

**Stream Data Science**

This stream consists of 4-6 compulsory modules which includes a compulsory programming project. The remaining credits to reach the required credit total are modules in Computer Science or selected modules in Mathematical Statistics. Not all modules are necessarily offered each year.

*Duration of Programme*

The duration of the programme is one year and begins with the start of the academic year.

*Programme Content*

**Stream Computer Science**

**(credits = 128)**

*Compulsory Modules*

**(credits = 32)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 63444 | 771 | 32 | Honours Project in Computer Science | Both |

**plus**

*Elective Modules*

**(credits = 96)**

Choose 6 modules to the value of 96 credits from the list below.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 63452 | 711 | 16 | Automata Theory and Applications | 1 |
| 64947 | 712 | 16 | Advanced Algorithms | 1 |
| 64955 | 713 | 16 | Theoretical Computer Science | 1 |
| 64963 | 714 | 16 | Concurrent Programming 1 | 1 |
| 63401 | 715 | 16 | Databases | 1 |
| 64971 | 716 | 16 | Advanced Topics in Computer Science 1 | 2 |
| 11788 | 741 | 16 | Machine Learning | Both |
| 64998 | 742 | 16 | Computer Graphics | 2 |
| 65005 | 743 | 16 | Simulation of Networks | 1 |
| 65013 | 744 | 16 | Concurrent Programming 2 | 2 |

| | | | | |
|---|---|---|---|---|
| 65021 | 745 | 16 | Software Construction | 1 |
| 65048 | 746 | 16 | Advanced Topics in Computer Science 2 | 2 |
| 12264 | 747 | 16 | Biological Sequence Analysis | 2 |
| 11261 | 748 | 16 | Software Development for Mobile Devices | Both |
| 62847 | 792 | 16 | Computer Vision | 2 |
| 64572 | 793 | 16 | Digital Image Processing | 2 |
| 62855 | 796 | 16 | Statistical Pattern Recognition | Both |

**Stream Data Science**

**(credits = 128)**

*Compulsory Modules*

**(credits = minimum 72, maximum 100)**

Computer Science

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11788 | 741 | 16 | Machine Learning | 2 |
| 63444 | 771 | 32 | Honours Project in Computer Science | Both |

Mathematical Statistics:

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 58777 | 741 | 12 | Data Mining | 1 |
| 13360 | 771 | 12 | Statistical Learning Theory | Both |

Unless you have completed Computer Science 315 or an equivalent, the following Computer Science module is also compulsory.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 62855 | 796 | 16 | Statistical Pattern Recognition | Both |

Unless you have completed Mathematical Statistics 3 or an equivalent qualification, the following Mathematical Statistics module is also compulsory.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 13361 | 771 | 12 | Mathematical Statistics for Data Scientists | Both |

**plus**

*Elective Modules*

**(credits = minimum 28, maximum 56)**

Choose modules from the Honours in Computer Science stream to a minimum value of 28 credits and a maximum value of 56 credits to reach the required credit total of 128 credits. However, you can also choose modules presented by other departments with permission from the Computer Science Division in the Department of Mathematical Sciences.

*Assessment and Examination*

All modules make use of flexible assessment and you must achieve a final mark of at least 50% for each module, as well as for the programming project.

### 5.5.3.2 MSc in Computer Science

*Programme Code*

18139 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Computer Science or an approved equivalent qualification.
- The Department can require supplementary studies, as determined by your supervisor(s) on a case-by-case basis.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Description*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required.

*Programme Content*

Your individual programme is compiled separately. This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66362 | 818 | 180 | Thesis Computer Science | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis to the satisfaction of the examiners and do an oral examination.

### 5.5.3.3 PhD in Computer Science

*Programme Code*

18139 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

#### 5.5.3.4 DSc in Computer Science

*Programme Code*

18139 – 998 (360)

*Programme Description*

For this degree published scientific work(s) of high quality, which contributes substantially to the enrichment of knowledge in Computer Science, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.5.4 African Institute for Mathematical Sciences (AIMS)

#### 5.5.4.1 MSc in Mathematical Sciences

*Programme Code*

58637 – 889(180)

*Programme Description*

This a one-year postgraduate programme leads to a structured MSc degree in Mathematical Sciences, which is formally accredited by the Universities of Cape Town, Stellenbosch, and the Western Cape. The programme is taught at the African Institute for Mathematical Sciences (AIMS) in association with the Universities of Cambridge, Oxford and Paris Sud XI. For more information, visit our website at www.aims.ac.za.

*Specific Admission Requirements*

In order to register for this programme, one of the following qualifications are required:

- A four-year Bachelor's degree (NQF level 8) in Mathematics, or any science or engineering subject with a significant Mathematics component;
- An Honours degree (NQF level 8) in Mathematics, or any science or engineering subject with a significant Mathematics component; or
- Any degree considered to be equivalent to the abovementioned degrees.

Your record should demonstrate a strong aptitude in Mathematics. A wide range of qualifications, equivalent to the above requirements, will be considered.

*Applications and Selection*

AIMS calls for online applications in October and December each year. The call is advertised via the AIMS mailing lists and through the partner universities. Applications that meet the admission requirements are assessed and students are selected by the AIMS Executive Team. Selected students are split equally between the Universities of Cape Town, Stellenbosch and the Western Cape for purposes of registration.

*Programme Structure*

The programme consists of two components that are grouped into two modules, namely Advanced Topics in the Mathematical Sciences and a research project in the Mathematical Sciences. The module Advanced Topics entails coursework that is divided into submodules. These submodules are generally three weeks long. They are self-contained and very demanding.

Each submodule consists of 30 hours' contact time (10 hours per week). Additional tutorials and special lectures are often held in the evenings while students are completing their assignments.

*Duration of Programme*

The curriculum runs over three semesters and there are two intakes each year – in January and in August.

*Programme Content*

**Advanced Topics in the Mathematical Sciences**

*First semester – Skills submodules (10 weeks):*

Seven submodules of 30 hours each.

*Second semester – Review submodules (6 three-week blocks):*

Eleven submodules of 30 hours each.

Review submodules are fundamentally different from one another and a wide range of topics are offered, which are more flexibly designed. You are required to complete 11 submodules selected from the 18 review submodules offered, with a maximum of two chosen from any three-week block. Choices offered are balanced as far as possible with regard to focus on Mathematics, Physics, Statistics, Computer Science and other interdisciplinary topics, such as Biomathematics and Financial Mathematics. You choose from the list of submodules in consultation with the Academic Director, who ensures that your chosen modules complement each other. The review submodules provide an overview and in-depth study of topics from a major field of modern scientific work in the Mathematical Sciences and its applications.

*Third semester – Research Project in Mathematical Sciences (8 weeks) (60 credits):*

During the research project phase you work on a research topic with a supervisor, usually from a South African university. It is not expected of you to do original work to achieve a passing grade, but the criterion for an outstanding research project is that it must constitute an original approach to the topic and may lead to publication, or form an outstanding introduction to the field that is useful to other students entering the field. During this time, communication skills and computer classes may continue, at the supervisor's discretion.

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11471 | 871 | 120 | Advanced Topics in the Mathematical Sciences | Both |
| 11472 | 871 | 60 | Research Project in the Mathematical Sciences | Both |

*Assessment and Examination*

- This programme is assessed continuously through written assignments, tutorials, short tests and presentations as set by the lecturers.
- You do an oral presentation on your written research project to a panel of examiners. This panel consists of the AIMS Director, the AIMS Academic Director, the supervisor, teaching assistant and external examiners.

## 5.6 Department of Microbiology

### 5.6.1 BScHons in Microbiology

*Programme Code*

16284 – 778 (120)

*Specific Admission Requirements*

- A BSc degree with Microbiology as a major, that means Microbiology 314, 324, 354 and 364 OR
- A BSc degree in Chemistry and Polymer Science with elective modules as in Option 2: Microbiology 314(16), and 324(16) or 364(16).
- An average final mark of at least 60% for Microbiology 3.
- Supplementary work may be required, depending on your background.

The number of students who are accepted each year is limited by the number of places available in the research laboratories.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Programme Structure*

The programme includes formal modules in Microbiology as well as seminars, self-study and experimental work.

*Duration of Programme*

The duration of the programme is usually one year and begins at the start of the academic year.

*Programme Content*

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10439 | 772 | 64 | Experimental Microbiology | Both |
| 10721 | 773 | 24 | Techniques in Molecular Microbiology | Both |
| 10483 | 774 | 32 | Selected Topics | Both |

*Assessment and Examination*

The programme is assessed continuously and you do an oral examination at the end of the year.

### 5.6.2 MSc in Microbiology

*Programme Code*

16284 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree in Microbiology or an approved equivalent qualification.
- The Department may also require supplementary work on specific topics.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Description*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required.

*Programme content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66281 | 818 | 180 | Thesis Microbiology | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral examination.

### 5.6.3 PhD in Microbiology

*Programme Code*

16284 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent scientific research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

### 5.6.4 DSc in Microbiology

*Programme Code*

16284 – 998 (360)

*Programme Description*

For this degree previously published research work(s) of a high standard that has made a substantial and important contribution to the enrichment of knowledge in Microbiology, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

## 5.7 Department of Physics

### 5.7.1 Postgraduate Programmes in Physics

#### 5.7.1.1 BScHons in Physics

*Programme Code*

12998 – 797 (128)

*Specific Admission Requirements*

- A BSc degree with Physics as major with an average final mark of at least 60% in Physics 3.
- Applications which deviate from the abovementioned requirement, for example if a BSc degree was obtained elsewhere, will only be considered on recommendation of the Department and approval by the Faculty Committee.
- The Department may require supplementary work, depending on your background.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Promotion Rules*

- To obtain this degree you must pass with an average of at least 50% and achieve a subminimum of 45% in all modules.
- If you achieved at least 40% in a module or modules of 16 credits or less, the Department will allow a second assessment opportunity in the modules concerned.
- If you are taking the Radiation and Health Physics stream you should note that a final mark of 50% in Physics 718, 750, 751, 752 and 753 is required to be admitted to an internship as a medical physicist.

*Programme Structure*

All modules listed in the various streams are compulsory and the total number of credits required per stream is 128.

The following streams are offered:

- BScHons in Physics (Laser Physics stream);
- BScHons in Physics (Nuclear Physics stream);
- BScHons in Physics (Radiation and Health Physics stream); and
- BScHons in Physics (Theoretical Physics stream).

*Duration of Programme*

The duration of the programme is normally one year and begins a week before the general start of classes.

*Programme Content*

The curricula of the respective streams are set out below.

**Stream Laser Physics**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10445 | 711 | 8 | Electromagnetism | 1 |
| 10590 | 712 | 8 | Lagrange and Hamilton Mechanics | 1 |
| 10752 | 713 | 8 | Solid State Physics | 1 |
| 10586 | 714 | 16 | Quantum Mechanics B (Advanced Formalism and Applications) | 1 |
| 10390 | 716 | 8 | Atomic Physics | 1 |
| 63274 | 741 | 32 | Physics Project | 2 |
| 12546 | 744 | 8 | Laser Spectroscopy | 2 |
| 10589 | 745 | 16 | Quantum Optics and Laser Technology | 2 |
| 10610 | 747 | 8 | Molecular Physics | 2 |
| 17221 | 772 | 16 | Optics | Both |

**Stream Nuclear Physics**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10445 | 711 | 8 | Electromagnetism | 1 |
| 10590 | 712 | 8 | Lagrange and Hamilton Mechanics | 1 |
| 10752 | 713 | 8 | Solid State Physics | 1 |
| 10586 | 714 | 16 | Quantum Mechanics B (Advanced Formalism and Applications) | 1 |
| 10587 | 719 | 8 | Quantum Mechanics C (Functional Integral Formulation) | 1 |
| 10702 | 721 | 16 | Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems) | 2 |
| 63274 | 741 | 32 | Physics Project | 2 |
| 10563 | 748 | 8 | Nuclear Reactions and Nuclear Structure | 2 |
| 10753 | 754 | 8 | Many-body Theory | 2 |
| 10674 | 755 | 16 | Relativistic Quantum Mechanics and Quantum Field Theory | 2 |

**Stream Radiation and Health Physics**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10445 | 711 | 8 | Electromagnetism | 1 |
| 10590 | 712 | 8 | Lagrange and Hamilton Mechanics | 1 |
| 10752 | 713 | 8 | Solid State Physics | 1 |
| 10586 | 714 | 16 | Quantum Mechanics B (Advanced Formalism and Applications) | 1 |
| 10390 | 716 | 8 | Atomic Physics | 1 |
| 10708 | 718 | 8 | Radiation Interaction | 2 |
| 63274 | 741 | 32 | Physics Project | 2 |
| 10563 | 748 | 8 | Nuclear Reactions and Nuclear Structure | 2 |
| 10467 | 750 | 8 | Physics of Radiation Dosimetry/Radiology | 2 |
| 10465 | 751 | 8 | Physics of Nuclear Medicine | 2 |
| 10466 | 752 | 8 | Physics of Radiotherapy | 2 |
| 10706 | 753 | 8 | Radiation Protection | 2 |

**Stream Theoretical Physics**

*Compulsory Modules*

**(credits = 120)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10445 | 711 | 8 | Electromagnetism | 1 |
| 10590 | 712 | 8 | Lagrange and Hamilton Mechanics | 1 |
| 10752 | 713 | 8 | Solid State Physics | 1 |
| 10586 | 714 | 16 | Quantum Mechanics B (Advanced Formalism and Applications) | 1 |
| 10587 | 719 | 8 | Quantum Mechanics C (Functional Integral Formulation) | 1 |
| 10702 | 721 | 16 | Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems) | 2 |
| 63274 | 741 | 32 | Physics Project | 2 |
| 10753 | 754 | 8 | Many-body Theory | 2 |
| 10674 | 755 | 16 | Relativistic Quantum Mechanics and Quantum Field Theory | 2 |

**plus**

*Elective Modules*

**(credits = 8)**

Choose one of the following Physics modules

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10539 | 757 | 8 | Entropy and Information | 2 |
| 10424 | 758 | 8 | Dynamic Systems and Complexity | 1 |

**or**

a module to the value of 8 credits from Mathematics or Applied Mathematics in consultation with the Theoretical Physics coordinator

### 5.7.1.2 MSc in Physics

*Programme Code*

12998 – 878 (180)

*Specific Admission Requirements*

- An appropriate BScHons degree or an equivalent qualification as approved by the Senate.

*Programme Structure*

- The Department appoints a supervisor for each student.
- You are expected to do an independent literature review and research in consultation with your supervisor.
- Advanced seminar and/or coursework, as approved by the Department, form an integral part of the MSc studies and contributes towards the final mark for the programme.

*Programme Content*

This programme consists of both a thesis and coursework.

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66249 | 818 | 156 | Thesis Physics | Both |
| 12278 | 828 | 24 | Advanced Physics Seminar and Coursework | Both |

*Assessment and Examination*

After completion of your research you must submit a thesis for examination to the satisfaction of the appointed examiners and do an oral examination.

#### 5.7.1.3 PhD in Physics

*Programme Code*

12998 – 978 (360)

*Programme Description*

A dissertation on the results of your independent scientific research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

#### 5.7.1.4 DSc in Physics

*Programme Code*

12998 – 998 (360)

*Programme Description*

For the DSc degree already published scientific work(s) of a high standard that have made a significant and outstanding contribution to the enrichment of knowledge in Physics, is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.7.2 Postgraduate Programmes in Physical and Mathematical Analysis

#### 5.7.2.1 BScHons in Physical and Mathematical Analysis

*Programme Code*

56855 – 797 (128)

*Specific Admission Requirements*

- A BSc degree with suitable majors from the Mathematical Sciences as approved by the Physical and Mathematical Analysis programme committee, with an average of at least 60% in the applicable third-year modules.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Duration of Programme*

The duration of the programme is one year and begins with the start of the academic year.

*Programme Content*

Depending on student numbers and the availability of modules, the Physical and Mathematical Analysis programme committee may, in consultation with the relevant departments, substitute suitable alternatives for those listed below.

**Stream A: Numerical Analysis and Complex Systems**

**(credits = 128)**

*Compulsory modules*

**(credits = 72)**

Physics

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 63274 | 741 | 32 | Physics Project | 2 |
| 10702 | 721 | 16 | Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems) | 2 |

Applied Mathematics

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 62812 | 773 | 16 | Numerical Modelling | Both |

Mathematics

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 20405 | 749 | 8 | Wavelet analysis | 2 |

**plus**

*Elective modules*

**(credits = 56)**

You can take any honours modules offered in Computer Science, Mathematics, Applied Mathematics or Physics, in consultation with the programme committee and subject to specific prerequisites.

**Stream B: Data Security**

**(credits = 128)**

*Compulsory modules*

**(credits = 112)**

Physics

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 63274 | 741 | 32 | Physics Project | 2 |

Computer Science

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 64947 | 712 | 16 | Advanced Algorithms | 1 |

**or**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 64971 | 716 | 16 | Advanced Topics in Computer Science 1 | 2 |

Applied Mathematics

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 62782 | 784 | 16 | Coding Theory | Both |

Mathematics

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10378 | 711 | 16 | Algebra | 1 |
| 62871 | 714 | 16 | Set Theory and Topology | 1 |
| 10379 | 747 | 8 | Algebraic Number Theory | 2 |
| 62995 | 748 | 8 | Computational Algebra | 2 |

**plus**

*Elective modules*

**(credits = 16)**

You can take any honours modules offered in Computer Science, Mathematics, Applied Mathematics or Physics, in consultation with the programme committee and subject to specific prerequisites.

### 5.7.2.2 MSc in Physical and Mathematical Analysis

*Programme Code*

56855 – 878 (180)

*Specific Admission Requirements*

An honours degree in Physical and Mathematical Analysis or one of the following BScHons degrees is required:

- Theoretical Physics;
- Mathematics;
- Numerical Mathematics;
- Applied Mathematics; or
- An equivalent qualification approved by the Senate.

Supplementary study may be required from you before research can begin as determined by your supervisor(s).

*Programme Structure*

A supervisor and co-supervisor from two of the participating departments and/or from an industrial partner are approved by the Physical and Mathematical Analysis programme committee.

You can choose the topic for your thesis, in consultation with the Physical and Mathematical Analysis programme committee, from one of the following interdisciplinary focal areas:

- Numerical Analysis;
- Complex Systems; or
- Data Security.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 66257 | 818 | 180 | Thesis Physical and Mathematical Analysis | Both |

*Assessment and Examination*

After completion of your research you must submit a thesis for examination to the satisfaction of the appointed examiners.

*Enquiries*

For more information, see http://pma.sun.ac.za. See also section 2.2 of this chapter for general information on the MSc degree in the Faculty of Science.

### 5.7.2.3 PhD in Physical and Mathematical Analysis

*Programme Code*

56855 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

## 5.8 Department of Physiological Sciences

### 5.8.1 BScHons in Physiological Sciences

*Programme Code*

59803 – 778 (120)

*Specific Admission Requirements*

- A BSc degree with Physiology 314, 334, 344 and 364 with an average final mark of at least 60% for the four modules.
- If you obtained a BSc degree with Physiology 3 from another university with a final mark of at least 60%, your application will be considered as well. In that case your marks achieved in Biochemistry courses at this same university will also be taken into account.

*Closing Date for Applications*

Apply online at **http://www0.sun.ac.za/pgstudies/** by 31 October of the previous year and submit all supporting documents where applicable. Late applications can be submitted until 30 November. In exceptional cases, if there are any spaces available, applications will be considered until the beginning of the academic year.

If you are not an SU student, please note that your application may take longer to process due to the verification of qualifications. Therefore apply early.

*Programme Structure*

The honours programme consists of interactive lectures, practicals, two seminars, a theory project and a research project. The lectures build on your existing knowledge of selected topics in physiology that are relevant to lecturers' research programmes, and include modules that integrate whole-body and systems physiology with cell biology and functional biochemistry. The practical component introduces students to current research techniques. One seminar is on a topic of theoretical (and sometimes controversial) interest in general physiology and the other presents the results of your research project. The research project is conducted under supervision in one of the Department's research laboratories. You will receive training in statistical methods, using the internet for research purposes, presentation skills and critical thinking.

*Duration of Programme*

The duration of the programme is one year and begins with the start of the academic year.

*Programme Content*

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10686 | 771 | 10 | Regenerative Physiology in Injury and Disease | 1 |
| 10614 | 772 | 10 | Physiology and Pathophysiology | Both |
| 10683 | 773 | 10 | Signal Transduction in Physiology and Pathophysiology | 1 |

| | | | | |
|---|---|---|---|---|
| 66443 | 774 | 10 | Metabolism in Health and Disease | 2 |
| 11260 | 775 | 10 | Stress Physiology | Both |
| 54895 | 776 | 60 | Research Project in Physiological Sciences | Both |
| 66192 | 781 | 10 | Research Methodology in Physiological Sciences | Both |

*Assessment and Examination*

This programme is assessed continuously. The final mark is calculated as a weighted mark according to the credit value of each module. To obtain this honours degree you must achieve a subminimum of 50% in each module.

### 5.8.2 MSc in Physiological Sciences

*Programme Code*

59803 – 878 (180)

*Programme Description*

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required. See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science.

*Programme Content*

This programme consists of a 100% thesis.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 59803 | 818 | 180 | Thesis: Physiological Sciences | Both |

*Assessment and Examination*

After completion of the research you must submit a thesis for examination to the satisfaction of the examiners and do an oral examination.

### 5.8.3 PhD in Physiological Sciences

*Programme Code*

59803 – 978 (360)

*Programme Description*

A dissertation containing the results of your independent research is required. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science.

### 5.8.4 DSc in Physiological Sciences

*Programme Code*

59803 – 998 (360)

*Programme Description*

For the DSc degree already published scientific work(s) of a high standard that makes a contribution to the enrichment of knowledge in Physiology is required from you. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science.

### 5.8.5 MSc in Exercise Science

*Programme Code*

51489 – 887 (180)

*Specific Admission Requirements*

- A four-year BSc degree on NQF level 8 or a three-year BSc degree followed by a BScHons degree in a related biological science field or an equivalent qualification.
- Undergraduate modules in Physiology and Biochemistry are recommended.
- The programme co-ordinator and the departmental chair have the final decision on admission, taking into account the infrastructure of the Department.

*Closing Date for Applications*

Apply in writing to the departmental chair by 30 September of the previous year. The Department will consider late applications until 31 October.

*Programme Structure*

The programme is offered on a full-time basis and consists of four theoretical modules that are offered in four semesters. Sessions that vary from one to four weeks are presented on a full-time basis and consist of intensive lectures, practical classes, demonstrations and seminars. You will receive prescribed reading work, assignments and seminar preparations continuously to be completed at home. In addition, you must complete a research project and submit a written thesis on the project.

*Duration of Programme*

The programme is offered over a period of two years and begins with the start of the academic year.

*Programme Content*

Continuous attention is given to professional development with regard to research methodology, computer and laboratory skills and statistics. Furthermore there will also be a focus on communication skills regarding teaching and writing techniques, as well as skills relevant for sport-related consultation services.

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10630 | 882 | 20 | Exercise Immunology, Endocrinology and Haematology | Both |
| 10614 | 883 | 20 | Multidisciplinary Approach to Muscle Physiology | Both |
| 64548 | 884 | 10 | Metabolic Factors influencing Performance | Both |
| 62421 | 885 | 10 | Exercise Biochemistry | Both |
| 12919 | 827 | 120 | Thesis in Exercise Science | Both |

*Assessment and Examination*

- The programme is assessed continuously.
- Examinations and assignments will constitute 33.3% of the final mark for the programme and the thesis the remaining 66.7%.
- The thesis will be assessed by the programme co-ordinator, the supervisor and two independent academics, of which one is external to the University.
- You must attain a minimum of 50% for the thesis to pass the programme and attain a final mark of 50% for each module.

# 6. Postgraduate programmes in other faculties

## 6.1 Faculty of AgriSciences

### 6.1.1 Department of Conservation Ecology and Entomology

#### 6.1.1.1 MSc in Entomology

*Programme Code*

34576 – 878(180)

*Programme Description*

Topics for the master's degree are determined in consultation between the prospective student and the lecturer concerned. You can select topics from fields such as morphology and systematics, insect conservation ecology and integrated pest management of insects.

| | |
|---|---|
| 34576 : Entomology | 878(180): Master's thesis |

#### 6.1.1.2 PhD and DSc in Entomology

For information on doctoral programmes in Entomology, please consult Part 7 (Faculty of AgriSciences) of the Calendar.

### 6.1.2 Department of Genetics

#### 6.1.2.1 Postgraduate programmes in Genetics

#### 6.1.2.1.1 BScHons in Genetics

*Programme Code*

13285 – 778 (120)

*Specific Admission Requirements*

- A BSc degree with Genetics 214, 244 plus 314, 324, 344 and 354 or equivalent modules at other universities.
- An average mark of at least 65% in Genetics in the final year.

*Closing Date for Applications*

Apply in writing to the Registrar by the end of September of the previous year for admission to this programme. The number of students admitted to this programme annually will be determined by available research laboratory space.

*Duration of Programme*

The duration of the programme is one academic year and begins at the start of the general academic year.

*Programme Content*

The programme consists of the six modules listed below. Subject to departmental approval, you may substitute two of the 8-credit theory modules with equivalent 8-credit modules from the BScHons in Plant Biotechnology. You must also complete a research assignment and present the

results in the form of a research publication. The Department places strong emphasis on acquiring laboratory skills.

*Compulsory Modules*

| | |
|---|---|
| 10481 : Genetics: Molecular Techniques | 711(16): Genetics: Molecular Techniques |
| 47295 : Human Genetics | 712(8): Human Genetics |
| 10478 : Genetic Data Analysis | 713(8): Genetic Data Analysis |
| 12555 : Bioinformatics | 714(8): Bioinformatics |
| 18007 : Project | 741(64): Honours Project in Genetics |
| 12557 : Plant Genomics | 716(16): Plant Genomics |

*Assessment and Examination*

The programme is assessed continuously and an oral examination is required.

#### 6.1.2.1.2 MSc in Genetics

*Programme Code*

13285 – 879(180)

*Specific Admission Requirements*

- An applicable honours degree preferably in Botany, Genetics, Microbiology, Biochemistry or Plant Biotechnology.

*Programme Structure*

The programme consists of research on an approved topic as determined by the Department. You must submit a satisfactory thesis on completion of the work. Supplementary study can be required from you in the form of formal lectures and/or seminars.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

*Programme Content*

*Compulsory Module*

| | |
|---|---|
| 13285 : Genetics | 818(180): Master's thesis: Genetics |

*Assessment and Examination*

An oral examination is required.

#### 6.1.2.1.3 PhD in Genetics

*Programme Code*

13285 – 978 (360)

*Programme Description*

A publication-quality dissertation and an oral examination is required from you. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

#### 6.1.2.1.4 DSc in Genetics

*Programme Code*

13285 – 998 (360)

*Programme Description*

For this degree previously published scientific work(s) of a high standard which has made a substantial and outstanding contribution to the enrichment of knowledge in Genetics. See also section 2.4 in this chapter for general information on the DSc degree in the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

### 6.1.2.2 Postgraduate programmes in Plant Biotechnology

#### 6.1.2.2.1 BScHons in Plant Biotechnology

*Programme Code*

53287 – 788 (120)

*Specific Admission Requirements*

- A BSc degree approved by the Departmental Postgraduate and Academic Committees with an average final mark of at least 60% in the appropriate modules at third-year level. Suitable modules include Biotechnology, Biochemistry, Genetics and Microbiology.
- You are, however, strongly encouraged to take Genetics 314, 315, 344 and 345 for admission to the honours in Plant Biotechnology.
- Additional work may be prescribed depending on your background.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar. The number of students admitted to this programme is determined by available research laboratory space.

*Duration of Programme*

The duration of the programme is one year and begins at the start of the academic year.

*Programme Content*

The programme introduces students to advanced concepts and skills in Plant Biotechnology needed for a career as a plant biotechnologist or a researcher. Emphasis is placed on three aspects in the educational process:

- The development of a satisfactory knowledge base;
- The development of a wide-ranging practical and theoretical capability; and
- The development of a professional scientific-methodological and ethical approach.

The programme includes theoretical work, seminars, practical tasks, independent research and independent consultation of the broader biological literature. As an honours student you are expected to attend departmental seminars and to act as an undergraduate demonstrator.

Subject to departmental approval, you can substitute two of the 8-credit theory modules with equivalent 8-credit modules from the BScHons in Genetics programme. All substitutions must be approved by the Department.

*Compulsory Modules*

| | |
|---|---|
| 10481 : Genetics: Molecular Techniques | 715(16): Genetics: Molecular Techniques |
| 12582 : Research Module in Plant Biotechnology | 790(64): Research Module in Plant Biotechnology |

*Theory modules*

The theory modules below consist of a series of contact sessions where information is exchanged by means of discussion groups, seminars, assignments and reading assignments. The module leaders will serve as facilitators guiding the students rather than teaching. Each theoretical module involves training in relevant techniques that are required to undertake experimental work that will lead to the development of theoretical knowledge about the module in question. These modules are presented in the first semester.

| | |
|---|---|
| 17523 : Plant Physiology | 712(8): Plant Physiology |
| 10475 : Integrated Plant Metabolism | 713(8): Integrated Plant Metabolism |
| 12555 : Bioinformatics | 714(8): Bioinformatics |
| 12557 : Plant Genomics | 716(16): Plant Genomics |

*Assessment and Examination*

- Assessment includes two oral examinations, written examinations, assignments, book reviews, seminars, a research project, a poster on the research project and the production of a popular article.
- To complete the honours programme successfully, you must complete the compulsory generic skills module, all four theory modules and a research project successfully.
- An average of 50% must be attained for both the research and theory components and in no module can you attain less than 40%.

#### 6.1.2.2.2 MSc in Plant Biotechnology

*Programme Code*

53287 – 878 (180)

*Specific Admission Requirements*

- An applicable honours degree preferably in Botany, Genetics, Microbiology, Biochemistry or Plant Biotechnology.

*Programme Structure*

Your individual programme will be structured according to a specific project and your background. The Department can require supplementary module(s) depending on your background.

See also section 2.2 in this chapter for general information on the MSc degree in the Faculty of Sciences, as well as Part 7 (Faculty of AgriSciences) of the Calendar.

*Programme Content*

*Compulsory Module*

| | |
|---|---|
| 66311 : Thesis Plantbiotechnology | 818(180): Thesis Plantbiotechnology |

#### 6.1.2.2.3 PhD in Plant Biotechnology

*Programme Code*

53287 – 978 (360)

*Programme Description*

A publication-quality dissertation and an oral examination is required from you. See also section 2.3 in this chapter for general information on the PhD degree in the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

### 6.1.3 Department of Plant Pathology

#### 6.1.3.1 BScHons in Applied Plant Physiology

*Programme Description*

The proposed programme aims to accommodate students with an appropriate three-year Bachelor of Science degree from a national or international institution, with an interest in postgraduate studies in Horticulture. Students in possession of an appropriate bachelor's degree, majoring in Botany, Biochemistry, Genetics or Plant Biotechnology with an average final mark of 60% will be considered for admission. The honours programme in Applied Plant Physiology is designed to strengthen your knowledge and competencies in the discipline of Horticultural Sciences, with specific emphasis on plant physiological, biochemical and molecular mechanisms, relevant to production and quality systems within Horticulture. You will also be equipped in research methodology, whilst writing and presentation skills will also be developed. A final average mark of 60% in this programme will enable you to apply for further postgraduate studies offered in Horticulture (MScAgric).

*Specific Admission Requirements*

- A three-year BSc degree, majoring in Botany, Biochemistry, Genetics or Plant Biotechnology.
- An average final mark of 60% in the applicable modules.
- The Department can require supplementary study from you.

*Duration of the Programme*

The duration of the programme is one year.

*Programme Content*

*Compulsory Modules*

| | |
|---|---|
| 12487 : Applied Plant Physiology | 714(16): Ecophysiology of horticultural and agronomical crops |
| 12487 : Applied Plant Physiology | 734(16): Applied plant physiology and tree architecture |
| 12487 : Applied Plant Physiology | 744(16): Postharvest physiology and technology of horticultural and agronomical crops |
| 12487 : Applied Plant Physiology | 764(16): Nutrition of horticultural and agronomical crops |
| 12487 : Applied Plant Physiology | 771(16): Advanced plant physiology |
| 12487 : Applied Plant Physiology | 773(40): Research project |

### 6.1.3.2 BScHons in Plant Pathology

*Programme Description*

The programme consists of further specialised study in Plant Pathology. The modules and study tasks add greater depth of learning, building further on a bachelor's programme with Microbiology, Genetics, Botany or Biotechnology as major. The programme is research and career-oriented and is based on modern technology and the most recently available research in Plant Pathology. The programme links up with research projects carried out in the Department.

*Specific Admission Requirements*

- A BSc degree with Microbiology or Genetics or Botany or Biotechnology as major.
- An average final mark of 60% in the applicable modules.
- The Department can require supplementary study from you.

*Duration of Programme*

The duration of the programme is one year.

*Programme Content*

The programme consists of the five modules listed below.

*Compulsory Modules*

| | |
|---|---|
| 32891 : Plant Pathology | 771(16): Advanced plant disease dynamics |
| 32891 : Plant Pathology | 772(16): Advanced disease management |
| 32891 : Plant Pathology | 773(10): Research methodology |
| 32891 : Plant Pathology | 774(60): Project management and presentation |
| 32891 : Plant Pathology | 775(18): Advanced topics in plant pathology |

### 6.1.4 Department of Viticulture and Oenology

Wine Biotechnology consists of the integration of several subject disciplines and the use of research techniques that are aimed at the study and genetic improvement, on a molecular level, of vine- and wine-associated micro-organisms and the grapevine itself.

#### 6.1.4.1 BScHons in Wine Biotechnology

*Programme Description*

The programme consists of formal lectures, as well as seminars, self-study and experimental work in Wine Biotechnology.

*Specific Admission Requirements*

- A suitable degree such as BSc, BScAgric or BEng with any applicable discipline as major.

*Duration of Programme*

The duration of the programme is one year.

*Programme Content*

The following topics are covered in this programme:

- Genetic properties and improvement of wine yeasts;
- Grape-based beverages;
- Alcoholic fermentation;
- Chemical compounds of grapes and wine;
- Techniques in wine and grapevine biotechnology;
- Malolactic fermentation and microbial spoilage;
- Enzymes in preparation of wine;
- Grapevine structure and functions; and
- Grapevine improvement with the aid of biotechnology.

Self-study on the South African wine industry as well as independent experimental research in grapevine and wine biotechnology is required.

*Compulsory Modules*

| | |
|---|---|
| 50997 : Wine Biotechnology | 714(5): Chemical components of grapes and wine |
| 50997 : Wine Biotechnology | 771(40): Research methodology for grapevine and wine biotechnology |
| 50997 : Wine Biotechnology | 772(25): Techniques in grapevine and wine biotechnology |
| 50997 : Wine Biotechnology | 773(30): Biotechnology of wine-related microbes |
| 50997 : Wine Biotechnology | 774(20): Vine structure and functioning and grapevine improvement |

### 6.1.4.2 MScAgric or MSc in Wine Biotechnology

*Programme Code*

50997 – 878(180)

*Programme Content*

Research projects can be selected from the following topics:

- The selection and genetic improvement of wine yeasts and bacteria in order to increase the effectiveness of wine fermentation and processing, and to improve the quality and sensory properties of wine and other grape-based beverages;
- The metabolic reprogramming of yeasts;
- The role of transcription factors and signal transduction in cell differentiation; and
- The genetic improvement of wine grape cultivars with regard to disease and stress resistance.

*Compulsory Module*

| | |
|---|---|
| 50997 : Wine Biotechnology | 878(180): Master's thesis |

### 6.1.4.3 PhD and DSc in Wine Biotechnology

For information on doctoral programmes in Wine Biotechnology, please consult Part 7 (Faculty of AgriSciences) of the Calendar.

## 6.2 Faculty of Arts and Social Sciences

### 6.2.1 Department of Geography and Environmental Studies

#### 6.2.1.1 BScHons in GeoInformatics

*Programme Code*

12279 – 778 (120)

*Specific Admission Requirements*

- A BSc degree in GeoInformatics or a related discipline as major.
- An average final mark of 60% for the major.

*Accreditation*

This programme, proceeding from an accredited three-year BSc GeoInformatics programme, satisfies the South African Geomatics Council's academic requirements for registration as a Professional Geographical Information Science (GISc) Practitioner. Students who successfully complete this four-year qualification will automatically be able to register as Professional GISc Practitioners in training.

*Duration of Programme*

This duration of the programme is one year.

*Programme Content*

This programme consists of lectures and an applied research component. Programme content includes the application of Geographic Information Systems as an integrating tool for the analysis, comprehension, management and resolution of spatial problems concerning human-environment interaction, environmental problems in special environments, and the execution of spatial analyses and modelling.

Below are the compulsory and elective modules.

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 49611 | 713 | 30 | Geographical Information Systems | 1 |
| 12187 | 716 | 30 | Spatial Modelling and Geographical Communication | 1 |
| 63363 | 742 | 30 | Environmental Geography Research Application | 2 |

*Elective Modules*

Choose one of the elective modules.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 63371 | 711 | 30 | Environmental Analysis and Synthesis | 2 |
| 63398 | 712 | 30 | Advanced Remote Sensing | 1 |
| 13134 | 712 | 30 | Disaster Risk Science and Development | 1 |

*Assessment and Examination*

This programme is assessed continuously through tests, assignments, a research project, oral presentations and examinations. You have to obtain a sub-minimum of 50% in each module to pass.

Although the programme is presented in English, discussions, tests, examinations, assignments and reports will be accepted and dealt with in English or Afrikaans.

*Enquiries*

Prof A van Niekerk
Tel: 021 808 3218/3101
E-mail: avn@sun.ac.za
Departmental website: http://www.sun.ac.za/geography

#### 6.2.1.2 MSc in GeoInformatics

*Programme Code*

12279 – 878(180)

*Specific Admission Requirements*

- A BScHons degree with GeoInformatics as a major and Geographic Information Systems (GIS) training, or a BScHons degree with training in GIS.
- An average final mark of 60% for the major.

*Programme Content*

The development, implementation, management and application of spatial technologies for managing resources, and for spatial analysis and modelling of environmental geographical phenomena and problems are dealt with in this programme.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 12280 | 874 | 180 | Thesis GeoInformatics | Both |

*Assessment and Examination*

You must submit a thesis. Although the programme is presented in English, discussions and reports can be presented in English or Afrikaans. The 100% thesis is examined according to the University's provisions in Part 1 (General) of the University Calendar.

*Enquiries*

Prof A van Niekerk
Tel: 021 808 3218/3101
E-mail: avn@sun.ac.za
Departmental website: http://www.sun.ac.za/geography

### 6.2.1.3 MSc in Geography and Environmental Studies

*Programme Code*

49913 – 878 (180)

*Specific Admission Requirements*

- A BScHons degree with Geography and Environmental Studies or an appropriate discipline as major.
- An average final mark of 60% for the major.

*Programme Content*

The programme focuses on the study and resolution of human-environmental problems and environmental phenomena from a spatial perspective. You can do the thesis research on a full-time or part-time basis. The research topic is developed and approved by the Department.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 49913 | 873 | 180 | Thesis Geography and Environmental Studies | Both |

*Assessment and Examination*

You can present the thesis in English or Afrikaans. The thesis is assessed according to the University's provisions set out in Part 1 (General) of the University Calendar.

*Enquiries*

Prof A van Niekerk
Tel: 021 808 3218/3103
E-mail: avn@sun.ac.za
Departmental website: http://www.sun.ac.za/geography

### 6.2.1.4 PhD in Geography and Environmental Studies

*Programme Code*

49913 – 978 (360)

*Specific Admission Requirements*

- An MSc degree in Geography and Environmental Studies or a related discipline or a master's degree approved by the Senate.

*Programme Content*

The programme focuses on the study and resolution of environmental problems and phenomena from a spatial perspective. You can do the dissertation research on a full-time or part-time basis. The research topic is developed and approved by the Faculty.

*Assessment and Examination*

You must submit a dissertation of approximately 90 000 words, in which you show your ability to create new knowledge or to reinterpret existing knowledge about a geographical environmental problem.

You can present your dissertation in English or Afrikaans. The dissertation is assessed according to the University's provisions in Part 1 (General) of the University Calendar.

*Enquiries*

Prof A van Niekerk
Tel: 021 808 3218/3103
E-mail: avn@sun.ac.za
Departmental website: http://www.sun.ac.za/geography

### 6.2.2 Department of Psychology

#### 6.2.2.1 BScHons in Psychology

*Programme Code*

18414 – 778(120)

*Specific Admission Requirements*

- A Bachelor's degree with a major in Psychology.
- An average final mark of at least 60% in Psychology 3. A higher performance cut-off for Psychology 3 may be set in a given year, depending on the number and the achievement level of applicants.
- You are selected based on academic achievement. Selection takes place annually in November of the previous year. Information on selection is available at www.sun.ac.za/psychology.

*Closing Date for Applications*

Apply in writing to the departmental chair by 31 October of the previous year.

*Duration of the Programme*

The programme is offered full-time over one year.

*Programme Content*

The programme is presented in English. The programme focuses on advanced knowledge of:

- Human behaviour;
- Intrapsychic as well as interpersonal;
- Normal as well as abnormal;
- Individually as well as in group contexts; and
- The application of such knowledge in the multi-cultural South African society, particularly to understand specific psychosocial problems and to develop intervention and preventative strategies.

In addition, the programme also focuses on the development of critical-analytical and problem-solving thinking skills, as well as social-scientific research knowledge and skills.

**Please note:**

The psychology honours programme at Stellenbosch University is an academic programme. It is not designed to meet the requirements for the Professional Board for Psychology for registration

as a psychological counsellor or as a psychometrist, and does not serve as an entrance qualification for internships in these areas. In this Department professional training in psychology is offered only at master's level.

Based on the credit values of modules, indicated in brackets after each module, a selection of modules is made to a minimum of 120 credits for the programme.

*Compulsory Modules*

| | |
|---|---|
| 10042 : Research Methodology (Psychology) | 771(25) |
| 10206 : Research Assignment (Psychology) | 772(30) |

*Elective Modules*

| | |
|---|---|
| 10207 : Psychotherapy | 711(13) |
| 10208 : Psychopathology | 742(13) |
| 10209 : Psychometry | 741(13) |
| 10210 : Vocational Psychology | 712(13) |
| 10211 : Family Psychology | 715(13) |
| 10212 : Community Psychology | 714(13) |
| 10213 : Child Psychology | 716(13) |
| 10214 : Cognitive Psychology | 743(13) |
| 10216 : Psychological Development of Women | 744(13) |
| 11558 : Interpersonal Relationships | 711(13) |
| 18996 : Social psychology | 745(13) |
| 10218 : Alcohol Abuse in the South African Context | 746(13) |
| 42935 : Sport Psychology | 711(13) |
| 11854 : Contemporary Issues in Psychology | 711(13) |
| 11853 : Applied Community Psychology | 754(13) |
| 11855 : Psychology Health and Disability | 741(13) |
| 12191 : Brain and behaviour | 711(13) |

Depending on staff availability, certain of the modules may not be offered every year. For certain modules a restriction may be placed on the number of students. If the demand for a specific module is too small in any given year, that module may also not be offered in that year.

### *Assessment and Examination*

Modules are assessed by means of practical and written assignments, tests and written examinations in June and November. You must obtain a minimum of 50% as pass mark for each module.

### *Enquiries*

Programme Coordinator: Dr D Painter
Tel: 021 808 3458
E-mail: dpainter@sun.ac.za
Web address: www.sun.ac.za/psychology

### 6.2.2.2 MSc in Psychology

*Programme Code*

18414 – 879 (180)

*Specific Admission Requirements*

- An Honours degree in Psychology or an equivalent qualification acceptable to the University.
- Applications must be accompanied by a brief, preliminary research proposal.

*Duration of Programme*

The duration of the programme is a minimum of one year.

*Programme Content*

This programme focuses on the acquisition and broadening of knowledge in a specific area of Psychology. It also aims at the development of research skills, particularly with respect to the planning and execution of research and the reporting of research results. On completion of the thesis, in consultation with the supervisor, you are expected to prepare a paper for publication which is based on your research.

*Compulsory Module*

| | |
|---|---|
| 12881 : Thesis (Psychology) | 871(180) |

*Assessment and Examination*

Your thesis is assessed according to the University's regulations for the examination of master's theses as stipulated in the section on postgraduate qualifications in Part 1 of the University Calendar.

*Enquiries*

Programme Coordinator: Prof AP Greeff
Tel: 021 808 3461
E-mail: apg@sun.ac.za
Web address: www.sun.ac.za/psychology

### 6.2.2.3 MSc in Clinical Psychology and Community Counselling

*Programme Code*

59773 – 899 (180)

*Specific Admission Requirements*

- An Honours degree in Psychology or equivalent qualification with a final mark of at least 65%.

*Closing Date for Applications*

Apply in writing to the departmental chair or the Registrar by 30 June of the previous year. Admission to the programme is subject to selection, which takes place in August of the previous

year. Application forms and information on the selection process are available on the Department of Psychology's website at www.sun.ac.za/psychology.

*Duration of Programme*

The programme is presented full-time for the duration of one year.

*Programme Content*

The programme focuses on the identification and psychotherapeutic treatment of psychopathology in children and adults, as well as on the development, implementation and assessment of preventative and remedial counselling programmes. The theoretical component of the programme is presented in English and consists of different modules which cover the broad terrain of Clinical and Counselling Psychology. The practical component of the programme requires students to be involved in the diagnostic assessment and psychotherapeutic treatment of adult patients, children and families, and to undertake individual community projects. It entails about 15 to 20 hours per week throughout the year and takes place in the Unit for Psychology of the Centre for Community Psychological Services, community clinics and within departmental community projects. You must also complete an assignment based on independent research under supervision.

This programme satisfies the conditions and requirements of the Professional Board for Psychology for the professional training of clinical and counselling psychologists and is accredited as such with the Professional Board. In order to register as a clinical or counselling psychologist the Professional Board for Psychology requires:

- The successful completion of the examination and practical work;
- A full-time internship of 12 months at an institution accredited by the Professional Board;
- 12 months of community service; and
- The successful completion of the Professional Board's examination for clinical or counselling psychologists.

Registration with the Professional Board as either a clinical or counselling psychologist is determined by whether you completed a clinical or counselling accredited internship. Details about internships and community service can be obtained from the programme co-ordinator.

The compulsory modules are set out in the table below.

*Compulsory Modules*

| | |
|---|---|
| 11559 : Concepts and Practice | 875(40) |
| 11560 : Assessment and Care | 875(50) |
| 11561 : Professional Development | 875(30) |
| 10224 : Assignment (Clinical & Community) | 875(60) |

*Assessment and Examination*

A minimum pass mark of 50% is required for each module. The final mark for the programme is based on the relative weights of the different modules as indicated by their respective credit values. In addition, the Professional Board for Psychology requires that, upon completion of the

programme, your knowledge and skills be externally assessed and your marks be moderated. This is done by means of an oral examination following the written examinations in November. Practical work is assessed continuously, and all practical work must be successfully completed as a prerequisite for obtaining the degree.

*Enquiries*

Programme Coordinator: Prof L Kruger
Tel: 021 808 3460
E-mail: lkrug@sun.ac.za
Web address: www.sun.ac.za/psychology

#### 6.2.2.4 PhD in Psychology

*Programme Code*

18414 – 978(360)

*Specific Admission Requirements*

- A Master's degree in Psychology or an equivalent qualification acceptable to the University.

*Programme Content*

The doctoral programme in Psychology, which requires a minimum of two years of study, focuses on the broadening of knowledge in a specific area of Psychology.

*Compulsory Module*

| | |
|---|---|
| 18414 : Psychology | 978(360) |

*Assessment and Examination*

Your dissertation is assessed according to the University's regulations for the examination of doctoral dissertations as stipulated in the section on postgraduate qualifications in Part 1 (General) of the University Calendar.

*Enquiries*

Programme Coordinator: Prof LP Swartz
Tel: 021 808 3450
E-mail: lswartz@sun.ac.za
Web address: www.sun.ac.za/psychology

## 6.3 Faculty of Economic and Management Sciences

### 6.3.1 Department of Logistics

#### 6.3.1.1 BScHons in Operations Research

*Programme Code*

55336 – 779 (120)

*Specific Admission Requirements*

- A suitable bachelor's degree with applicable modules on third-year level.
- An average final mark of at least 60% for Operations Research, Computer Science, Applied Mathematics, Mathematics or Mathematical Statistics on third-year level, or any degree that the Department of Logistics considers an equivalent qualification.

*Duration of Programme*

The duration of this programme is one year.

*Programme Content*

You must earn at least 120 credits as set out in the compulsory modules listed below.

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11167 | 718 | 12 | Applied Stochastic Simulation (Dept. of Statistics and Actuarial Science) | Both |
| 11047 | 774 | 30 | Research Assignment: Operational Research | Both |

*Elective Modules*

**(at least 78 credits)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10761 | 795 | 15 | Mathematical Programming (only available to (and compulsory for) students who have not taken Operations Research on third-year level) (Dept. of Mathematical Sciences) | Both |
| 10906 | 712 | 15 | Advanced linear programming (Dept. of Logistics) | 1 |
| 12318 | 713 | 15 | Metaheuristics (Dept. of Logistics) | 1 |
| 10925 | 742 | 15 | Location of facilities (Dept. of Logistics) | 2 |
| 10932 | 742 | 15 | Inventory control (Dept. of Logistics) | 2 |
| 46744 | 712 | 15 | Decision Making (Dept. of Logistics) | 1 |
| 10931 | 743 | 15 | Game theory (Dept. of Logistics) | 1 |
| 11907 | 786 | 15 | Methods of Operational Research (Dept. of Logistics) | 2 |
| 10542 | 782 | 16 | Graph Theory (Dept. of Mathematical Sciences) | 2 |

| | | | | |
|---|---|---|---|---|
| 10751 | 747 | 12 | Time series analysis B (Dept. of Statistics and Actuarial Science) | 2 |
| 10750 | 722 | 12 | Time series analysis A (Dept. of Statistics and Actuarial Science) | |
| 10749 | 752 | 12 | Applied time series analysis B (Dept. of Statistics and Actuarial Science) | 2 |
| 10600 | 721 | 12 | Multivariate methods in statistics A (Dept. of Statistics and Actuarial Science) | 1 |
| 10601 | 751 | 12 | Multivariate methods in statistics B (Dept. of Statistics and Actuarial Science) | 2 |
| 10598 | 714 | 12 | Multivariate categorical data analysis A (Dept. of Statistics and Actuarial Science) | Both |
| 10599 | 744 | 12 | Multivariate categorical data analysis B (Dept. of Statistics and Actuarial Science) | 2 |
| 58777 | 741 | 12 | Data mining (Dept. of Statistics and Actuarial Science) | 2 |
| 10440 | 713 | 12 | Experimental design (Dept. of Statistics and Actuarial Science) | 1 |
| 65250 | 718 | 12 | Stochastic Simulation (Dept. of Statistics and Actuarial Science) | 1 |
| 64009 | 714 | 15 | Capita Selecta (Operations Research) (Operations Research) (Dept. of Logistics) | 1 |
| 64009 | 744 | 15 | Capita Selecta (Operations Research) (Operations Research) (Dept. of Logistics) | 2 |

### 6.3.1.2 MCom and MSc in Operations Research – Full Thesis option

**Programme Code**

55336 – 879 (180)

*Specific Admission Requirements*

- An honours degree in Operations Research, Computer Science, Applied Mathematics, Mathematics or Mathematical Statistics and you must be knowledgeable across the broad spectrum of Operations Research.
- You can also be considered for admission if you are in possession of an equivalent qualification as considered by the Department of Logistics.

*Programme Content*

If you are registered for Operation Research 879, you must submit a thesis that is the result of your independent research.

### 6.3.1.3 MCom and MSc in Operations Research – Coursework and Thesis option

*Programme Code*

55336 – 899 (180)

*Specific Admission Requirements*

- An honours degree in Operations Research, Computer Science, Applied Mathematics, Mathematics or Mathematical Statistics and you must be knowledgeable across the broad spectrum of Operations Research.
- You can also be considered for admission if you are in possession of an equivalent qualification as considered by the Department of Logistics.

For information on the MCom in Operations Research (Coursework and Thesis option) please consult Part 10 (Faculty of Economic and Management Sciences) of the Calendar.

*Programme Content*

If you are registered for Operations Research 899, you must earn at least 180 credits as set out in the tables below. You can take a maximum of 60 credits from the honours programme.

*Compulsory Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11243 | 884 | 150 | Thesis: Operational Research | Both |

*Elective Modules*

**(at least 30 credits)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10905 | 813 | 15 | Financial investment planning (Dept. of Logistics) | 1 |
| 10926 | 844 | 20 | Scheduling (Dept. of Logistics) | 2 |
| 10933 | 853 | 15 | Forecasting (Dept. of Logistics) | 2 |
| 10694 | 811 | 15 | Bootstrap and other resampling techniques A (Dept. Of Statistics and Actuarial Science) | Both |
| 10695 | 841 | 15 | Bootstrap And Other Resampling Techniques B (Dept. Of Statistics and Actuarial Science) | 2 |
| 64009 | 814 | 15 | Capita Selecta (Operations Research) (Dept. of Logistics) | 1 |
| 64009 | 844 | 15 | Capita Selecta (Operations Research) (Dept. of Logistics) | 2 |

### 6.3.1.4 MCom and MSc in Operations Research – Coursework and Assignment option

*Programme Code*

55336 – 889 (180)

*Specific Admission Requirements*

- An honours degree in Operations Research, Computer Science, Applied Mathematics, Mathematics or Mathematical Statistics and you must be knowledgeable across the broad spectrum of Operations Research.
- You can also be considered for admission if you are in possession of an equivalent qualification as considered by the Department of Logistics.

For information on the MCom in Operations Research (Coursework and Assignment option), please consult Part 10 (Faculty of Economic and Management Sciences) of the Calendar.

*Programme Content*

If you are registered for Operations Research 889, you must earn at least 180 credits as set out in the tables below. You can take a maximum of 60 credits from the honours programme.

*Compulsory Modules*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11225 | 873 | 85 | Assignment: Operational Research | Both |

*Elective Modules*

**(at least 95 credits)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10905 | 813 | 15 | Financial investment planning (Dept. of Logistics) | 1 |
| 10926 | 814 | 15 | Scheduling (Dept. of Logistics) | 2 |
| 10933 | 853 | 15 | Forecasting (Dept. of Logistics) | 2 |
| 10694 | 811 | 15 | Bootstrap and other resampling techniques A (Dept. of Statistics and Actuarial Science) | Both |
| 10695 | 841 | 15 | Bootstrap And Other Resampling Techniques B (Dept. of Statistics and Actuarial Science) | 2 |
| 10542 | 882 | 16 | Graph Theory (Dept. of Mathematical Sciences) | |
| 64009 | 814 | 15 | Capita Selecta (Operations Research) (Dept. of Logistics) | 1 |
| 64009 | 844 | 15 | Capita Selecta (Operations Research) (Dept. of Logistics) | 2 |

#### 6.3.1.5 PhD in Operations Research

*Programme Code*

55336 – 979 (360)

*Programme Description*

A dissertation containing the results of your independent research is required. Also consult the section "Postgraduate Qualifications" in Part 1 (General) of the University Calendar.

### 6.3.2 Department of Statistics and Actuarial Science

#### 6.3.2.1 BComHons and BScHons in Mathematical Statistics

*Specific Admission Requirements*

- A bachelor's degree with an average mark of at least 60% for Mathematical Statistics 3.

*Closing Date for Applications*

Apply in writing to the departmental chair before the end of October of the previous year.

*Duration of Programme*

The duration of the programme is one year and begins one and a half weeks before the general start of classes.

*Programme Content*

You must earn a minimum of 120 credits for this programme. Depending on circumstances in the Department, some of the modules listed below may not be offered in a specific year and modules can also be offered in different semesters than listed below.

You can ask for permission to take a maximum of 12 credits from suitable postgraduate modules offered by other departments.

See the programme outline below.

*Programme Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 22853 | 778 | 120 | Honours programme in Mathematical Statistics | Both |

*Compulsory Modules*
**(36 credits)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 13074 | 723 | 6 | Introduction to C Programming | 1 |
| 11228 | 791 | 30 | Research Assignment: Mathematical Statistics | Both |

*Elective Modules*

**(at least 84 credits)**

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10394 | 711 | 12 | Bayesian statistics | 1 |
| 10408 | 712 | 12 | Biostatistics | 1 |
| 11922 | 724 | 12 | Capita Selecta in Mathematical Statistics A | 1 |
| 11923 | 754 | 12 | Capita Selecta in Mathematical Statistics B | 2 |
| 58777 | 741 | 12 | Data mining | 2 |
| 10440 | 713 | 12 | Experimental design | 1 |
| 10507 | 719 | 12 | Advanced inference A | 1 |
| 10508 | 749 | 12 | Advanced inference B | 2 |
| 10569 | 753 | 12 | Consultation practice | 2 |
| 10598 | 714 | 12 | Multivariate categorical data analysis A | Both |
| 10599 | 744 | 12 | Multivariate categorical data analysis B | 2 |
| 10602 | 715 | 12 | Multivariate statistical analysis A | 1 |
| 10603 | 745 | 12 | Multivariate statistical analysis B | 2 |
| 10628 | 743 | 12 | Non-parametric statistics | 2 |
| 10636 | 746 | 12 | Survival analysis | 2 |
| 10701 | 716 | 12 | Statistical quality control and –improvement | 1 |
| 10705 | 742 | 12 | Sampling techniques | 1 |
| 65250 | 718 | 12 | Stochastic Simulation | 1 |
| 10750 | 717 | 12 | Time series analysis A | 2 |
| 10751 | 747 | 12 | Time series analysis B | 2 |

*Assessment and Examination*

Examinations are written at the end of each semester in June and in November. Examination results are supplemented by the assessment of various practical projects. You must also submit a compulsory assignment under supervision for examination.

### 6.3.2.2 MCom and MSc in Mathematical Statistics – Coursework and Thesis option

*Specific Admission Requirements*

- An honours degree with Mathematical Statistics as the major field of study.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar by the end of October of the previous year.

*Programme Structure*

You must submit a thesis of 90 or 120 credits and earn further credits from advanced coursework to obtain a total of at least 180 credits.

*Duration of Programme*

The duration of the programme is at least 12 months and begins one and a half weeks before the general start of classes.

*Programme Content*

The compulsory and elective modules are presented in the tables below. Depending on circumstances in the Department, some of the modules listed below may not be offered in a specific year and modules can also be offered in different semesters than listed below.

*Programme Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 22853 | 879 | 180 | MCom and MSc in Mathematical Statistics (coursework plus thesis option) | Both |

Choose one of the two thesis options from the Mathematical Statistics modules given below.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11246 | 891 | 90 | Thesis: Mathematical Statistics | Both |
| 11246 | 892 | 120 | Thesis: Mathematical Statistics | Both |

*Elective Modules*

Choose modules from the table below to obtain at least 180 credits together with the thesis.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10441 | 813 | 15 | Extreme value theory A | 2 |
| 10442 | 843 | 15 | Extreme value theory B | 2 |
| 10509 | 814 | 15 | Advanced multivariate categorical data analysis A | 2 |
| 10511 | 844 | 15 | Advanced multivariate categorical data analysis B | 2 |
| 10512 | 815 | 15 | Advanced multivariate statistical analysis A | Both |
| 10513 | 845 | 15 | Advanced multivariate statistical analysis B | 2 |
| 10523 | 818 | 15 | Advanced sampling techniques | 2 |
| 10524 | 819 | 15 | Advanced Mathematical Statistics A | 1 |
| 11173 | 849 | 15 | Advanced Mathematical Statistics B | 2 |
| 10694 | 811 | 15 | Bootstrap and other resampling techniques A | Both |
| 10695 | 841 | 15 | Bootstrap And Other Resampling Techniques B | 2 |
| 10530 | 816 | 15 | Large sample theory A | 1 |
| 10531 | 846 | 15 | Large sample theory B | 2 |
| 18130 | 822 | 15 | Multi-dimensional Scaling A | 1 |
| 11910 | 852 | 15 | Multi-dimensional Scaling B | 2 |

| | | | | |
|---|---|---|---|---|
| 11174 | 817 | 15 | Probability Theory A | 1 |
| 11175 | 847 | 15 | Probability Theory B | 2 |
| 10703 | 812 | 15 | Statistical Learning Theory A | 2 |
| 10704 | 842 | 15 | Statistical Learning Theory B | 2 |

*Assessment and Examination*

Examinations in the coursework are written at the end of the second semester in November. You must also submit a thesis resulting from your independent research plus supplementary work that can be required by the Department.

### 6.3.2.3 MCom and MSc in Mathematical Statistics – Coursework and Assignment option

*Specific Admission Requirements*

- An honours degree with Mathematical Statistics as the major field of study.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar by the end of October of the previous year.

*Programme Structure*

You must obtain a minimum of 180 credits in this programme. The assignment of 60 credits is compulsory.

*Duration of Programme*

The duration of the programme is at least 12 months and begins one and a half weeks before the general start of classes.

*Programme Content*

The compulsory and elective modules are presented in the tables below. Depending on circumstances in the Department, some of the modules listed below may not be offered in a specific year and modules can also be offered in different semesters than listed below.

*Programme Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 22853 | 889 | 180 | MCom and MSc in Mathematical Statistics (coursework plus assignment option) | Both |

*Compulsory Assignment:* Mathematical Statistics module

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 11228 | 895 | 60 | Research Assignment: Mathematical Statistics | Both |

*Elective Modules*

Choose from the modules below to obtain at least 180 credits together with the assignment.

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 10509 | 814 | 15 | Advanced multivariate categorical data analysis A | 2 |
| 10511 | 844 | 15 | Advanced multivariate categorical data analysis B | 2 |
| 10512 | 815 | 15 | Advanced multivariate statistical analysis A | Both |
| 10513 | 845 | 15 | Advanced multivariate statistical analysis B | 2 |
| 10523 | 818 | 15 | Advanced sampling techniques | 2 |
| 10524 | 819 | 15 | Advanced Mathematical Statistics A | 1 |
| 11173 | 849 | 15 | Advanced Mathematical Statistics B | 2 |
| 10694 | 811 | 15 | Bootstrap and other resampling techniques A | Both |
| 10695 | 841 | 15 | Bootstrap And Other Resampling Techniques B | 2 |
| 10441 | 813 | 15 | Extreme value theory A | 2 |
| 10442 | 843 | 15 | Extreme value theory B | 2 |
| 10530 | 816 | 15 | Large sample theory A | 1 |
| 10531 | 846 | 15 | Large sample theory B | 2 |
| 18130 | 822 | 15 | Multi-dimensional scaling A | 1 |
| 11910 | 852 | 15 | Multi-dimensional scaling B | 2 |
| 11174 | 817 | 15 | Probability Theory A | 1 |
| 11175 | 847 | 15 | Probability Theory B | 2 |
| 10703 | 812 | 15 | Statistical learning theory A | 2 |
| 10704 | 842 | 15 | Statistical learning theory B | 2 |

*Assessment and Examination*

Examinations in the coursework are written at the end of the second semester in November. You must also submit an assignment resulting from your independent research plus supplementary work that can be required by the Department.

### 6.3.2.4 PhD in Mathematical Statistics

*Programme Description*

A dissertation containing the results of your independent research is required. See also “General Rules for PhD degrees” in Part 1 (General) of the University Calendar.

*Programme Module*

| Code | Module | Credits | Module Name | Semester |
|---|---|---|---|---|
| 22853 | 978 | 360 | PhD in Mathematical statistics | Both |

## 6.4 Faculty of Education

### 6.4.1 Department of Sport Science

For information on the module content for BScHons in Biokinetics and BScHons in Sport Science, please consult Part 6 (Faculty of Education) of the University Calendar.

#### 6.4.1.1 BScHons in Biokinetics

*Specific Admission Requirements*

- A bachelor's degree with Sport Science as one of the majors and which Senate has approved for this purpose.
- You must apply in writing in order to be admitted to the programme by Senate, or the Executive Committee that acts on behalf of Senate.
- An average final mark of at least 60% in Sport Science subjects (theory and practicals) during your undergraduate years.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar by 31 August of the previous year. Only a limited number of students will be accepted in the Biokinetics specialisation.

*Duration of Programme*

The duration of the programme is one year.

*Programme Content*

An internship period that meets the conditions laid down by the Health Professions Council of South Africa will be required before you can apply for registration as a biokineticist in an independent practice.

*Anchor Module*

| | |
|---|---|
| Biokinetics | 778(120) |

*Compulsory Submodules*

| | |
|---|---|
| Biokinetics Practice | 772(20) |
| Ergonomics | 775(20) |
| Exercise Physiology | 774(20) |
| Exercise Science | 771(30) |
| Research Project | 773(30) |

*Assessment and Examination*

This programme is assessed continuously and includes theoretical and practical assignments, as well as informal class tests and formal tests. All assessments contribute to the final mark of each year subject.

You must obtain a class mark of 40% per semester subject for admission to the written examination. In order to pass Biokinetics Practice 772, you have to pass the written examination with at least 50%, as well as pass a practical and oral examination at the end of the year with at

least 50%. The final mark for each submodule consists of 50% of the examination mark and 50% of the class mark.

*Enquiries*

Programme Manager: Dr K Welman
Department of Sport Science
Tel: 021 808 4718
E-mail: welman@sun.ac.za
Websites for more information: http://www.sun.ac.za/education or http://www.biokinatsun.ac.za

### 6.4.1.2 BScHons in Sport Science (Performance Sport)

*Specific Admission Requirements*

- A bachelor's degree with Sport Science as one of the majors that Senate has approved for this purpose.
- You must apply in writing in order to be admitted to the programme by Senate, or the Executive Committee that acts on behalf of Senate.
- An average final mark of at least 60% in Sport Science subjects (theory and practicals) during your undergraduate years.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar by 31 August of the previous year. Only a limited number of students are admitted to the specialisation in Performance Sport.

*Duration of Programme*

The duration of the programme is one year.

*Programme Content*

The compulsory submodules are offered in the table below. Apart from the compulsory submodules, you can choose additional elective modules. See the table directly following the compulsory submodules for the additional modules.

*Anchor Module*

| | |
|---|---|
| Performance Sport | 778(120) |

*Compulsory Submodules*

| | |
|---|---|
| Professional practice in sport science | 773(30) |
| Research Project | 771(30) |
| Current Topics in Sport and Exercise Science | 721(12), 751(12) |
| Biomechanics | 712(12) |
| Exercise Physiology | 743(12) |
| Sport Psychology | 712(12) |
| Applied Exercise Physiology | 714(12) |

*Additional Modules*

| | |
|---|---|
| Exercise Psychology | 713(12) |
| History of Sport | 745(12) |
| Kinanthropometry | 715(12) |
| Motor Control | 711(12) |
| Motor Learning | 741(12) |
| Sport for Persons with Disabilities | 772(12) |
| Statistics for Sport Science and Exercise Science | 772(12) |

*Assessment and Examination*

This programme is assessed continuously and includes theoretical and practical assignments, as well as informal class tests and formal tests. All assessments contribute to the final mark of each year subject.

You must obtain a class mark of 40% per subject for admission to the written examination. In order to pass Professional Practice in Sport Science 773, you must do 300 hours practical work during the course of the year and obtain at least 50% in the two oral examination, namely in the middle and at the end of the year. The final mark for each submodule consists of 50% of the examination mark and 50% of the class mark.

*Enquiries*

Programme Manager: Dr RE Venter
Department of Sport Science
Tel: 021 808 4721
E-mail: rev@sun.ac.za
Website for more detailed information: http://www.sun.ac.za/education

### 6.4.1.3 BScHons in Sport Science (Kinder Kinetics)

*Specific Admission Requirements*

- A bachelor's degree with Sport Science as one of the majors that Senate has approved for this purpose.
- You must apply in writing in order to be admitted to the programme by Senate, or the Executive Committee that acts on behalf of Senate.
- An average final mark of at least 60% in Sport Science subjects (theory and practicals) during your undergraduate years.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar by 31 August of the previous year. Only a limited number of students are admitted to this specialisation in Kinder Kinetics.

*Duration of Programme*

The duration of the programme is one year.

### *Programme Content*

The compulsory submodules are offered in the table below. Apart from the compulsory submodules, you can choose additional elective submodules. See the table directly following the compulsory submodules for the additional submodules.

*Anchor Module*

| | |
|---|---|
| Kinder Kinetics | 778(120) |

*Compulsory Submodules*

| | |
|---|---|
| Professional practice in sport science | 773(30) |
| Research Project | 771(30) |
| Current Topics in Sport and Exercise Science | 751(12) |
| Motor Control | 711(12) |
| Kinanthropometry | 715(12) |
| Sport for Persons with Disabilities | 772(12) |
| Kinder Kinetics Theory | 772(12) |

*Additional Submodules*

| | |
|---|---|
| Applied Exercise Physiology | 714(12) |
| Biomechanics | 712(12) |
| Exercise Physiology | 743(12) |
| Exercise Psychology | 713(12) |
| History of Sport | 745(12) |
| Motor Learning | 741(12) |
| Sport Psychology | 712(12) |
| Statistics for Sport Science and Exercise Science | 772(12) |

### *Assessment and Examination*

This programme is assessed continuously and includes theoretical and practical assignments, as well as informal class tests and formal tests. All assessments contribute to the final mark of each year subject.

You must obtain a class mark of 40% per subject for admission to the written examination. In order to pass Professional Practice in Sport Science 773, you must do 300 hours practical work during the course of the year and obtain at least 50% in the two oral examination, namely in the middle and at the end of the year. The final mark for each submodule consists of 50% of the examination mark and 50% of the class mark.

### *Enquiries*

Programme Manager: Dr E Africa
Department of Sport Science
Tel: 021 808 4591
E-mail: Africa@sun.ac.za
Website for more detailed information: http://www.sun.ac.za/education

#### 6.4.1.4 MSc in Sport Science

*Specific Admission Requirements*

- A bachelor's or honours degree with an average of at least 60% that Senate has approved for this purpose.
- If you attained a standard of competence in your field of study in another manner that Senate accepts as satisfactory for this purpose, you can be admitted to this programme.

*Closing Date for Applications*

Apply in writing to the departmental chair or Registrar. In all cases, final admission to the degree programme rests with the postgraduate committee of the Department of Sport Science, subject to the available resources in the Department. If necessary, supplementary study can be required from you by the Department.

*Programme Structure*

The MSc (Sport Science) consists of a 100% thesis on a topic which has been approved by the departmental postgraduate committee and the supervisor. The thesis is assessed externally on completion of the study.

*Assessment and Examination*

On completion your thesis is assessed both internally and externally. The thesis counts 100% towards the final mark and you must obtain 50% in order to pass the degree.

*Enquiries*

Programme Manager: Prof E Terblanche
Department of Sport Science
Tel: 021 808 2742
E-mail: et2@sun.ac.za
Website for more detailed information: http://www.sun.ac.za/education

# Subjects, Modules and Module Contents for All Programmes

## 1. Definitions and explanations of important terms and language specifications

It is important that you take note of the definitions of a few terms in order to understand and use this chapter fully. The example below shows how these terms will appear in the tables that are offered later in this chapter.

**Example:**

| **11053 Biochemistry** | | | | |
|---|---|---|---|---|
| **214** | **16** | **Biomolecules: Structure-function Relationships** | 3L, 3P | **T** |

### 1.1 Explanation of the abovementioned terms

- *Five-digit subject number* – 


  Each subject is identified by this five digit-subject number.

- *Subject name* – 


  The specific name of the subject is presented in capital letters in the table before the various modules of the subject are offered. Normally the subject name is followed by the module code and the credit value of the specific module, for example in this case: Biochemistry 214 (16).

- *Module code* – 


  The module code consists of a three-digit number that is unique to the specific module. The abovementioned module code "214" has the following meaning:

  - The first digit refers to the year of study in which the module is presented, for example:

    *Year 1: **1**14*
    *Year 2: **2**14*
    *Year* 3: **3**14

  - The second digit "1" refers to the semester that the module will be presented in and also serves as a number to distinguish between various modules offered within the same specific year of study. The University uses different numbers to indicate the particular semester of a module, either the first or the second semester or modules that are presented in both semesters (which are year modules). The numbers that indicate semesters are as follows:

- **1**, **2** or **3**– modules are presented in the first semester.

  *Semester 1: 2**1**4, 3**2**4, 3**3**4*

- **4**, **5** or **6** – modules are presented in the second semester.

  *Semester 2: 3**4**2, 3**5**4, 3**6**4*

- **7**, **8** or **9** – modules are presented in both semesters, which are year modules.

  *Year module (both semesters): 2**7**8, 2**8**8, 3**9**1*

- The third digit of the module code 

serves as a distinguishing digit between various modules of the same subject in a particular year of study.
- **Please note:** Some of the postgraduate module entries in this Calendar part deviate from the abovementioned pattern. The five digit-subject number and the three digit-module code in these postgraduate modules are written continuously in the same block.

- *Credit value* – The number in the second block of the table indicates the credit value of the particular module, for example Biochemistry 214 (16).
- *Module subject* – This indicates the subject that will be dealt with in this specific module.
- *Teaching load* – The teaching load of a module is indicated in the block following the module subject. It gives you both the teaching load and the type of teaching per week that you can expect in this particular module. For the module Biochemistry 214 (16) you can expect three lectures and three practical periods each week for the duration of the module. The following abbreviations are used for the teaching load:
  - **L** – Lectures lasting 50 minutes each, for example 3L
  - **P** – Practical periods lasting 50 minutes, for example 1P, 2P, 3P
  - **S** – Seminars lasting 50 minutes, for example 1S
  - **T** – Tutorials lasting 50 minutes, for example 1T, 2T
- *Language specifications* – The language specification is presented in the last block of the example table. The Language specification indicates in which language a particular module will be presented. The language specification can be indicated as "A-specification", "T-specification" or "E-specification". See also section 1.2 below for more information on the various language specifications:
  - **A**-specification – the module is mainly presented in Afrikaans.
  - **T**-specification – the module is presented in both English and Afrikaans.
  - **E**-specification – the module is mainly presented in Engels.
  - **A- & E**-specification – the module is presented completely in both Afrikaans and in English in parallel classes.
  - **A & E (Interpreting)**-specification – the Faculty makes simultaneous interpreting available.

## 1.2 Explanation of the various language specifications

It is important that you know in which language your modules will be presented. It is therefore important that you know what it means when a module will be presented in a particular language specification. A more detailed explanation is given below on the practicalities of the different language specifications.

### 1.2.1 A-specification

- The oral communication language of the lecturer in lectures, seminars, tutorials and practicals is primarily Afrikaans, but key terms and concepts may be explained briefly in English. If you ask questions in English, the lecturer can answer you in English. Guest lectures by overseas and/or South African lecturers with an inadequate academic language proficiency in Afrikaans can be delivered in English.
    - Prescribed textbooks are in Afrikaans and/or English.
    - Module frameworks and study guides drawn up by the lecturer are in Afrikaans and, where possible, are provided to you in Afrikaans and English depending on your academic language of preference.
    - Class notes drawn up by the lecturer are:
        - fully in Afrikaans, or
        - where possible, fully in Afrikaans and fully/partially, such as core class notes, also in English.
    - Transparencies, data-projector contents or PowerPoint presentations used by the lecturer in lectures, seminars, tutorials and practicals are in Afrikaans and/or English.
    - Other compulsory reading material such as scholarly journals and books are in Afrikaans and/or English.
    - Written assignments from lecturers for tutorials, seminars and practicals, when used for assessment purposes, are fully in Afrikaans and in English on the same hand-out.
    - Test and examination question papers are fully in Afrikaans and in English on the same question paper.
    - Written answers to test and examination questions and assignments may be in Afrikaans or English according to your academic language of preference.
    - Your oral presentations in lectures, seminars, tutorials and practicals may be in Afrikaans or English according to your academic language of preference.

### 1.2.2 T-specification

- The oral communication language of the lecturer in lectures, seminars, tutorials and practicals is:
    - in the same class Afrikaans and English, provided that the use of Afrikaans is at least 50%; or
    - alternately Afrikaans and English in different classes of the module or programme, provided that the use of Afrikaans is at least 50%.

- Prescribed textbooks are in Afrikaans and/or English.
- Module frameworks and study guides are:
  - fully in Afrikaans and in English; or
  - alternately in Afrikaans and English depending on the language of oral communication of the lecturer in the particular classes.
- Class notes drawn up by the lecturer are:
  - fully in Afrikaans and in English; or
  - alternately in Afrikaans and English.
- Transparencies, data-projector contents and PowerPoint presentations used by lecturers in lectures, seminar classes, tutorials and practicals are in Afrikaans or English.
- Other compulsory reading material such as scholarly journals and books are in Afrikaans and/or English.
- Written assignments from lecturers for tutorials, seminars and practicals, when used for assessment purposes, are:
  - fully in both Afrikaans and English on the same hand-out; or
  - alternately in Afrikaans and English depending on the material not for assessment purposes such as class notes, module frameworks and study guides where the average use of Afrikaans must be at least 50%.
- Test and examination question papers are fully in both Afrikaans and English on the same question paper.
- Written answers to test and examination questions and assignments can be in Afrikaans or English according to your academic language of preference.
- Your oral presentations in lectures, seminars, tutorials and practicals can be in Afrikaans or English according to your academic language of preference.

### 1.2.3 E-specification

- The oral communication language of the lecturer in lectures, seminars, tutorials and practicals is primarily English, but key terms and concepts can be explained briefly in Afrikaans. If you ask questions in Afrikaans, the lecturer can answer you in Afrikaans. Afrikaans is not compulsory in the case of overseas lecturers.
- Prescribed textbooks are in English.
- Module frameworks and study guides drawn up by the lecturer are in English and, where possible, are provided in English and Afrikaans to students whose academic language of preference is Afrikaans.
- Class notes drawn up by the lecturer are fully in English or, where possible, fully in English and fully/partially, such as core class notes, also in Afrikaans.
- Transparencies, data-projector contents and PowerPoint presentations used by the lecturer in lectures, seminars, tutorials and practicals are in English.
- Other compulsory reading material such as scholarly journals and books are in English and/or Afrikaans.

- Written assignments from lecturers for tutorials, seminars and practicals, when used for assessment purposes, are fully in both English and Afrikaans on the same hand-out.
- Test and examination question papers are fully in both English and Afrikaans on the same question paper.
- Your written answers to test and examination questions and assignments can be in Afrikaans or English according to your academic language of preference.
- Your oral presentations in lectures, seminars, tutorials and practicals can be in English or Afrikaans except in cases where the lecturer does not understand Afrikaans.

### 1.2.4 A- & E-specification

Lectures are presented completely in both Afrikaans and in English in parallel classes.

### 1.2.5 A & E (Interpreting)-specification

The Faculty makes simultaneous interpreting available.

## 2. Prerequisite pass, prerequisite and corequisite modules

After the description of the content of the module, the prerequisite pass, prerequisite and corequisite modules, where applicable, are given for that module. The following abbreviations are used:

- **PP** – Prerequisite pass module
  - A prerequisite pass module is a module that you must pass before you can take the module(s) for which it is a prerequisite pass module.
- **P** – Prerequisite module
  - A prerequisite module is a module in which you must obtain a class mark of at least 40, or a final mark of at least 40 in the case of a module subject to continuous assessment, before you can take the module for which it is a prerequisite module.
- **C** – Corequisite module
  - A corequisite module is a module that you must take in the same academic year as the module for which it is a corequisite, or in an earlier academic year.

### 2.1 Condition for the granting of a qualification or degree

The Faculty will only award a qualification if you have passed all the relevant prerequisite and corequisite modules of the specific degree programme.

## 3. Assessment of modules

Modules are assessed by means of tests and examinations unless otherwise indicated in the module content.

## 4. Subjects, modules and module contents

Subjects with their accompanying modules, credits, module subjects, teaching loads, language specifications and module contents are presented below.

# Undergraduate module contents

## Department of Biochemistry

| 11053 Biochemistry | | | | |
|---|---|---|---|---|
| **214** | **16** | **Biomolecules: Structure-function Relationships** | 3L, 3P | **A+i** or **E+i** |
| ***Please note:*** *Students intending to take Biochemistry as a subject are required to take modules in Biology, Physics and Mathematics during their first year. Chemistry 124 plus Chemistry 144 are taken as the first-year equivalent of Biochemistry.*<br>Structures, characteristics and functions of bio-molecules (bio-elements, water, nucleic acids, proteins, enzymes, coenzymes, carbohydrates, lipids).<br>*Continuous assessment*<br>*PP Chemistry 124 and 144*<br>*PP Biology 124* | | | | |
| **244** | **16** | **Intermediary Metabolism** | 3L, 3P | **A+i** or **E+i** |
| Bioenergetics; metabolism of carbohydrates, lipids and nitrogenous compounds; integration of metabolism.<br>*Continuous assessment*<br>*P Biochemistry 214* | | | | |
| **315** | **16** | **Biophysical and Structural Protein Biochemistry** | 3L, 3T | **A+i** or **E+i** |
| Advanced protein biochemistry: Protein structure/function relationships studied in the context of a number of specialized complex protein systems and enzymatic reaction mechanisms. Basic protein purification techniques and analysis of protein purity, composition and structure.<br>Analysis of biological molecules and processes with light, fluorescence, infrared, Raman and nuclear magnetic resonance spectroscopy, mass spectrometry, circular dichroism, optical rotatory dispersion, isotope-dependent techniques, advanced gel electrophoresis and chromatographic techniques.<br>*This module must be passed to be considered for selection to do BScHons in Biochemistry.*<br>*Continuous assessment*<br>*PP Biochemistry 214 and 244*<br>*PP Physics 114 or*<br>*PP Physics (Bio) 134* | | | | |
| **324** | **16** | **Systems Biology and Bio-informatics for Biochemistry** | 3L, 3T | **A+i** or **E+i** |
| Thermodynamics and kinetics of biochemical processes; enzyme kinetics; kinetics of membrane transport processes; kinetics of coupled-reaction systems; metabolic control analysis; supply-demand analysis of metabolic regulation; mathematical modelling; types of models; modelling with differential equations; examples of models. | | | | |

Relevant database searches; nucleotide- and protein-sequence alignment; structural and functional protein analysis; secondary protein-structure determination; tertiary protein-structure modelling; protein-structure visualisation; phylogeny.

*This module must be passed to be considered for selection to do BScHons in Biochemistry.*

*Continuous assessment*

*PP Biochemistry 214 and 244*
*PP Mathematics (Bio) 124 or*
*PP Mathematics 114*

| | | | | |
|---|---|---|---|---|
| **345** | **16** | **Specialised Biochemical Topics** | 3L, 3T | **A+i** or **E+i** |

Selected topics chosen from the following (three of the following four topics are selected for presentation every year):

Antibiotics: The biochemistry of selected antibiotics and antimicrobial agents. Intracellular signal transduction pathways; receptors; hormones; cAMP; networks and cross talk; biochemistry of vision; biochemistry of smell.

Immunology: Innate and specific acquired immunity; antibody structure and function; defence mechanisms against pathogenic organisms; vaccinations; allergies; immune disorders; AIDS.

Eukaryotic gene expression: Transcription and control of gene expression, promoters and enhancers, and transcription factors.

*This module must be passed to be considered for selection to do BScHons in Biochemistry.*

*Continuous assessment*

*P Biochemistry 315 and 324*

| | | | | |
|---|---|---|---|---|
| **365** | **16** | **Practical protein expression, purification and analysis techniques** | 3L, 3P | **T** |

Recombinant protein expression and protein purification techniques. Analysis of protein purity and integrity. Techniques include: plasmid DNA isolation, PCR, restriction enzyme digests, agarose gel electrophoresis, preparation of competent cells, transformation, induction of protein expression, gel permeation chromatography, ion exchamge chromatography, immobilized-metal affinity chromatography, protein concentration determinations, SDS-PAGE, western blot, activity assays and spectrophotometric analyses.

Practicals will be presented during the recess periods, specifically during a) the week before the 2nd semester officially starts, and b) the recess between the 3rd and 4th terms. Students registering for this module declare that they are available during both these periods.

*Continuous assessment*

*P Biochemistry 315*
*P Biochemistry 324*

### Biochemistry as a major for the BSc degree

The following modules are compulsory: Biochemistry 214(16), 244(16), 315(16), 324(16), 345(16), 364(16)

## Department of Botany and Zoology

The teaching, training and research conducted by the Department of Botany and Zoology is designed to foster an appreciation and an understanding of the evolution and functioning of plants and animals, as well as their roles in natural and managed ecosystems. The undergraduate and postgraduate modules provide a solid background in the biological sciences, with particular emphasis on developing expertise in biodiversity, conservation ecology, evolutionary ecology, conservation genetics and environmental biology.

| **53953 Biodiversity and Ecology** | | | | |
|---|---|---|---|---|
| **212** | **16** | **Statistics and Other Tools for Biologists** | 3L, 3P | **E+i** |
| This module is a thorough introduction to the key numerical skills and processes underpinning the good practice of biological sciences. It covers statistical analyses, the concept of null and alternative hypotheses, data handling and logical interpretation, data presentation and scientific communication, advanced use of Microsoft Excel, PowerPoint and Statsoft Statistica. Hands-on statistical exercises cover a range of parametric, non-parametric and contingency-based analyses from descriptive statistics through to combinations of analysis of variance and regression analysis. Applied scientific investigatory principles to biology are explored using experimental design, ethics, scientific and popular publication processes, and the use of scientific literature.<br>*C Computer Skills 171* | | | | |
| **214** | **16** | **Principles of Ecology** | 3L, 3P | **E+i** |
| The basics of aquatic biology and population ecology are taught by integrating theory and practical field work. Topics will focus on population growth and life history strategies used by organisms to maximise fitness. This module will be closely integrated with Biodiversity and Ecology 212 in which students will be taught how to analyse ecological data. There will be a three-day, compulsory field course in which students conduct their own research projects.<br>*Continuous assessment*<br>*PP Biology 144*<br>*P Mathematics (Bio) 124 or*<br>*P Mathematics 114 and 144*<br>*C Biodiversity and Ecology 212 or*<br>*C Probability Theory and Statistics 114 or 144* | | | | |

| | | | | |
|---|---|---|---|---|
| **224** | **16** | **Diversity and Function of Invertebrates** | 3L, 3P | **A+i** or **E+i** |

The focus of this module is invertebrate diversity and physiology. Major evolutionary changes in morphology (form) within each of the phyla that allow animals to survive in their respective habitats and eventually colonise the terrestrial environment will be explored. Within each environment (marine, freshwater and terrestrial), students will be exposed to the physiological challenges animals have to endure in order to survive. Major physiological changes within major invertebrate phyla will be explored in relation to their evolution. The practical component of the module will entail both laboratory and field work.

*Continuous assessment*

*PP Biology 144 or 154 and a final mark of at least 40% in the remaining Biology module*

| | | | | |
|---|---|---|---|---|
| **244** | **16** | **Principles of Evolution** | 3L, 3P | **E+i** |

The principal evolutionary mechanisms which shape the biological world will be dealt with. It provides a historical perspective on the development of the major ideas in evolutionary thinking and tackles the interface between evolutionary research and the public's perception of it. Topics covered include theoretical genetic models which underlie modern molecular genetic approaches, natural selection and how it operates, the distinctions and links between micro- and macroevolution and how species are formed and lost. In addition to theoretical understanding, students will be exposed to the design and execution of experiments in evolution.

*PP Biology 124 and 144 or 154 and a final mark of at least 40% in the remaining Biology module*
*P Mathematics (Bio) 124 or*
*P Mathematics 114 and 144*
*C Biodiversity and Ecology 212, 224, 254, 264*

| | | | | |
|---|---|---|---|---|
| **254** | **16** | **Vertebrate Life** | 3L, 3P | **A+I** or **E+i** |

The vertebrate story: where they originated, present diversity, how they evolved, what they do and how they work. Topics include characteristic features of vertebrates and their body plans; the broad pattern of the evolutionary relationships of vertebrates; ontogeny of vertebrates and the evolutionary implications of developmental mechanisms; basic anatomy, physiology and evolution of vertebrate organ systems; reproductive biology and strategies: sex determination; hormonal control; seasonal cycles; evolution of viviparity; thermo-energetics; water balance, osmoregulation and excretion; surviving in extreme environments. This module includes practical sessions/workshops and a research project with data collected in the laboratory or during a field excursion.

*Continuous assessment*

*PP Biology 124 or 154 and a final mark of at least 40% in the remaining Biology module*
*P Chemistry 124, 144*

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| **264** | **16** | **Diversity of Plant Form and Function** | 3L, 3P | **A+i** or **E+i** |

Plants occupy the most diverse habitats on earth. A wide range of morphological and physiological adaptations are required to conquer these habitats. The diversity of plant form and function will be explored as interlinked themes to understand how plants grow, respond to natural cycles, capture resources and survive in adverse conditions. The theory and practicals will explore each theme in a complementary way that will include formal lectures, group discussions, laboratory and field experiments.

*PP Biology 144 or 154 and a final mark of at least 40% in the remaining Biology module*

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| **315** | **16** | **Ecology Field Course** | 3L, 3P | **E** |

This is a field-based module. The location of the module will change from year to year. The module will be timed to fall outside of the formal lecture periods – typically two weeks during January. The aim of the module is to bring ecological and evolutionary theory to life in the field. The main foci are biotic interactions (e.g. pollination, competition, facilitation), animal behaviour and ecosystem-level ecology. Lectures, assignments and discussion groups will be conducted in the field, as well as during the normal university term.

This module is a restricted module and largely limited to students registered in the Biodiversity and Ecology programme. Participants maybe selected from other programmes based on past performance and available places.

*Continuous assessment*

*PP Biodiversity and Ecology 212, 214*

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| **324** | **16** | **Angiosperm Diversity and Evolution** | 3L, 3P | **E+i** |

The theory investigates the origin and phylogenetic relationships among angiosperms, as determined through different classification systems. Angiosperm diversification and classification is studied through the use of morphological, anatomical, embryological, palynological and molecular characters. The role of hybridisation and polyploidy in the diversification of the angiosperm lineage is assessed. Specialised morphological and physiological adaptations to suboptimal environments and the effect of such adaptations on the diversification of angiosperms are discussed.

The practical series focuses on Fynbos taxa and plant identification up to the family level.

*Continuous assessment*

*PP Biodiversity and Ecology 264*

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| **334** | **16** | **Global Change Biology** | 3L, 3P | **E+i** |

The study of global change with a biological perspective, which brings together historical and current evidence for such change and summarises its main drivers. Topics include global climate change, anthropogenic change such as pollution, and land use. Data at different spatial and temporal scales and at different levels of biological organisation are covered, highlighting the technologies and numerical techniques used to study these processes. Finally, ways of ameliorating the process are covered, as is communication about all of the above topics both between scientists, and between scientists and the public.

*Prerequisite pass: any 4 of the following 6 modules:*

*PP Biodiversity and Ecology 212, 214, 224, 244, 254, 264*

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|---|---|---|---|---|
| **344** | **16** | **Evolutionary Ecology** | 3L, 3P | **E** |

Topical themes in evolutionary ecology will be covered, namely the evolution of behaviour, biotic interactions and physiology. This module will deal with the following, as well as related, topics: game theory; optimal-foraging theory; life history evolution; evolution of sex; sexual selection and sex ratios; altruism and the evolution of sociality. Evolutionary arms races with mimicry and sexual conflict as examples; coevolution of plant animal interactions. The link between behaviour and physiology and physiological tolerances and constraints on survival, life histories and reproductive strategies. Appropriate field and statistical techniques used in evolutionary ecology research will be covered during practical sessions.

*Continuous assessment*

*PP Biodiversity and Ecology 212, 214*
*P Biodiversity and Ecology 244*

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| **345** | **16** | **Invasion Biology** | 3L, 3P | **E** |

Biological invasions provide fascinating opportunities to improve our understanding of how the world works (from genes to ecosystems), but invasions also represent a major challenge to our sustainable use of resources (from impacts on rural communities to effects on major shipping companies). As such invasion science involves a wide range of disciplines. Biological invasions are widely recognised as one of the main threats to both the conservation of biodiversity, and the maintenance of ecosystem services worldwide. In many parts of the world, the most challenging and time-consuming tasks of conservation biologists and managers are those relating to controlling alien species and preventing impacts, and, increasingly, repairing systems already damaged by aliens. The interaction between invasions and other drivers of global change creates fascinating areas for research.

The aim of this module is to provide an introduction to the exciting and important field of "invasion science" – the full spectrum of fields of enquiry that address issues pertaining to alien species and biological invasions.

*Prerequisite pass: any 4 of the following 6 modules:*

*PP Biodiversity and Ecology 212, 214, 224, 244, 254, 264*

| 354 | 16 | Evolutionary Patterns and Processes | 3L, 3P | E+i |
|---|---|---|---|---|
| Evolutionary theory underpins all of modern biology and is used and applied to generate hypotheses pertinent to the understanding of biodiversity and ecology. By adopting a multi-level approach the module focus on the following topics: Time tree of life, evolutionary biogeography, genetic diversity and differentiation among populations, gene flow, terrestrial and marine phylogeography, reconstruction of a phylogeny, gene trees/species trees, coalescent, rates of evolution, taxonomy, evolutionary classification, conservation genetics, molecular ecology, invasion genetics, genome evolution, cytogenetics/chromosomal evolution, evolutionary development.<br>*P Biodiversity and Ecology 244* | | | | |
| **364** | **16** | **Conservation Biology** | 3L, 3P | **E+i** |
| This module will introduce the topic of conservation biology with a focus on the role that science plays in this field. It aims to equip young biologists and conservation managers with a working knowledge of modern conservation biology principles. On completion, students will have an understanding of biodiversity patterns, how conservation can be addressed at the molecular, population, ecosystem and landscape scales, and how resource management interfaces with conservation efforts and the relevant policy framework.<br>*Continuous assessment*<br>*PP Biodiversity and Ecology 212 or*<br>*PP Biomathematics 214*<br>*PP Biodiversity and Ecology 214* | | | | |

### Biodiversity and Ecology as a major for the BSc degree

The following modules are required: Biodiversity and Ecology 212(16), 214(16), 224(16), 244(16), 254(16), 264(16), 315(16), 324(16), 334(16), 344(16), 345(16), 354(16), 364(16).

| **25046 Biology** | | | | |
|---|---|---|---|---|
| **124** | **16** | **Cell Biology** | 3L, 3P | **A & E** |
| Origin and early history of life. Cytology. Cell chemistry, biological membranes and cellular respiration. Fixation, transfer and expression of genetic information. Evolution.<br>Responsible departments: Biochemistry, Botany and Zoology, and Genetics | | | | |
| **144** | **16** | **Biodiversity and Ecology** | 3L, 3P | **A & E** |
| Classification of organisms. Diversity of micro-organisms, plants and animals. Ecological principles and global changes.<br>Responsible departments: BOTANY AND ZOOLOGY and MICROBIOLOGY<br>*C Biology 124 and*<br>*C Chemistry 124, 144* | | | | |

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| **146** | **16** | **Principles of Biology** | 3L, 3P | **A & E** |
| For students in the BSc (Extended Degree Programmes).<br>Introducing biological concepts: 'What is life?', biological evolution, biodiversity and the Tree of Life. The chemical basis of life. Biological molecules. Enzymes. Biological membranes: Structure and function. Cell structure and function: Pro- and eukaryotes, as well as animal and plant cells. Mendelian genetics and inheritance. Introduction to animal phylogeny. Vertebrate life.<br>Responsible department: BOTANY AND ZOOLOGY<br>*Flexible assessment* | | | | |
| **154** | **16** | **Functional Biology** | 3L, 3P | **A & E** |
| Plant anatomy and morphology; photosynthesis; water relations; transport in plants; plant mineral nutrition; growth and development; responses to the environment. Functional biology of animals. Introduction to biotechnology.<br>Responsible departments: BOTANY AND ZOOLOGY and GENETICS<br>*C Biology 124 and*<br>*C Chemistry 124, 144 (not applicable to the stream Biomathematics, option 2: Ecology)* | | | | |

| **12545 Biology (OCC)** | | | | |
|---|---|---|---|---|
| **153** | **18** | **Biology** | 4L | **T** |
| The chemical basis of life. Biological molecules. Membrane structure and function. Cell structure and cell chemistry. Cell reproduction with the emphasis on human genetics. Medical embryology. Metabolism. Levels of organisation of the human body and homeostasis.<br>Responsible department: BOTANY AND ZOOLOGY | | | | |

## Department of Chemistry and Polymer Science

**Please note:**

Students who wish to continue their studies in Chemistry 3 or further, shall present Chemistry 124, 144 and Mathematics 114, 144 on first-year level.

| **11479 Chemistry** | | | | |
|---|---|---|---|---|
| **124** | **16** | **Fundamental Principles of Chemistry I** | 3L, 3P | **A & E** |
| Matter and its properties; chemical formulae; stoichiometry; solution stoichiometry and reactions in aqueous solution; thermodynamics: energy, enthalpy, entropy and Gibbs free energy; atomic structure and bonding; molecular geometry and structure according to Lewis and VSEPR; intermolecular forces; chemical kinetics. | | | | |
| **144** | **16** | **Fundamental Principles of Chemistry II** | 3L, 3P | **A & E** |
| Chemical equilibrium (both quantitative and qualitative), with applications in acid-base and precipitation reactions of aqueous solutions; an introductory study of organic compounds with a variety of functional groups; reaction mechanisms; stereochemistry; polymerisation.<br>*C Chemistry 124* | | | | |
| **176** | **32** | **Introduction to Chemistry** | 3L, 3P | **A & E** |
| For students in the BSc (Extended Degree Programmes). This module deals with the following themes: Classification of matter; atoms, molecules and ions; stoichiometry; reactions in aqueous solutions; atomic structure; chemical bonding and molecular structure; the periodic table; weak acids and weak bases; electrochemistry. Examples that illustrate the importance and relevance of science as an everyday phenomenon.<br>*Flexible assessment* | | | | |
| **214** | **16** | **Organic Chemistry** | 3L, 3P | **E+i** |
| Reaction mechanisms, including nucleophilic addition and substitution, elimination, electrophilic addition, electrophilic aromatic substitution; organometallic reactions; stereochemistry.<br>*PP Chemistry 124, 144* | | | | |
| **234** | **16** | **Inorganic Chemistry** | 3L, 3P | **E+i** |
| Periodic trends; structure and bonding in molecules; structure and bonding in solids; acid-base chemistry; main group elements.<br>Coordination chemistry: Introduction, types of ligands, nomenclature; isomerism in coordination compounds; different geometries; formation constants; crystal field theory.<br>*PP Chemistry 124* | | | | |

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|---|---|---|---|---|
| **254** | **16** | **Physical Chemistry** | 3L, 3P | **A+i** |
| Chemical thermodynamics; colligative properties; phase diagrams; reaction kinetics; electrochemistry.<br>*PP Chemistry 124*<br>*P Mathematics 114, 144* | | | | |
| **264** | **16** | **Chemical analysis I** | 3L, 3P | **A+i** or **E+i** |
| Introduction to chemical analysis; basic classical analytical chemistry; errors and uncertainty in analytical data; basic statistical methods; volumetric methods (acid-base, redox and complexometric analysis); solvent extraction; introduction to chromatographic separation; introduction to analytical molecular spectroscopy: fundamental principles and quantitative aspects of UV/visible spectrophotometry; introduction to infrared spectroscopy.<br>*PP Chemistry 124, 144 and*<br>*P Mathematics 114, 144 or*<br>*P Mathematics (Bio) 124 or*<br>*P Engineering Mathematics 115, 145* | | | | |
| **314** | **16** | **Chemical Analysis II** | 3L, 3P | **E** |
| Introduction to instrumental analysis. Error theory in quantitative chemical analysis, calibration in instrumental analysis and figures of merit. Introduction to atomic spectroscopy: atomic absorption and atomic emission spectroscopy for quantitative elemental analysis. Molecular spectroscopy: basic principles and application of $^{1}H$ and $^{13}C$ nuclear magnetic resonance spectroscopy (NMR); introduction to analytical mass spectrometry; instrumental chromatographic methods.<br>*PP Chemistry 264* | | | | |
| **324** | **16** | **Physical Chemistry** | 3L, 3P | **A+i** |
| Quantum mechanical description of atoms and molecules; vibrational and rotational spectra; statistical thermodynamics.<br>*PP Chemistry 254*<br>*PP Mathematics 114, 144* | | | | |
| **344** | **16** | **Organic Chemistry** | 3L, 3P | **T** |
| Reaction mechanisms, including those pertaining to enolate chemistry, chemo-, stereo- and diastereoselectivity, controlling geometry of double bonds, pericyclic reactions; stereochemistry; syntheses.<br>*PP Chemistry 214* | | | | |

| 364 | 16 | Inorganic Chemistry | 3L, 3P | E |
|---|---|---|---|---|
| Stereochemical non-rigidity; structure and strength correlations for acids and bases; structure, bonding and reactivity of transition metal complexes; selective metal-complexation; kinetics and mechanisms of selected inorganic reactions; bio-inorganic chemistry and the role of metal complexes in biological systems; introduction to organometallic chemistry and catalysis; the synthesis and characterisation of inorganic compounds (practicals).<br>*PP Chemistry 234* | | | | |

### Chemistry as a major for the BSc Degree

The following modules are required: Chemistry 124(16), 144(16), 214(16), 234(16), 254(16), 264(16), 314(16), 324(16), 344(16) and 364(16).

### Applied Chemistry

**Please note:**

Applied Chemistry 3 can be taken as a third-year subject in combination with Chemistry 3 for the BSc degree.

| 52078 Applied Chemistry | | | | |
|---|---|---|---|---|
| **324** | **16** | **Polymer Science I** | 3L, 3P | **E** |
| Introduction to polymers as materials; chemistry of polymerisation reactions (theory and examples): step and ring-opening polymerisation reactions, polyesters, polyamides, phenolic resins and epoxy resins; addition polymerisation reactions: free-radical polymerisation reactions, ionic polymerisation reactions, transition metal-catalysed polymerisation reactions; reactions of polymers; degradation reactions: chemistry and case studies; stabilisation of polymer systems; industrial processes, recycling and biodegradabliltiy, polymers and the environment.<br>*Practicals*: laboratory work, seminars and tasks. | | | | |
| **344** | **16** | **Polymer Science II** | 3L, 3P | **E** |
| Introduction to polymer structure and morphology: classification of polymers, polymers in solution, molecular weight and molecular weight distributions, structure/ property relationship of polymers; introduction to polymer analysis and characterisation: measurement of polymer molecular masses, spectroscopic techniques for polymer analysis; thermal analysis; physical testing of polymers; measurement of crystallinity in polymers.<br>*Practicals:* laboratory work, seminars and tasks. | | | | |

| 48321 Chemistry C | | | | |
|---|---|---|---|---|
| **152** | **6** | **Chemistry Laboratory Practicals** | 3T | **E+i** |
| Development of laboratory skills by performing introductory chemistry experiments.<br>*Project*<br>*PP Engineering Chemistry 123* | | | | |
| **224** | **15** | **Industrial Chemistry I** | 4L, 2P | **E+i** |
| *8 Practicals per semester*<br>Bonding models; solid-state chemistry; chemistry in solution; introduction to coordination chemistry. Thermochemistry, chemical and phase equilibrium, ideal and electrolyte solutions, electrochemistry, colligative properties, elementary chemical kinetics.<br>*Flexible assessment*<br>*PP Engineering Chemistry 123* | | | | |
| **254** | **15** | **Industrial Chemistry II** | 4L, 2P | **E+i** |
| *8 Practicals per semester*<br>Organic chemistry: Basic nomenclature, introduction to preparation and reactions of *inter alia* alkenes, alkynes, alkyl halides, alcohols, ketones, carboxylic acids and esters; Introduction to polymer chemistry: Chemistry of polymerisation reactions, *inter alia* polyesters, polyamides.<br>*Flexible assessment*<br>*P Chemistry C 224* | | | | |

| 25518 Chemistry (Medicine) | | | | |
|---|---|---|---|---|
| **197** | **12** | **Chemistry for EDP Students** | 4L, 1P | **E** |
| This module is an aid to the mainstream module Chemistry 111 (Health Sciences) and provides an introduction to chemistry for students who are aiming at careers in the health sciences. It is offered parallel to the mainstream module. This module is offered only to qualifying students. | | | | |

## Chemistry for the Health Sciences

**Please note:**

The module Chemistry for the Health Sciences 111(17) caters for the special needs of students in the Faculty of Medicine and Health Sciences.

| **65692 Chemistry for Health Sciences** | | | | |
|---|---|---|---|---|
| **111** | **17** | **Chemistry for Health Sciences** | 5L, 3P | **T** |
| The module covers areas of general chemistry required as a foundation for studying further in the health sciences. It comprises atomic structure and bonding; stoichiometry; gas laws; properties of solutions; chemical kinetics; chemical equilibria; acids, bases and buffer solutions; electrochemistry; organic chemistry and biomolecules. | | | | |

| **50563 Textile Science** | | | | |
|---|---|---|---|---|
| **254** | **16** | **Fibre Science** | 3L, 3P | **T** |
| Introduction to the textile industry, textile terminology and the history of textiles. The classification, composition, morphology, chemical and physical structure of textile fibres as well as molecular arrangements within fibres and its effect on the behaviour characteristics of specific textile fibres and fabrics. New developments in textile fibre modifications especially with regard to behaviour characteristics and functional textiles for niche markets.<br>*P Chemistry 124, 144* | | | | |
| **314** | **16** | **Textile Production Processes** | 3L, 3P | **T** |
| A study of manufacturing processes for the production of textile structures, as well as new developments in this regard. Introduction to the basic colouring and finishing processes and the design of technical textiles. Practical experience to the analyses and description of textile products and the laboratory testing of specific textile product properties.<br>*C Textile Science 254* | | | | |
| **344** | **16** | **Functional Textiles** | 3L, 3P | **T** |
| An overview of the disciplines and principles pertaining to the chemical and mechanical finishing of textiles, the different colorants and finishing agents, their morphology and chemical orientations and the factors that influence their absorption and retention, followed by an introduction to the principles of electrospinning and nanofiber technology. The last part of the module focuses on the development of functional and technical textiles.<br>*P Textile Science 254, 314*<br>*C Chemistry 344* | | | | |

## Department of Earth Sciences

| 64165 Geo-Environmental Science | | | | |
|---|---|---|---|---|
| **154** | **16** | **Introduction to Earth Systems Science** | 3L, 3P | **A+i** or **E+i** |
| Introduction to Earth Systems Science; Internal earth processes; Mineral- and rock-forming processes; Origin of magma and igneous rocks; External structure of the earth; Formation of continents; Plate tectonics; Sedimentary rocks and the geological record; Geological time scale; Metamorphic rocks and mountain building; Geology of South Africa; Energy and mineral resources; Humans and tectonics: earthquakes and volcanoes; The hydrosphere; Surface-water processes; Groundwater processes; Theory of the origin and evolution of life. | | | | |

| 12239 Earth Science Field Skills | | | | |
|---|---|---|---|---|
| **172** | **8** | **Earth Science Field Skills** | 2P | **E** |
| Students taking the Earth Science Programme must enrol in this module. The module is composed of eight days' field or practical work, spread throughout the year which may be scheduled during holidays or on weekends. These field trips will cover the following aspects of geological field skills: Defining lithological packages, recognizing map scale; working with topographic maps and aerial photos to record information and to locate yourself; identification of sedimentary, metamorphic and igneous rocks and structures and their depositional or emplacement significance, practical consideration of natural environment.<br>*Continuous assessment*<br>*C Geo-Environmental Science 124, 154* | | | | |
| **272** | **16** | **Earth Science Field Skills** | 2P | **E** |
| A compulsory module for students taking the Earth Science Programme The module is composed of eight days' compulsory field work spread over one year. Field work will cover the following aspects of geological field skills: Defining lithological packages, recognizing map scale; the use of structural compasses to record structural information and geological map construction; working with topographic maps and aerial photos whilst in the field to record information and to locate yourself; identification of sedimentary, metamorphic and igneous rocks and structures in the field and their depositional or emplacement significance; ore deposit indicators and rock associations; practical consideration of environmental systems to understand the consequences of anthropogenic activities.<br>*Continuous assessment*<br>*PP Earth Science Field Skills 172*<br>*P Geo-Environmental Science 124*<br>*PP Geo-Environmental Science 154*<br>*C Geology 224, 244, 254*<br>*C Environmental Geochemistry 214* | | | | |

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| **374** | **16** | **Earth Science Field Skills** | 3.5P | **E** |

A compulsory module for students taking the Earth Science Programme. The module is composed of sixteen days' compulsory field work spread over one year. These field trips will cover the following aspects of geological field skills: Defining lithological packages, recognizing map scale; the use of structural compasses to record structural information and geological map construction; working with topographic maps and aerial photos whilst in the field to record information and to locate yourself; identification of sedimentary, metamorphic and igneous rocks and structures in the field and their depositional or emplacement significance; ore deposit indicators and rock associations; practical consideration of environmental systems to understand the consequences of anthropogenic activities.

*Students must obtain a sub-minimum of 50% in order to gain admission to the final examination.*

*PP Earth Science Field Skills 272*
*PP Geology 224, 244, 254*
*C Geology 314, 324, 344, 354*

**13374 Geology**

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|---|---|---|---|---|
| **224** | **16** | **Introduction to Mineralogy** | 3L, 3P | **E** |

Introduction to mineralogy and crystallography; mineral chemistry; chemical families of minerals; mineral identification, properties and classification.

*Students must obtain a 50% sub-minimum on the combined mark of practical 1 and the practical test.*

*Continuous assessment*

*P Geo-Environmental Science 124*
*PP Geo-Environmental Science 154*
*P Chemistry 124*

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|---|---|---|---|---|
| **244** | **16** | **Physical Earth Sciences and Structural Geology** | 3L, 3P | **T** |

Physical Earth Sciences. Planar and linear elements in structural geology. Uses of the geological compass. Principles of stereographic projection, content of topographic and geological maps, classification of fabrics, folds and fault zones, structural interpretation of geological maps, block diagrams, cross sections and strike-parallel sections. Geological mapping techniques, plane table, theodolite, GPS, photo geology.

Structural geology. Forces, stress and strain, rheology of geological materials, fissures and fracture planes, foliations and lineations, faults and fault zones, folding and boudinage, halokinesis, intrusion mechanisms, structural control of fluid flow, introduction to plate-tectonic principles, relationship between tectonics, metamorphism and sedimentation.

*A 50% sub-minimum for practical work is required for admission to the examination.*

*PP Geo-Environmental Science 124, 154*
*PP Geology 224*

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| **254** | **16** | **Optical Mineralogy and Petrography** | 3L, 3P | **E** |
| Introduction to the petrographic microscope; optical properties of minerals in thin-sections; the description of rocks in hand-specimen and thin-section; classification of rocks using petrological principles; relationships between mineral associations, rock textures and tectonic environments.<br>*Students must obtain a 50% sub-minimum on the practical test.*<br>*Continuous assessment*<br>*PP Geo-Environmental Science 124, 154*<br>*PP Geology 224*<br>*PP Chemistry 124* | | | | |
| **314** | **16** | **Igneous Petrology** | 3L, 3P | **E** |
| Tools used to study igneous rocks (physical and chemical diagrams, thin-sections, geochemistry – major and trace elements, isotopes, experimental petrology); processes and conditions from partial melting to ascent, emplacement, and final solidification that have lead to the formation of igneous rocks; important associations of igneous rocks (granites, ophiolites and oceanic crust, layered intrusions, andesites and arc magmas, intra-plate and rift-related rocks, Archaean magmatic rocks) – investigated and discussed in the context of their tectonic environments.<br>*A 50% sub-minimum for practical work is required for admission to examinations.*<br>*PP Geology 224, 244, 254*<br>*PP Chemistry 124, 144* | | | | |
| **324** | **16** | **Sedimentology and Stratigraphy** | 3L, 3P | **E** |
| Origin, composition and classification of sedimentary rocks. Sedimentary textures and structures. Facies analysis and depositional environments. Basin analysis and palaeo-geography. Sequence analysis and cyclicity. Stratigraphic principles. South African stratigraphy. Well log/core correlation/interpretation. Sedimentary log description.<br>*A 50% sub-minimum for practical work is required for admission to the examination.*<br>*PP Geology 224, 244, 254*<br>*PP Chemistry 124, 144* | | | | |
| **344** | **16** | **Economic Geology** | 3L, 3P | **T** |
| Classification, global distribution and genesis of mineral deposits. Introduction to mineral economics. Mineral deposits and the environment. Mineral exploration including geochemistry, geophysics and project management. Introduction to ore microscopy.<br>*A 50% sub-minimum for practical work is required for admission to the examination.*<br>*PP Geology 224, 244, 254*<br>*PP Chemistry 124, 144* | | | | |

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|---|---|---|---|---|
| **354** | **16** | **Metamorphic Petrology and Tectonics** | 3L, 3P | **E** |

Introduction to metamorphism, environments of metamorphism, compositional types of metamorphic rocks**,** metamorphic minerals, metamorphic grade, progressive metamorphism and metamorphic zones, the metamorphic facies concept, chemical processes of metamorphism, types of metamorphic reactions, the fluid phase in metamorphism, graphical representation of metamorphic assemblages, analysis of the details of assemblage change during metamorphism in common rock types, practical analysis of the pressure-temperature history of metamorphic rocks, geothermobarometry.

Tectonics: Rheological stratification of the lithosphere and mantle; types of heat and material transport; absolute and relative plate motions; types of plate margins; processes at and architecture of divergent and convergent plate margins; collisional tectonics and collisional belts; magmatic, metamorphic, structural and sedimentary signatures of tectonic environments.

*A 50% sub-minimum for practical work is required for admission to the examination.*

*PP Geology 224, 244, 254*
*PP Chemistry 124, 144*

**63991 Environmental Geochemistry**

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|---|---|---|---|---|
| **214** | **16** | **Introduction to Environmental Geochemistry** | 3L, 3P | **E+i** |

The natural geochemical cycles of elements at the surface of the Earth, as well as effects of human activities upon these cycles; the distribution and transport of chemical substances between the atmospheric, continental and marine environments; interactions between chemical, geological, physical and biological environmental processes; analysis of environmental geochemical data (geochemical modelling techniques and methods).

*P Geo-Environmental Science 124*
*PP Geo-Environmental Science 154*
*P Chemistry 124, 144*

| | | | | |
|---|---|---|---|---|
| **314** | **16** | **Environmental Geochemistry** | 3L, 3P | **E** |

Application of redox, acid-base chemistry, thermodynamics and kinetic principles to environmental geochemistry. Surface complexation reactions; contaminants in soils; chemical evolution of surface and subsurface water; wastewater evolution; contaminant transport processes and reactions; geomaterials and human health; sampling and monitoring of air, soils and water; a brief introduction to physics and chemistry of the atmosphere.

*PP Environmental Geochemistry 214*
*PP Chemistry 234 and either 254 or 264*
*PP Mathematics 114 or*
*PP Mathematics (Bio) 124*

### Geology as major for the BSc degree

The following modules are compulsory: Earth Science Field Skills 172(8), 272(16), 374(16), Geo-Environmental Science 124(16), 154(16), Geology 224(16), 244(16), 254(16), 314(16), 324(16), 344(16) and 354(16) and Environmental Geochemistry 214(16).

| **59552 Engineering Geology** | | | | |
|---|---|---|---|---|
| **214** | **15** | **Geology for Civil Engineers** | 3L, 3P | **A+i** or **E+i** |
| This module does not grant admission to Geology 224, 244 and 254.<br>Introduction to the Earth system: Internal structure, plate tectonics; Crystallography introductory; Mineralogy: physical properties of common minerals; Petrology: magma, igneous, sedimentary and metamorphic rocks; Structural geology: strike and dip of layers, folds and faults, tectonic forms, foliation, lineation, geological mapping.<br>Responsible departments: EARTH SCIENCES (50%) and CIVIL ENGINEERING (50%)<br>*Flexible assessment*<br>*P Engineering Chemistry 123* | | | | |

## Department of Mathematical Sciences
## Division: Mathematics

| 21539 Mathematics | | | | |
|---|---|---|---|---|
| **114** | **16** | **Calculus** | 5L, 2T | **A & E** |
| *Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics in the NSC or the IEB's school-leaving certificate.*<br>Induction and the binomial theorem. Functions, limits and continuity; derivatives and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of elementary functions. | | | | |
| **144** | **16** | **Calculus and Linear Algebra** | 5L, 2T | **A & E** |
| Complex numbers; transcendental functions; techniques of integration; improper integrals; conic sections; polar co-ordinates; partial derivatives; introduction to matrices and determinants.<br>*P Mathematics 114* | | | | |
| **186** | **32** | **Introductory Mathematics** | 3L, 3T | **A & E** |
| For BSc (Extended Degree Programme) and BEng (Extended Degree Programme) students.<br>*Any student who wishes to take this module must have achieved a mark of at least 5 (or 60%) for Mathematics in the NSC or the IEB's school-leaving certificate.*<br>An introduction to calculus, linear algebra and mathematical reasoning: Different presentations of functions in terms of formulas, graphs, tables and stories; inverse of a function; exponential and logarithmic functions; trigonometric functions and their inverse functions; modelling with functions. Gradual progression from average to instantaneous rate of change; limits; basic integration. Systems of equations; analytic geometry; mathematical induction; binomial theorem.<br>*Flexible assessment* | | | | |
| **214** | **16** | **Advanced Calculus and Linear Algebra** | 4L, 2T | **A & E** |
| Advanced Calculus: Functions of more than one real variable, multiple integrals, line integrals, surface integrals, the divergence theorem.<br>Linear algebra: Vectors in n dimensions: linear transformations of real vector spaces and their matrices; geometric transformations: rotation, reflection, dilation, projection; composition of transformations. General real vector spaces: subspaces, linear independence, basis, dimension; rank and nullity of a matrix. General inner-product matrices; orthogonality, orthonormal bases, projections, the Gram-Schmidt process; QR factorisation of a matrix; least squares approximations; orthogonal matrices.<br>*PP Mathematics 114, 144* | | | | |

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| **244** | **16** | **Analysis and Linear Algebra** | 4L, 2T | **A & E** |

Analysis: Improper integrals, sequences and series, power series and Taylor's theorem, second-order linear differential equations.

Linear algebra: Eigenvalues and eigenvectors, diagonalisation of a real matrix; orthogonal diagonalisation; linear transformations of general real vector spaces; matrix representation of linear transformations between general finite dimensional vector spaces; change of basis; systems of first-order differential equations and other applications.

*P Mathematics 214*

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|---|---|---|---|---|
| **278** | **32** | **Foundations of Abstract Mathematics I** | 3L, 2P | **E+i** |

*Out of the three tutorial periods, one is a scheduled tutorial, and two are for independent work on assignments.*

The purpose of this module is to give an insight to the conceptual view of modern mathematics, rather than the computational one. Some foundational topics from set theory, logic, abstract algebra and topology will be covered with an emphasis on the deep connections between different mathematical constructions throughout these fields. In the process, the art of mathematical reasoning will be thoroughly exhibited, which will give opportunity to deliver a rigorous understanding of historically challenging conceptual themes such as infinity and continuity. This module is ideal for students who would like to pursue an academic career in mathematics, or simply those who would like to obtain a broad but relatively thorough picture of contemporary mathematics.

*Flexible assessment*

| | | | | |
|---|---|---|---|---|
| **314** | **16** | **Algebra** | 3L, 3T | **A+i** |

This module is an introduction to the basic axiomatic structures of algebra. These structures provide the natural surroundings for the discussion of many of the most important results in number theory, algebraic geometry and computational algebra. Among others, the following are studied: groups, rings, residue classes modulo n, quotient rings and fields, rings of polynomials, Euclidean domains, unique factorisation domains, extensions of fields, applications to straight-edge and compass constructions, finite fields and their applications.

*PP Mathematics 214, 244*

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|---|---|---|---|---|
| **324** | **16** | **Complex Analysis** | 3L, 3T | **E+i** |

Types of sets in **C**, convergence of series, point wise and uniform convergence of sequences and series of functions, paths, Cauchy-Riemann equations, determination of the radius of convergence and coefficients of a power series, the complex exponential and trigonometric functions, arguments, complex logarithms and exponentiation, integration of continuous functions along piecewise smooth paths, Cauchy's theorem and formula, Taylor series expansion of differentiable functions, analytic functions, zeros, Liouville's theorem, proof of the Fundamental Theorem of Algebra, Laurent series, identification and classification of isolated singularities, calculation of residues, the Residue theorem, applications.

*PP Mathematics 214, 244*

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|---|---|---|---|---|
| **325** | **16** | **Topology** | 3L, 3T | **E+i** |
| *Out of the three tutorial periods, one is a scheduled tutorial, and two are for independent work on assignments.*<br>This module gives an introduction to topology through its basic concepts: Topological spaces and continuous maps. Applications to analysis will be also covered<br>*Continuous assessment* | | | | |
| **344** | **16** | **Discrete Mathematics** | 3L, 3T | **E+i** |
| Discrete Mathematics, or "Concrete Mathematics", as it is called in a famous book, deals with concrete objects that are inherently discrete, such as permutations, sets, trees and words. Emphasis will be placed on enumeration techniques. An introduction to elementary number theory will also be presented. In this part of the module, classical topics such as Fermat's theorem, Wilson's theorem or Lagrange's theorem on sums of four squares are treated.<br>*PP Mathematics 214, 244 or equivalent modules* | | | | |
| **345** | **16** | **Logic** | 2L, 4T | **E+i** |
| *Out of the four tutorial periods, two are scheduled tutorials and two are for independent work on assignments*<br>This module gives an introduction to mathematical logic and formal mathematical languages, with a special emphasis on those languages that can be used for foundation of mathematics.<br>*Continuous assessment*<br>*PP Mathematics 114, 144 or equivalent modules* | | | | |
| **365** | **16** | **Real Analysis** | 3L, 3T | **E+i** |
| Some concepts and results from real analysis will be covered.<br>*PP Mathematics 214, 244* | | | | |
| **378** | **32** | **Foundations of Abstract Mathematics II** | 1L, 3P | **E+i** |
| Out of the four tutorial periods, two are scheduled tutorials and two are for independent work on assignments.<br>This module continues from Foundations of Abstract Mathematics I, going to higher levels of modern conceptual mathematics. The module will be chiefly based on group discussions led by the lecturer and it involves work on a project in any field of contemporary mathematics selected by the student in consultation with the Department. This shall give excellent preparation for postgraduate study in mathematics. The module will be also useful for those who do not intend to carry on with mathematics, as it will enrich them with the mathematical culture of thinking and logical reasoning.<br>*Admission subject to approval by the Department of Mathematical Sciences.*<br>*Flexible assessment* | | | | |

### Mathematics as a major for the BSc degree

The following modules are required: Mathematics 114(16), 144(16), 214(16), 244(16), and Mathematics 314(16), 324(16) together with two modules from Mathematics 325(16), 344(16), 345(16), 365(16), or Mathematics 378(32) together with two modules from Mathematics 314(16), 324(16), 325(16), 344(16), 345(16), 365(16), or Mathematics 314(16), 324(16), Financial Mathematics 378(32) or Biomathematics 214(16), 314(16), 344(16), 374(16).

| **66176 Biomathematics** | | | | |
|---|---|---|---|---|
| **214** | **16** | **Mathematical Applications in Biology and Medicine** | 4L, 2T | **E** |
| Introduction to simple deterministic mathematical models in biology and medicine. One-species exponential and logistic population growth. Models with age distribution; population projection. Two-species models; phase plane and stability analysis. Predator-prey; Lotka-Volterra models. Introduction to mathematical epidemiology. Compartmental analysis; SIR models. Modelling metabolic processes.<br>*PP Mathematics 114, 144* | | | | |
| **314** | **16** | **An Introduction to Biological Modelling I** | 3L, 3T | **E** |
| Selection of models including: discrete models, probabilistic models, deterministic models, stochastic models, Bayesian models. Discussion and illustration of their applications on the basis of computer lab activities.<br>*PP Biomathematics 214*<br>*PP Mathematics 214, 244* | | | | |
| **344** | **16** | **An Introduction to Biological Modelling II** | 3L, 3T | **E** |
| Methods for discrete and continuous optimization. Discussion and illustration of their limitations and applications in biology.<br>*P Biomathematics 314* | | | | |
| **374** | **16** | **Project on Biological Modelling** | 1P | **E** |
| Research project on a topic in biomathematics designed to provide students with experience in applying mathematical and statistical models.<br>*Please note:* The schedule of the weekly practical can be individually determined by the student in consultation with the supervisor.<br>*C Biomathematics 314* | | | | |

| 56847 Financial Mathematics | | | | |
|---|---|---|---|---|
| **378** | **32** | **Financial Mathematics** | 3L, 3T | **E+i** |

Matrix algebra and matrix differentiation. Taylor's theorem for functions of more than one variable, differential equations and numerical methods, Riemann-Stieltjes integrals, introduction to measure and probability spaces, Radon-Nikodym derivatives, L2 spaces and Hilbert spaces, mathematical modelling of financial markets, the Black-Scholes model.

*PP Mathematics 214, 244*
*P Mathematical Statistics 214, 244*

| 58378 Mathematics for Statistics | | | | |
|---|---|---|---|---|
| **214** | **16** | **Mathematics for Statistics** | 3L, 2T | **A** |

Calculus: Introductory concepts about functions, exponential functions, logarithmic functions, limits, continuity, derivatives, higher-order derivatives, the derivative as a rate of change, optimisation problems, indefinite and definite integrals, the Fundamental Theorem of Calculus, areas between curves, substitution, integration by parts.

Linear algebra: Gauss elimination, matrix algebra, inverse of a matrix, determinants of matrices, vectors in $\mathbf{R}^3$: rules of computation, unit vectors, linear combinations of vectors, linear independence and bases, dot product. The binomial theorem.

*C Statistics 214*

| 21547 Mathematics (Bio) | | | | |
|---|---|---|---|---|
| **124** | **16** | **Mathematics for the Biological Sciences** | 4L, 2T | **A & E** |

Functions and their inverses: polynomial functions, rational functions, power functions, exponential functions, trigonometric functions. Solution of trigonometric equations. Composition of functions. Limits. Definition of the derivative of a function. Continuity. Rules of differentiation, certain formulae. Higher-order derivatives. Implicit differentiation. Applications of differentiation: processes of growth and decay, graph sketching, optimisation problems. Indefinite integrals. Techniques of integration: substitution, integration by parts. The definite integral as the limit of a sum. The Fundamental Theorem of Calculus. Definite integrals as areas. Solution and use of simple differential equations.

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|---|---|---|---|---|
| **176** | **32** | **Introductory Mathematics for the Biological Sciences** | 3L, 3P | **A & E** |

For students in the BSc (Extended Degree Programmes).

*Any student who wishes to take this module must have achieved a mark of at least 4 (or 50%) for Mathematics in the NSC or the IEB's school-leaving certificate.*

Different presentations of functions in terms of formulas, graphs, tables and stories; inverse of a function; exponential and logarithmic functions; trigonometric functions and their inverse functions; modelling with functions; gradual progression from average to instantaneous rate of change; limits. Simple two-dimensional Euclidean geometry, as applied to polygons and circles; co-ordinate geometry; linear programming: optimising a function in two variables subject to linear constraints; introduction to data handling and probability.

*Flexible assessment*

**38571 Engineering Mathematics**

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|---|---|---|---|---|
| **115** | **15** | **Introductory Differential and Integral Calculus** | 5L, 2T | **A & E** |

*Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics in the NSC or the IEB's school-leaving certificate or must have successfully completed the first year of a suitable extended degree programme.*

Mathematical induction and the binomial theorem; functions; limits and continuity; derivatives and rules of differentiation; applications of differentiation; the definite and indefinite integral; integration of simple functions.

*Flexible assessment*

| | | | | |
|---|---|---|---|---|
| **145** | **15** | **Further Differential and Integral Calculus** | 5L, 2T | **A & E** |

Complex numbers; transcendental functions; integration techniques; improper integrals; conic sections; polar coordinates; partial derivatives; introduction to matrices and determinants.

*Flexible assessment*
*P Engineering Mathematics 115*

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|---|---|---|---|---|
| **214** | **15** | **Differential Equations and Linear Algebra** | 4L, 2T | **A & E** |

Ordinary differential equations of first order; linear differential equations of higher orders; Laplace transforms and applications. Matrices: linear independence, rank, eigenvalues. Laplace transforms and applications.

*Flexible assessment*
*PP Engineering Mathematics 115 or 145*
*P Engineering Mathematics 145*

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|---|---|---|---|---|
| **242** | **8** | **Series and Partial Differential Equations** | 2L, 1T | **A & E** |
| Infinite series and Taylor series; Fourier series; introduction to partial differential equations; Fourier transforms.<br>*Flexible assessment*<br>*PP Engineering Mathematics 145 or 214*<br>*P Engineering Mathematics 214* | | | | |

| **53759 Linear Algebra B** | | | | |
|---|---|---|---|---|
| **812** | **8** | **Linear Algebra** | | |
| Vector spaces, subspaces, bases. Matrix factorisation. Diagonalization. Application to the solution of systems of ordinary differential equations. Introduction to iterative methods for the solution of large systems of algebraic equations. | | | | |

## Division: Applied Mathematics

| 56820 Probability Theory and Statistics | | | | |
|---|---|---|---|---|
| **114** | **16** | **Probability Theory and Statistics** | 3L, 3T | **A & E** |
| (For BSc students)<br>Combinatorial analysis; the basic counting principles; permutations and combinations. Random phenomena; sample spaces and events; the probability axioms; the probability of an event; random selection; probability rules; conditional probability; the rule of Bayes; stochastic independence. Discrete and continuous stochastic variables; expected value and variance of stochastic variables; important discrete distributions: binomial, Poisson, geometric, hyper-geometric, negative binomial; important continuous distributions; uniform, exponential, normal.<br>*Please note:* This module is identical to Probability Theory and Statistics 144(16), which is offered in the second semester by the Department of Statistics and Actuarial Science for BCom students. | | | | |

| 20710 Applied Mathematics | | | | |
|---|---|---|---|---|
| **144** | **16** | **Modelling in Mechanics** | 3L, 3T | **A & E** |
| Development of the skilled use of vector, differential and integral calculus in the modelling of dynamics of simple physical systems, including the analysis of force fields, motion and modelling assumptions.<br>*P Mathematics 114*<br>*C Mathematics 144* | | | | |
| **214** | **16** | **Applied Matrix Methods** | 3L, 3T | **A+i** or **E+i** |
| Linear systems. Orthogonality: application to curve fitting. Eigenvalues and eigenvectors: Application to systems of difference and differential equations. Singular values: application to image processing. Numerical computations with matrices like LU and QR decomposition and the calculation of eigenvalues and eigenvectors. Matrix norms. Sensitivity of linear systems; condition numbers. The use of MATLAB for matrix computations.<br>*Continuous assessment*<br>*P Mathematics 144* | | | | |
| **244** | **16** | **Applied Differential Equations** | 3L, 3T | **A+i** or **E+i** |
| Modelling of a wide variety of applications using ordinary differential equations. Linear, non-linear, separable and homogeneous differential equations and systems are used. Analytic and numeric methods, as well as Laplace transforms, are used to solve the mathematical models. The various steps of the modelling process are emphasised.<br>*Continuous assessment*<br>*P Mathematics 114, 144* | | | | |

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|---|---|---|---|---|
| **314** | **16** | **Applied Discrete Mathematics** | 3L, 3T | **A+i** or **E+i** |
| Applications of prime factorisation, divisibility, greatest common divisors; the Euler phi function, modular arithmetic, multiplicative inverses, algebraic groups and elementary combinatorics in cryptology (the protection of information) and coding theory (the integrity of information). Introductory graph theory: planarity, colourings, Hamilton and Euler graphs.<br>*Continuous assessment*<br>*P Applied Mathematics 214 or*<br>*P Mathematics 214* | | | | |
| **324** | **16** | **Numerical Methods** | 3L, 3T | **A+i** or **E+i** |
| Methods for the solution of nonlinear equations; analysis of convergence. Interpolation with polynomials and splines; error analysis. Numerical differentiation and integration. Case studies. The use of MATLAB or PYTHON for numerical calculations.<br>*Continuous assessment.*<br>*P Mathematics 114* | | | | |
| **354** | **16** | **Flow Modelling** | 3L, 3T | **A+i** or **E+i** |
| Modelling of the dynamics of continuous systems; convective and diffusive transport as special cases of the general transport theorem; stress dyadic; energy and heat transport, constitutive equations for fluids; derivation and solution of the Navier-Stokes equation; ideal flow; potential flow.<br>*Continuous assessment*<br>*P Applied Mathematics 144* | | | | |
| **364** | **16** | **Applied Fourier Analysis** | 3L, 3T | **A+i** or **E+i** |
| Fourier series, Continuous and Discrete Fourier transforms, Convolution, Laplace transform, Sturm-Liouville theory, Orthogonal functions. Applications in signal and image processing, as well as in the solution of ordinary and partial differential equations. Numerical Fourier analysis and the FFT.<br>*Continuous assessment*<br>*PP Mathematics 114, 144 or*<br>*PP Engineering Mathematics 115, 145* | | | | |

## Applied Mathematics as a major for the BSc degree

The following modules are required: Probability Theory and Statistics 114(16), Applied Mathematics 144(16), 214(16), 244(16), 314(16), 324(16), 354(16) and 364(16).

| 20753 Applied Mathematics B | | | | |
|---|---|---|---|---|
| **124** | **15** | **Statics** | 4L, 2T | **A & E** |
| Vectors; forces; sum of forces at a point; direction cosines and direction angles; components and component vectors; scalar products; vector products; moment of a force; force systems on rigid bodies; equivalent force systems; couples; line of action of the resultant; equilibrium of a rigid body; friction; centre of mass; centroid; volumes; definite integration; moment of inertia of areas.<br>*Flexible assessment* | | | | |
| **154** | **15** | **Dynamics** | 4L, 2T | **A & E** |
| Kinematics in one and two dimensions; relative velocities; the equations of motion; rectilinear motion with constant forces; forces in a plane; parabolic motion; circular motion; the principle of work and energy; power; conservation laws; impulse and momentum; angle impulse and angle momentum; kinetics of particle systems.<br>*Flexible assessment*<br>*C Engineering Mathematics 115*<br>*P Applied Mathematics B 124* | | | | |
| **224** | **15** | **Dynamics of Rigid Bodies** | 3L, 3T | **A & E** |
| Plane kinetics of rigid bodies; rotation and translation; absolute motion; relative motion; instantaneous centre of zero velocity. Properties of rigid bodies; definite and multiple integrals; Cartesian, polar, cylindrical and spherical coordinate systems; areas, volumes, centres of mass and moments of inertia. Plane kinetics of rigid bodies; Newton's laws; energy methods. Introduction into three-dimensional dynamics of rigid bodies. Vibrations of rigid bodies.<br>*Flexible assessment*<br>*P Applied Mathematics 144 or*<br>*P Applied Mathematics B 154* | | | | |
| **242** | **8** | **Vector Analysis** | 2L, 1.5T | **A & E** |
| The straight line and the plane; space curves, derivatives and integrals of vectors, curves, the unit tangent, arc length; surfaces, partial derivatives of vectors, the gradient vector, vector fields, vector differential operators; line integrals, gradient fields; surface integrals in the plane, Green's theorem, surface integrals in space, Stokes' theorem; volume integrals; Gauss' divergence theorem; centres of mass and moments of inertia of 1-, 2- and 3-dimensional bodies.<br>*Flexible assessment*<br>*C Applied Mathematics B 224*<br>*P Engineering Mathematics 145* | | | | |

| 252 | 8 | **Applied Mathematics for Civil Engineers** | 2L, 1T | **A+i** or **E+i** |
|---|---|---|---|---|
| Mathematical modelling: correct identification of problems and specification of assumptions; formulation of ordinary and partial differential equations; analytical solutions; interpretation of a solution in terms of the initial problem.<br>*Flexible assessment*<br>*P Applied Mathematics B 154* | | | | |

| **20753 Applied Mathematics B** | | | | |
|---|---|---|---|---|
| **834** | **15** | **Partial Differential Equations** | | **E** |
| Derivation of simple PDEs from first principles, Fourier analysis, separation of variables and transform techniques for linear second-order PDEs, characteristics, Lagrange's method for first-order PDEs, finite differences. | | | | |

| **36323 Numerical Methods** | | | | |
|---|---|---|---|---|
| **262** | **8** | **Numerical Methods** | 2L, 1T | **A & E** |
| Introduction to MATLAB; zeros of functions; solving of systems of linear equations; numerical differentiation and integration; interpolation and curve-fitting; numerical methods for solving ordinary and partial differential equations.<br>*Flexible assessment*<br>*P Engineering Mathematics 214* | | | | |

## Division: Computer Science

| **18139 Computer Science** | | | | |
|---|---|---|---|---|
| **114** | **16** | **Introductory Computer Science** | 3L, 3P | **A+i** or **E+i** |
| Introduction to basic computer programming; formulation and solution of problems by means of computer programming; data representation and variable types (including character strings, integers, floating point numbers and Boolean variables); assignment statements; conditional execution and iteration; static data structures (arrays and records); input and output (including graphics and sound); modular programming; recursion; testing and debugging; introduction to object-oriented programming (including abstraction, encapsulation and use of existing object implementations).<br>*Continuous assessment*<br>*C Mathematics 114* | | | | |

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|---|---|---|---|---|
| **144** | **16** | **Introductory Computer Science** | 3L, 3P | **E+i** |
| Further formulation and solution of problems by means of computer programming; introductory data structures and algorithms in an object-oriented set-up; key concepts in object orientation: inheritance and polymorphism; design patterns as abstractions for the creation of reusable object-oriented designs; searching and sorting algorithms; complexity theory for the analysis of algorithms; fundamental methods in the design of algorithms; dynamic data structures; regular expressions and finite automata.<br>*Continuous assessment*<br>*P Computer Science 114* | | | | |
| **146** | **16** | **Preparatory Computer Science** | 3L, 3T | **E+i** |
| *Module will only be presented if a minimum of 10 students register for this module.*<br>For students in the BSc (Extended Degree Programmes).<br>Introduction to algorithmic thinking, abstract problem-solving skills and programming.<br>*Flexible assessment*<br>*C Mathematics 186* | | | | |
| **214** | **16** | **Data Structures and Algorithms** | 3L, 3T | **A+i** or **E+i** |
| The classical data structures and algorithms in an object-oriented set-up. Advanced techniques for the analysis of algorithms.<br>*Continuous assessment*<br>*PP Computer Science 144*<br>*P Mathematics 114, 144* | | | | |
| **244** | **16** | **Computer Architecture** | 3L, 3P | **A+i** or **E+i** |
| Basic computer architecture. Programming in machine language and assembly language.<br>Assemblers, binders and loaders. Basic concepts of operating systems; memory management, process management and file systems.<br>*Continuous assessment*<br>*C Computer Science 214* | | | | |

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|---|---|---|---|---|
| **314** | **16** | **Concurrency** | 3L, 3P | **A+i** or **E+i** |
| Introduction to programming techniques and principles of concurrent systems, from operating systems to application programs.This includes communication, synchronisation, scheduling and load balancing. Several parallel and distributed architectures will be covered.<br>*Continuous assessment*<br>*P Computer Science 214, 244*<br>For programmes in Engineering:<br>*P Computer Science E 214*<br>*P Computer Systems 245* | | | | |
| **315** | **16** | **Machine Learning** | 3L, 3T | **A+i** or **E+i** |
| Dimension reduction techniques; machine-learning techniques based on maximum-likelihood, maximum-posterior and expectation-maximization estimates; modelling using logistic regression, Gaussian mixtures and hidden Markov models.<br>*Continuous assessment*<br>*PP Computer Science 144 or*<br>*P Computer Science E 214*<br>*P Mathematical Statistics 244 or*<br>*P Systems and Signals 344* | | | | |
| **334** | **16** | **Databases and Web Centric Programming** | 3L, 3P | **E+i** |
| Introduction to relational databases. Mapping relational model onto object model. Implementing a database application in the context of the web. Web services.<br>Server-side scalability. Virtualization. Cloud Computing.<br>*Continuous assessment*<br>*P Computer Science 214, 244*<br>For programmes in Engineering:<br>*P Computer Science E 214*<br>*P Computer Systems 245* | | | | |
| **344** | **16** | **Program Design** | 3L, 3P | **E+i** |
| Program specifications as guidelines for program design; reusable frameworks for program design; testability of program designs; development of a medium-sized system to illustrate the practical application of the principles of program design.<br>*Continuous assessment*<br>*P Computer Science 214, 244*<br>For programmes in Engineering:<br>*P Computer Science E 214*<br>*P Computer Systems 245* | | | | |

| **354** | **16** | **Computer Networks** | 3L, 3P | **E+i** |
|---|---|---|---|---|
| Introduction to networks in general and the internet in particular. Architecture and protocols. Allocation of resources and congestion control. Network security. Applications.<br>*Continuous assessment*<br>*P Computer Science 214, 244*<br>For programmes in Engineering:<br>*P Computer Science E 214*<br>*P Computer Systems 245* | | | | |
| **364** | **16** | **Computer Vision** | 3L, 3P | **T** |
| Projective geometry and transformations of 2D and 3D. Camera models, the projective camera. Computation of the camera matrix using a calibration object. Removal of radial distortion. Epipolar geometry, the fundamental and essential matrices. Camera rectification and 3D reconstruction methods.<br>*Continuous assessment*<br>*P Computer Science 214 or*<br>*P Computer Science E 214*<br>*P Applied Mathematics 214 or*<br>*P Applied Mathematics B 242* | | | | |

### Computer Science as a major for the BSc degree

The following modules are required: Computer Science 114(16), 144(16), 214(16), 244(16), 314(16), 334(16), 344(16) and 354(16).

| **12263 Scientific Computing** | | | | |
|---|---|---|---|---|
| **272** | **5** | **Scientific Computing** | 2L | **A+i** or **E+i** |
| *Study load: 35 lectures in total*<br>Introduction to Linux; Linux commands; Linux file systems; editors; process control. Introduction to programming in Python: variables, types, control structures, loop structures, functions, files and directories, strings, unit testing, basic data processing.<br>Introduction to numerical computing using Numpy; plotting and curve fitting.<br>*Continuous assessment* | | | | |

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|---|---|---|---|---|
| **372** | **5** | **Scientific Computing** | 2L | **A+i** or **E+i** |

*Study load: 35 lectures in total*

Scientific-document construction and presentations in LaTeX. Regular expressions. Important algorithms including sorting, searching and random-number generation. Advanced computing in Python with Numpy and Scipy; applications including pattern searching, processing of large empirical data sets and constructing data-processing pipelines. Other scientific tools in Linux.

*Continuous assessment*

*P Scientific Computing 272*

**50040 Computer Skills**

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|---|---|---|---|---|
| **171** | **4** | **Computer Skills** | 1L | **T** |

*Study load: 26 lectures in total, presented as 2L per week every second week.*

Introduction to general computer usage with the focus on the development of skills in using software for word processing, skills in using spreadsheets to perform calculations in creating meaningful graphs and skills in using presentation software.

*The class mark will serve as the final mark.*

| | | | | |
|---|---|---|---|---|
| **176** | **8** | **Computer Skills** | 1L, 4T | **A & E** |

This module is taken by students in the BSc (Extended Degree Programmes). Utilisation of computers in computer users' areas on campus. Introduction to an operating system, Internet, E-mail, word processing, spreadsheet and presentation software.

*The class mark will serve as the final mark.*

| | | | | |
|---|---|---|---|---|
| **272** | **5** | **Computer Skills** | 2L | **E+i** |

*Study load: 35 lectures in total*

The main objective of this module is to equip the student with the relevant skills required to successfully and efficiently perform tasks identified as fundamental to the scientific process. Each topic is presented using an appropriate computer software package. Specific attention is given to the following topics: obtaining relevant literature, data capturing and analysis, creation and technical maintenance of electronic documents for reporting and presentation.

*Continuous assessment*

*P Computer Skills 171*

| 372 | 5 | Computer Skills | 2L | E+i |
|---|---|---|---|---|

*Study load: 35 lectures in total*

Component 1:

(22 lectures): Introduction to Computer Programming using Visual Basic:

Programming Code, Data Types, Variables, Decision Structures, Iteration, Strings, Arrays, Files

Component 2:

(13 lectures): Problem solving using programming. Designing applications in Microsoft Office using *Visual Basic Applications* (VBA). Customise/Enhance Microsoft Office by creating Macros, Procedures and Functions.

For more information see http://www.sun.ac.za/rv

*The class mark will be used as the final mark*

*P Computer Skills 272*

| 59536 Computer Science E | | | | |
|---|---|---|---|---|
| **214** | **15** | **Object-Oriented Programming** | 3L, 3P | **A+i** or **E+i** |

Formulation and solution of problems by means of computer programming in an object-oriented set-up; principles of testing and debugging; key concepts in object orientation: abstraction, encapsulation, inheritance and polymorphism; design patterns as abstractions for the creation of reusable object oriented designs; searching and sorting algorithms; complexity theory for the analysis of algorithms; fundamental methods in the design of algorithms; dynamic data structures.

*Continuous assessment*

*PP Computer Programming 143*
*P Engineering Mathematics 115, 145*

| 64007 University Practice in the Natural Sciences | | | | |
|---|---|---|---|---|
| **176** | **8** | **University Practice in the Natural Sciences** | 3L | **A & E** |

*Study load: 78 lectures in total, presented as 5L per week in the first semester and 1L per week in the second semester.*

For students in the BSc (Extended Degree Programmes). It is followed up during the second semester in the different subject-specific modules of Mathematics 176, Physics 146, Chemistry 176 and Biology 146. Basic terminology and concepts are addressed. Study and life skills receive attention. The natural sciences and specifically the subjects taken by the students serve as a context.

*Flexible assessment*

## Department of Microbiology

| 16284 Microbiology | | | | |
|---|---|---|---|---|
| **214** | **16** | **Introductory Microbiology** | 3L, 3P | **A+i** or **E+i** |
| History, microscopy, classification, structure and function, nutritional requirements and growth factors, nutrient uptake, energy generation, culture media, growth curves, yields and effect of nutrient limitation, continuous culture, physical and chemical control, environmental factors, antimicrobial therapy.<br>*PP Biology 124 or 144*<br>*PP Chemistry 124 and 144* | | | | |
| **244** | **16** | **Microbial Diversity** | 3L, 3P | **E+i** |
| Prokaryotes, kingdoms of life and modern classification, Archaeal cell structure and function, Gram-positive bacteria, Gram-negative bacteria, actinomycetes, cyanobacteria. Fungal divisions, cell structure and function. Structure of viruses and virus taxonomy, bacteriophages, human viruses. Microbiology of air, water and soil environments, different metabolic types of micro-organisms, the role of micro-organisms in biogeochemical cycles and energy flow in the food web, the dependence of animals and plants on micro-organisms, including symbiotic associations, microbe-plant associations and microbe-insect associations, interactions between micro-organisms.<br>*PP Biology 124 or 144*<br>*PP Chemistry 124 and 144* | | | | |
| **314** | **16** | **Microbial Molecular Biology** | 3L, 3P | **T** |
| Genome organisation of prokaryotes versus eukaryotes, advanced aspects of DNA replication in bacteria e.g. multiple replication forks and genome segregation, advanced aspects of transcription and translation using *Escherichia coli* (bacterium) and *Saccharomyces cerevisiae* (yeast) as model organisms, principles of gene regulation from single gene to global regulation levels, including operons, regulons, networks and signal transduction in bacteria, production of industrially important heterologous proteins in yeast, key concepts of yeast recombinant DNA technology.<br>*PP Microbiology 214; P Microbiology 244*<br>*P Biochemistry 214, 244* | | | | |
| **324** | **16** | **Microbial Physiology and Metabolism** | 3L, 3P | **T** |
| Elemental composition, carbon and energy flows, oxidation-reduction reactions, energy production through fermentation, respiration and photosynthesis, variety of molecules used as electron donors and acceptors and the micro-organisms involved, membrane transport, chemotaxis, sources and assimilation of nitrogen, sulphate and phosphate, assimilation of carbon dioxide, biosynthesis of amino acids and other monomers, application of metabolism to industrial processes, Pasteur and Crabtree effects, iron-oxidising bacteria and bio-mining.<br>*PP Microbiology 214; P Microbiology 244*<br>*P Biochemistry 214, 244* | | | | |

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| **354** | **16** | **Industrial Microbiology** | 3L, 3P | **T** |
| Food fermentations, traditional microbial processes: beer, wine, bread, cheese, yoghurt, salami, etc. Specialised food fermentations, e.g. biological preservatives, preparation and the role of micro-organisms. Introduction to microbial fermentations, batch, continuous and fed-batch fermentations, mono-culture versus mix culture fermentations, scaling-up of microbial fermentations. Quality control measures: HACCP, ISO 9000, etc. The occurrence of pathogens and food-spoiling bacteria and their control. Industrial production of non-food products: selected examples of industrial production of enzymes, overproduction of citric acid and lysine, antibiotics, pharmaceutical products, influence of substrate on production levels.<br>*PP Microbiology 214; P Microbiology 244* | | | | |
| **364** | **16** | **Microbial Ecology** | 3L, 3P | **T** |
| Introduction to environmental microbiology, overview of microbial environments, including earth, aquatic and extreme niches, role of microorganisms in biogeochemical cycling, microbial communication and interactions, application of microbes in environmental and industrial remediation, sewage water, industrial wastewater and drinking water treatment, detection, enumeration and identifications of microorganisms.<br>*PP Microbiology 214; P Microbiology 244* | | | | |

### Microbiology as a major for the BSc degree

The following modules are required: Microbiology 214(16), 244(16), 314(16), 324(16), 354(16), 364(16).

## Department of Physics

| 12998 Physics | | | | |
|---|---|---|---|---|
| **114** | **16** | **Introductory Physics A** | 3L, 3P | **A+i** or **E+i** |
| A calculus-based introductory systematic treatment of Newton mechanics that serves as the foundation for more advanced physics modules and eventual specialisation in physics. Experimental measurement and expression of physical quantities, kinematics, dynamics of translation, work and energy, rotational motion, statics, conservation laws, heat and thermodynamics.<br>*C Mathematics 114* | | | | |
| **144** | **16** | **Introductory Physics B** | 3L, 3P | **A+i** or **E+i** |
| An introductory physics module with a mathematical approach and emphasis on the fundamental concepts, with contents: Electrostatics, electrodynamics and magnetism. Special relativity.<br>*P Physics 114*<br>*P Mathematics 114*<br>*C Mathematics 144* | | | | |
| **176** | **32** | **Preparatory Physics** | 3L, 3P | **A & E** |
| Students follow this module in the BSc Extended Degree Programmes in AgriSciences and Science and for the BEng. The module focus on the nature of physics with the following themes as content: Mechanics, electromagnetism, modern physics.<br>*Flexible assessment* | | | | |
| **214** | **16** | **Computational Physics A** | 3L, 3P | **T** |
| Simulations in basic physics systems developing a toolbox for numerical analysis. Topics change annually. Typical examples are the chaotic pendulum, planetary motion, integral equations for electromagnetic fields and waves.<br>*Continuous assessment*<br>*PP Physics 114, 144*<br>*C Physics 224*<br>*P Mathematics 114, 144*<br>*C Scientific Computing 272* | | | | |

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|---|---|---|---|---|
| **224** | **16** | **Classical Mechanics, Wave Theory and Optics** | 3L, 3P | **T** |
| Velocity-dependent non-conservative force, conservative systems in three-dimensional space, central force motion, planetary and satellite motion, scattering of particles, multi-particle systems, dynamics of rigid bodies, geometrical optics, free and forced linear oscillations with damping, one-dimensional wave motion with boundary conditions, Doppler effect, interference and diffraction, physical optics.<br>*Continuous assessment*<br>*PP Physics 114*<br>*P Mathematics 114, 144*<br>*PP Physics 144* | | | | |
| **244** | **16** | **Computational Physics B** | 3L, 3P | **T** |
| Numerical stimulation of many-particle and higher dimensional systems. Topics change annually. Typically they may include stochastic growth, lattice gases, sand-pile models or percolation. Introduction to statistical data analysis.<br>*Continuous assessment*<br>*PP Physics 114, 144*<br>*P Physics 214, 224*<br>*C Physics 254*<br>*C Scientific Computing 272* | | | | |
| **254** | **16** | **Electromagnetism and Introduction to Quantum Physics** | 3L, 3P | **T** |
| Electrostatic fields; magnetic fields; electromagnetic induction and alternating currents, Maxwell's equations and electromagnetic waves. Quantum properties and wave-particle duality.<br>Schrödinger equation in one dimension, eigenvalues and eigenfunctions for piecewise constant potentials and the harmonic oscillator. Time dependence, wave packets and tunnelling.<br>*Continuous assessment*<br>*PP Mathematics 114*<br>*P Mathematics 144*<br>*P Physics 224* | | | | |

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| **314** | **16** | **Statistical Physics A (Introductory Thermodynamics and Statistical Mechanics)** | 3L, 3P | **T** |
| The three laws of thermodynamics are formulated, analysed and applied to simple thermodynamical systems; statistical and thermodynamic functions; phase equilibrium; statistical basis of thermodynamics. Fermi and Bose statistics, the ideal gas, black body radiation and other applications.<br>*Continuous assessment*<br>*P Physics 254*<br>*P Mathematics 214, 244* | | | | |
| **334** | **16** | **Quantum Mechanics A (Quantum Mechanics with applications)** | 3L, 3P | **T** |
| Schrödinger equation in three dimensions; particle in a box; spherically symmetric potentials, orbital angular momentum: Eigenvalues and spherical harmonic functions. The hydrogen atom. Electrons in periodic crystal potentials, time-independent perturbation theory, spin and application to the atom.<br>*Continuous assessment*<br>*PP Physics 224*<br>*P Physics 254*<br>*P Mathematics 214, 244* | | | | |
| **342** | **8** | **Electromagnetism and Relativity** | 1.5L, 1.5P | **T** |
| Polarisation and magnetisation of materials, electromagnetic waves and their transitions between different media. Theory of relativity.<br>*Continuous assessment.*<br>*PP Physics 224, 254*<br>*P Mathematics 244* | | | | |
| **344** | **16** | **Computational Physics C (Monte Carlo Methods in Physics)** | 3L, 3P | **T** |
| Generation and testing of random numbers. Statistics of data analysis. Analytic solutions, computer simulation and analysis of random systems such as random walks and the Ising model.<br>*Continuous assessment*<br>*P Physics 214 or 314* | | | | |

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| **352** | **8** | **Atomic and Nuclear Physics** | 1.5L, 1.5P | **T** |
| Magnetic dipole moments, spin-orbit coupling, radiation transition rates, Zeeman effect, Helium atom. Nuclear structure and properties, radioactive decay, the nuclear force, introduction to nuclear models, apparatus of nuclear physics, elementary particles.<br>*Continuous assessment*<br>*P Physics 254, 334* | | | | |
| **372** | **8** | **Project (Theoretical Physics)** | 0.7L, 0.7P | **T** |
| Application(s) of topics forming part of the BSc programme in Physics, stream Theoretical Physics.<br>*Continuous assessment* | | | | |
| **384** | **16** | **Experimental Work in Physics** | 3L, 3P | **T** |
| (This module cannot be taken simultaneously with Chemistry 2.)<br>Practical laboratory work in Physics. Selected experiments in modern Physics, which are related to the experimental research in the Department, are carried out introducing the student to experimental design and analysis of data.<br>*Continuous assessment*<br>*C Physics 342, 352* | | | | |

### Physics as a major for the BSc degree

The following modules are required: Physics 114(16), 144(16), 224(16), 254(16), 314(16), 334(16), 342(8), 352(8), 384(16).

For specialisation in Theoretical Physics the following third-year modules are required: Physics 314(16), 334(16), 342(8), 344(16) and Project (Theoretical Physics) 372(8).

### Other modules in Physics

| **19267 Special Physics** | | | | |
|---|---|---|---|---|
| **142** | **8** | **Physics for Health Sciences** | 2L, 1T | **T** |
| Structure of matter, kinematics, statics, dynamics, heat, temperature, wave motion and electricity. | | | | |

| **13005 Physics (Bio)** | | | | |
|---|---|---|---|---|
| **134** | **16** | **Introductory Physics for Biological Sciences A** | 3L, 3P | **A & E** |
| Selected topics, relevant to the biological sciences, from introductory mechanics, hydro-statics and optics.<br>*Continuous assessment*<br>*C Mathematics (Bio) 124 or*<br>*C Mathematics 114* | | | | |

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|---|---|---|---|---|
| **154** | **16** | **Introductory Physics for Biological Sciences B** | 3L, 3P | **A & E** |
| Selected topics, relevant to the biological sciences, from introductory electricity, magnetism, thermodynamics, gas laws, atomic physics, radioactivity, oscillations and waves.<br>*Continuous assessment*<br>*P Physics (Bio) 134* | | | | |

| **59420 Engineering Physics** | | | | |
|---|---|---|---|---|
| **113** | **8** | **Physics for Engineering students** | 2L, 0.5P, 0.5T | **A & E** |
| Introduction to physics and physical quantities, including: macro- and micro-descriptions of nature; molecular and atomic structure of materials: crystalline and amorphous solids; crystal structures, defects and applications; oscillatory motion, introduction to wave motion, superposition and standing waves, sound waves, Doppler effect; wave optics (diffraction, interference, polarization); introduction to nuclear physics.<br>*Flexible Assessment* | | | | |
| **152** | **6** | **Physics for Engineering students** | 3T | **E+i** |
| Introduction to basic relativity and basic quantum mechanics. Continued study of waves, acoustics and optics based on Engineering Physics 113.<br>*Flexible Assessment*<br>*P Engineering Physics 113* | | | | |

## Department of Physiological Sciences

| 13080 Physiology | | | | |
|---|---|---|---|---|
| **114** | **12** | **Introductory Overview of Physiology** | 3L | **A+i** |
| Basic overview of the following physiological principles, organs and systems: Homeostasis, organic molecules, the cell, tissue, special senses, nervous, endocrine, immune and reproductive systems.<br>*(Offered for the programme BA with Sport Science)* | | | | |
| **144** | **12** | **Overview of Physiology** | 3L | **A+i** |
| Basic overview of the following physiological principles and systems: Acid/base balance, muscle, cardiovascular, respiratory, urinary and digestive systems.<br>*(Offered for the programme BA with Sport Science)*<br>*P Physiology 114* | | | | |
| **214** | **16** | **Physiological Principles and Systems** | 3L, 3P | **A+i** or **E+i** |
| Textbook-based overview of the following physiological principles and systems: Homeostasis and body fluids, cell membranes, general physiological control systems, nervous, muscle, respiratory, hormonal, digestive (basic single stomach) systems, and also typical diseases applicable to these systems.<br>*PP Biology 124, 154 or*<br>*PP Biology (OCC) 111 or*<br>*PP Physiology 114, 144*<br>*C Biochemistry 214* | | | | |
| **244** | **16** | **Systems in Physiology** | 3L, 3P | **A+i** or **E+i** |
| Textbook-based overview of the following physiological systems of the body: Special sense organs, acid/base balance, blood, cardiovascular, renal and reproductive systems.<br>*P Physiology 214*<br>*C Biochemistry 244* | | | | |
| **314** | **16** | **Integrated Physiology** | 3L, 3P | **A+i** or **E+i** |
| This module will concentrate mainly on integrated physiology and will cover a selection of the following topics: Systems physiology and homeostasis, endocrinology, metabolism of physiological conditions, cardiovascular physiology, reproductive physiology and neurophysiology.<br>*PP Physiology 214, 244*<br>*P Biochemistry 214, 244* | | | | |

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|---|---|---|---|---|
| **334** | **16** | **Metabolic Physiology** | 3L, 3P | **A+i** or **E+i** |
| This module will concentrate on metabolic physiology and will cover the following topics: macronutrient uptake and utilisation, exercise and metabolism, energy balance, digestion, absorption, factors influencing carbohydrate metabolism, glycaemic index/load, fat metabolism, protein metabolism, mechanisms of hypertrophy.<br>*PP Physiology 214 or 244*<br>*P Biochemistry 214, 244* | | | | |
| **344** | **16** | **Cellular Physiology** | 3L, 3P | **A+i** or **E+i** |
| This module will concentrate mainly on cellular physiology and will cover a selection of the following topics: Membrane and cell communication, immunology, tissue hypoxia, muscle satellite cells and stem cells.<br>*P Biochemistry 214, 244*<br>*PP Physiology 214 for the Molecular Biology and Biotechnology programme*<br>*P Physiology 314 for the Human Life Sciences and Sport Science programmes* | | | | |
| **364** | **16** | **Clinical Applied Physiology** | 3L, 3P | **A+i** or **E+i** |
| This module will concentrate mainly on diseases of lifestyle and the promotion of wellness. The physiological and cellular aspects of several chronic diseases will be covered and will include a selection of the following topics: Body composition, obesity, anorexia, bone tissue and density, osteoporosis, stress fractures, mechanisms of muscle atrophy and conditions leading to muscle atrophy, mild brain injury, ageing, chronic kidney disease, nutrition and kidney disease, clinical haematology, HIV, cancer and TB.<br>*PP Physiology 214, 244*<br>*P Biochemistry 214, 244* | | | | |

## Physiology as a major for the BSc degree

The following modules are required: Physiology 214(16), 244(16) 314(16), 334(16), 344(16) and 364(16).

## Faculty of AgriSciences

## Department of Conservation Ecology and Entomology

| 55638 Conservation Ecology | | | | |
|---|---|---|---|---|
| **314** | **16** | **Biome Ecology** | 3L, 3P | **E** |
| Introduction to biomes and ecosystem services; key drivers; social-ecological systems of dynamics and biome-level management issues; ecology of tropical and afromontane forests, woodlands, savannahs, treeless vegetation types; wetlands; animal diversity-habitat interactions; patterns of endemism; biological invasion and its management.<br>*Continuous assessment.* | | | | |

## Department of Genetics

| 11061 Biometry | | | | |
|---|---|---|---|---|
| **211** | **8** | **Statistics in Biology** | 1L, 1P | **T** |
| Role of statistics in research; principles of estimation, sampling, randomization and unbiasedness; methods of tabulation and graphical representation of data; descriptive measures of locality, variance and association; probability distributions and hypothesis testing; tests for homoscedasticity and normality; analysis of variance; T tests; simple and multiple linear regression; contingency tables and chi-square tests; non-parametric tests. All data will be analysed using Excel.<br>*Continuous assessment* | | | | |

| 13285 Genetics | | | | |
|---|---|---|---|---|
| **214** | **16** | **Introductory Genetics** | 3L, 3P | **T** |
| *Part I: Principles of Heredity*<br>Molecular basis of genetic diversity and heredity; the cell cycle; mitosis and meiosis; chromosomes, genes and heredity; Mendelian genetics; linkage and crossing over of genes on a chromosome; linkage analysis and gene mapping; sexual reproduction and sex determining chromosomes; mutations that affect chromosome number and structure and their phenotypic effects.<br>*Part II: Population Genetics*<br>Introduction to population genetics; population diversity and genotype and allele frequencies; Hardy-Weinberg principle; quantitative genetics and heredity.<br>*PP Biology 124 or 144 or 154*<br>*P Mathematics (Bio) 124 or Mathematics 114 or 144* | | | | |

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|---|---|---|---|---|
| **215** | **16** | **Introductory Microbial Biotechnology** | 3L, 3P | **T** |

Biotechnology is an applied science, aimed at utilising biological systems and organisms. Biotechnologists therefore use their knowledge of biological systems to generate products or deliver services. This module introduces the student to microbial biotechnology by focussing on the most important aspects of first- and second-generation microbial biotechnology. Themes that will be discussed include bioprospecting, fermentation and bioreactors, microbial metabolic pathways for respiration and fermentation, production of baker's yeast and single-cell protein, the beer- and wine-making processes, production of bio-ethanol and the production of pharmaceutically important compounds and enzymes.

Responsible departments: BIOCHEMISTRY, GENETICS, MICROBIOLOGY, PLANT PATHOLOGY and the INSTITUTE FOR FOR WINE BIOTECHNOLOGY .

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| **244** | **16** | **Introductory Molecular Biology** | 3L, 3P | **T** |

The biology of the molecule of life. The structure of double-stranded DNA; the processes of replication and recombination of DNA; the deciphering and nature of the genetic code; the processes of transcription and translation; protein structure and function; the regulation of gene expression in prokaryotes and eukaryotes; DNA mutations; DNA repair and transposable elements; the construction and analysis of DNA clones; applications and ethics of recombinant DNA technology; introduction to bio-informatics.

*P Genetics 214*

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|---|---|---|---|---|
| **245** | **16** | **Introductory Plant and Animal Biotechnology** | 3L, 3P | **T** |

This module follows on from the Genetics 215 module and introduces the student to first- and second-generation biotechnology in eukaryotic systems, including plants, animals and humans. First-generation biotechnology entails the use of organisms/ biological systems as they are, e.g extracting pharmaceutical products from plants. In contrast, second-generation biotechnology focuses on more specialised techniques, e.g. *in vitro* propagation, mutagenesis and breeding. Themes that will be discussed include aquaculture, aquatic bioremediation, aquatic bioprocessing, embryogeny, assisted reproduction and embryo manipulation, cell and tissue culture for both plant and animal systems, micropropagation, and the identification, characterization and production of valuable natural products and pharmaceuticals in plants.

Presented by DEPARTMENTS GENETICS, PLANT PATHOLOGY, and the INSTITUTE FOR WINE BIOTECHNOLOGY.

| | | | | |
|---|---|---|---|---|
| **314** | **16** | **Genomes and Genome Analysis** | 3L, 3P | **T** |
| The module focuses on the organisation, structure and functionality of genomes and covers the following aspects: genome structure, genome organisation, genome function and methods to study genomes. Chromosome structure and organisation are also studied. Other complementary topics include: Introductory Bioinformatics to study genomes; chloroplast and mitochondrial genomes; genome models; genetics of development.<br>*Continuous assessment.*<br>*PP Genetics 244* | | | | |
| **315** | **16** | **Advanced Biotechnology** | 3L, 3P | **E** |
| This module focuses on the most important aspects of third-generation biotechnology. Third-generation biotechnology can also be described as molecular biotechnology and the themes covered include genetic fingerprinting and molecular forensics, molecular diagnostics, genetic engineering, gene therapy, bio-processing, metabolic engineering (integrated metabolism), bioinformatics and mathematical modelling of biological systems, applied "-omics" and nano-biotechnology.<br>Presented by the DEPARTMENT OF GENETICS, FACULTY OF AGRISCIENCES<br>*PP Genetics 215, 245* | | | | |
| **324** | **16** | **Molecular Population Genetics** | 3L, 3P | **T** |
| The genetic structure and dynamics of populations; frequencies of genes and genotypes; genetic polymorphisms; random mating and the Hardy-Weinberg principle; factors that determine genetic change and genetic equilibrium: mutation, migration, selection and population size; linkage disequilibrium, heterozygosity in subdivided populations; genetic relationships between populations; implications for genetic identification (DNA typing).<br>*Subject to continuous assessment.*<br>*PP Genetics 214*<br>*C Genetics 244* | | | | |
| **344** | **16** | **Advanced Topics in Molecular Genetics** | 3L, 3P | **T** |
| Various advanced topics are addressed in this module and include: DNA markers and applications in mapping of genes involved with genetic diseases; diagnostic applications in human genetics; marker-assisted selection in plant and animal breeding; DNA fingerprinting and forensic science; applications from genome projects; personalised medicine and pharmacogenetics; epigenomics; genetic modification; cancer and apoptosis; gene therapy; genetics of behavioural traits.<br>*Subject to continuous assessment.*<br>*PP Genetics 244* | | | | |

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|---|---|---|---|---|
| **345** | **16** | **Economic and Legal Aspects of Biotechnology** | 3L, 3P | **T** |
| This module is aimed at introducing the biotechnology student to the non-biological (non-natural science) aspects of biotechnology. Students will be introduced to concepts such as the generation and development of creative ideas, entrepreneurship, market research, feasibility studies, the generation of a business plan, financing, profitability, the South African legal system, intellectual property law, patents, plant breeders' rights, trademarks and copyright, licensing agreements, regulatory measures and prerequisites in terms of research practice and GMOs, good laboratory practice, quality control and project management in a research environment.<br>Presented by THE DEPARTMENT OF GENETICS, FACULTY OF AGRISCIENCES. | | | | |
| **354** | **16** | **Quantitative genetics** | 3L, 3P | **T** |
| Quantitative traits and continuous variation; components of phenotypic and genetic variances; resemblance between relatives; estimation of heritability and breeding value; selection methods and genetic improvement; correlated traits; multiple traits selection; principles of marker-based selection; mapping and characterising of quantitative trait loci.<br>*Continuous assessment.*<br>*P Genetics 324*<br>*P Biometry 211 or 212* | | | | |

## Department of Soil Science

| **14176 Soil Science** | | | | |
|---|---|---|---|---|
| **214** | **16** | **Introduction to Soil Science** | 3L, 3P | **T** |
| Soil as a three-dimensional unit; soil formation factors: climate, parent material, relief, organisms and time; weathering processes and products; physical properties of soil: texture, structure, colour, air-water-temperature relationships; chemical properties of soil: soil colloids, clay minerals, cation adsorption and exchange, soil reaction; formation and properties of soil organic material; elementary interpretation and evaluation of physical, chemical and morphological soil characteristics for resource use.<br>*P Chemistry 144* | | | | |

## Faculty of Arts and Social Sciences
## Department of General Linguistics

| 10294 General Linguistics | | | | |
|---|---|---|---|---|
| **178** | **24** | **Introduction to Linguistics** | 3L, 1T | **T** |
| Nature and objectives; functions of language; construction of (a) language out of a sound system, a meaning system, and systems for forming words and sentences; principles of language use; language diversity and variation; interaction between linguistic and social phenomena; language change; language acquisition; language in the brain; language production and perception. | | | | |
| **278** | **32** | **Language and the Human Mind** | 3L | **T** |
| Principles and practice of the analysis of language structure (syntax and phonology, other aspects of language structure); principles and practice of the analysis of language use (pragmatics/discourse analysis); sociolinguistic aspects of language; core questions about language acquisition and language processing; *capita selecta* which contribute to the realisation of the outcomes of the module.<br>*A system of continuous assessment is used in General Linguistics 278.* | | | | |
| **379** | **48** | **Advanced Linguistics** | 4L | **T** |
| The role of linguistic principles in solving problems concerning language acquisition; principles and practice of pragmatic analysis/discourse analysis; theory formation in syntax and morphology and/or semantics; pragmatic and sociolinguistic perspectives on multilingualism, language policy and language planning; aspects of the dynamics of language (origin, evolution, change, decay of language(s)); *capita selecta* which contribute to the realisation of the outcomes of the module.<br>*A system of continuous assessment is used in General Linguistics 379.* | | | | |

## Department of Geography and Environmental Studies

| 64165 Geo-Environmental Science | | | | |
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| **124** | **16** | **Introduction to Human-Environmental Systems** | 3L, 3P | **T** |
| Nature of human geography; Demography of world population; Food resources; Urbanisation: models of urban structure, functional areas in cities, cities in developing countries; Politico-geographical organisation: nations and states in conflict, regions in the news; Environmental systems on a global scale: fluvial, arid, karst, coastal and glacial environments; Ecosystems and humans; Utilisation of environmental resources: global occurrence, use and depletion of non-renewable energy, water and soil resources; Practical mapping and graphics. | | | | |

## Geography and Environmental Studies

**Please note:**

As general outcomes the subject foci and contents are aimed at delivering students who:

- Think critically about social and environmental issues and problems, and assist in finding innovative solutions;
- Have attained international standards in academic and operational thought;
- Understand social, human and environmental phenomena and the interactions between these elements;
- Have occupational skills applicable in the public and private management sectors and can compete professionally on a global level; and
- Have computer, information and analytical skills for effective participation in the wider information society.

| **56502 Geography and Environmental Studies** | | | | |
|---|---|---|---|---|
| **214** | **16** | **Geographical Information Systems** | 3L, 3P | **E** |
| Introductory overview and comprehension of GIS in the context of geo-information science; The nature of geographical data, data models, coordinate systems and map projections; GIS processes: data capturing, ordering and storage, manipulation and analysis; Map design and cartographic visualisation with a GIS; GIS applications.<br>*P Geo-Environmental Science 124*<br>*C Mathematics 114 OR*<br>*C Mathematics (Bio) 124* | | | | |
| **265** | **16** | **Environmental Studies** | 3L, 3P | **T** |
| Energy, moisture and wind as climatic elements; movement in the atmosphere: air circulation at global, regional and local scales; significant climatic phenomena to humans: El Niño, tropical cyclones and tornadoes; South African weather and climate; atmospheric environmental problems in South Africa: drought, air pollution, floods, hail and frost; analysis of climatic data: collection, processing and interpretation; synoptic maps and weather forecasting. Soil erosion, acid mine water drainage, water pollution, strategic risk management planning.<br>*P Geo-Environmental Science 124* | | | | |
| **358** | **16** | **Environmental Studies** | 3L, 3P | **T** |
| Geomorphology of South African rivers and drainage basins: run-off regime, basin morphology, stream and channel patterns; human-induced changes in rivers and river basins: impoundment, canalisation, interbasin transfers; water quality in South Africa: interaction between humans and the environment with special reference to industrial and agricultural pollution; use, development and management of South African water resources: impact of the Water Act. South African environmental policies; Environmental impact assessment process.<br>*P Geography and Environmental Studies 265* | | | | |

### Geography and Environmental Studies as a major for a BSc degree

The following modules are required: Geo-Environmental Science 124(16), 154(16); Geography and Environmental Studies 214(16); Geographical Information Technology 211(16), 241(16), 242(16) 311(16), 312(16), 341(16), 342(16).

| **12923 Geographical Information Technology** | | | | |
|---|---|---|---|---|
| **211** | **16** | **Earth Observation** | 3L, 3P | **E** |
| Principles of remote sensing and earth observation; the electromagnetic spectrum; reflectance characteristics of various objects on the earth's surface; atmospherical interaction with electro-magnetic energy; digital imagery; image resolution; satellite systems; image enhancement and pre-processing; unsupervised and supervised image classification; accuracy assessment; GIS integration.<br>*Continuous assessment*<br>*C Geography and Environmental Studies 214*<br>*C Mathematics 114 OR*<br>*C Mathematics (Bio) 124* | | | | |
| **241** | **16** | **Spatial Data Management** | 3L, 3P | **E** |
| Map projections and coordinate systems; spatial data modelling (e.g. vector, raster, object-orientated); topology and topological dimensions; topological-dimension conversions; geo-databases; data model and format conversions; data generalisation and aggregation.<br>*Continuous assessment*<br>*P Geography and Environmental Studies 214* | | | | |
| **242** | **16** | **Digital Photogrammetry** | 3L, 3P | **E** |
| Principles of digital photogrammetry; stereo vision and parallax; types of photogrammetry; image sourcing and acquisition; flight planning; sensor orientation and image characteristics; interior and exterior orientation; ground control and tie-point collection; least-squares adjust-ment and coordinate transformations; image processing (contrast and spectral enhancement, image matching, mosaicing); topographical-map production; GIS integration.<br>*Continuous assessment*<br>*P Geographical Information Technology 211*<br>*P Mathematics 114 or*<br>*P Mathematics (Bio) 124* | | | | |

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|---|---|---|---|---|
| **311** | **16** | **Spatial Data Acquisition** | 3L, 3P | **E** |
| Spatial data types and models, acquisition and creation of spatial data, digitizing and scanning, field data collection, global navigation satellite systems, uncertainty and error, data quality, national and international data providers and warehouses, metadata and standards, spatial data as property, data sharing.<br>*Continuous assessment*<br>*Geographical Information Technology 241* | | | | |
| **312** | **16** | **Spatial Analysis** | 3L, 3P | **E** |
| Query operations and query languages; Geometric measures; Spatial analytical operations; Surface analysis; Geostatistics; Network analysis; Analysis design; Fuzzy sets.<br>*Continuous assessment*<br>*P Geography and Environmental Studies 214*<br>*P Geographical Information Technology 241* | | | | |
| **341** | **16** | **Spatial Modelling** | 3L, 3P | **E** |
| Models in science; Spatial models: types, construction, design and development; Cartographic modelling: terminology, methodology, in and outputs, functions.<br>*Continuous assessment*<br>*P Geographical Information Technology 312* | | | | |
| **342** | **16** | **Earth Observation** | 3L, 3P | **E** |
| Image pre-processing techniques (e.g. geometric, radiometric, atmospheric and topographic corrections); image transforms; geographical object-based image analysis (GEOBIA); image classification approaches and algorithms; earth observation workflows; image acquisition; GIS integration<br>*Continuous assessment*<br>*P Geographical Information Technology 211* | | | | |

## Department of Information Science

| 58173 Socio-Informatics | | | | |
|---|---|---|---|---|
| **224** | **16** | **Introduction to Computer Programming** | 2L, 2P | **T** |
| Principles of computer programming. Skills development in object-oriented program languages.<br>*Continuous assessment* | | | | |
| **254** | **16** | **Internet Technology and Design** | 1L, 3P | **T** |
| The internet and the world wide web. Architecture of hypertext systems. The design of web sites and portals.<br>*Continuous assessment* | | | | |
| **262** | **8** | **Electronic Business and Government** | 1.5L | **T** |
| The management of private and public organisations in contexts rich in information and knowledge technology.<br>*Continuous assessment* | | | | |
| **314** | **18** | **Database Systems** | 3L, 2P | **T** |
| Database concepts, models, design and management.<br>*Continuous assessment* | | | | |
| **334** | **18** | **Architecture of Information Systems and Enterprises** | 2L, 3P | **T** |
| Theory of software and hardware systems and their design and analysis. Cybernetics. Introduction to modelling and modelling languages such as UML. | | | | |
| **354** | **18** | **Information Systems** | 2L, 3P | **T** |
| Advanced software applications, such as simulation and modelling. Integration of preceding modules through the design and presentation of an elementary, experimental system.<br>*Continuous assessment* | | | | |
| **364** | **18** | **Knowledge Dynamics and Knowledge Management** | 3L, 1P | **T** |
| Knowledge technology, knowledge-based systems, artificial intelligence and knowledge dynamics in complex organisations.<br>*Continuous assessment* | | | | |

## Department of Music

| 50652 Music Technology | | | | |
|---|---|---|---|---|
| **112** | **6** | **Music Technology** | 2L | **T** |
| Music and computers: MIDI; notation software; sequencing software; basic principles of sound recording and editing; the physiology of hearing; music in film/advertisements; video and soundtracks; basic web design and HTML.<br>*Continuous assessment is implemented.* | | | | |
| **142** | **6** | **Music Technology** | 2L | **T** |
| Music and computers: MIDI; notation software; sequencing software; basic principles of sound recording and editing; the physiology of hearing; music in film/advertisements; video and soundtracks; basic web design and HTML.<br>*Continuous assessment is implemented.* | | | | |
| **222** | **8** | **Music Technology** | 1L, 1P | **T** |
| An advanced study of sound waves, sound perception, acoustics, the sound studio, sound synthesis, MIDI, sound signal processing and sound orientated programming.<br>*Continuous assessment is implemented.* | | | | |
| **252** | **8** | **Music Technology** | 1L, 1P | **T** |
| An advanced study of sound waves, sound perception, acoustics, the sound studio, sound synthesis, MIDI, sound signal processing and sound orientated programming.<br>*Continuous assessment is implemented.* | | | | |
| **379** | **48** | **Music Technology** | 2L, 2T | **T** |
| Projects regarding sound recordings and sound orientated programming.<br>*Continuous assessment is implemented.* | | | | |

## Department of Philosophy

| 59277 Business Ethics | | | | |
|---|---|---|---|---|
| **214** | **8** | **Business Ethics** | 2L | **T** |
| Introduction to ethics and applied ethics; philosophical approaches to ethics; macro-ethical issues in business ethics; contemporary approaches to corporate social responsibility and corporate governance; management and organisational ethics; writing skills, research and case study analysis in applied ethics. | | | | |

## Department of Psychology

| 18414 Psychology | | | | |
|---|---|---|---|---|
| **114** | **12** | **Psychology as a Science** | 2L, 1T | **T** |
| This module is an introduction to psychology both as a science and a profession, with specific emphasis on psychological issues that are relevant in the South African context. Psychology is positioned at the convergence of a number of traditions of research and practice, including biological, philosophical and pragmatic traditions. This introductory module gives students a basis from which to approach further study of the discipline. | | | | |
| **144** | **12** | **Psychology in Context** | 2L, 1T | **T** |
| In this module the basic principles in psychology are applied in order to understand the person in context, with particular reference to core social issues and challenges facing South African society. | | | | |
| **213** | **8** | **Approaches to Psychological Theories of the Person** | 1.5L | **T** |
| This module addresses psychological theories and understandings of the person with reference to major contemporary approaches. Theories to be considered may include systemic, psychodynamic, behavioural, cognitive and existential components, with consideration of the applicability of psychological theories to African contexts.<br>*PP Psychology 114, 144* | | | | |
| **223** | **8** | **Human Development in Context** | 1.5L | **T** |
| In this module human development is studied, with specific reference to the South African context.<br>*PP Psychology 114, 144* | | | | |
| **243** | **8** | **Research Design in Psychology** | 1.5L | **T** |
| This module will equip students with knowledge and skills to evaluate the scientific literature in psychology. The module covers the core theoretical elements of both quantitative and qualitative research methodology using examples of current psychosocial issues.<br>*PP Psychology 114, 144* | | | | |
| **253** | **8** | **Data Analysis in Psychology** | 1.5L | **T** |
| This module focuses on the statistical procedures that are commonly used in psychological research. The module will equip students with knowledge and skills to analyse quantitative data and to interpret statistical results.<br>*PP Psychology 114, 144* | | | | |

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|---|---|---|---|---|
| **314** | **12** | **Psychopathology** | 4L | **T** |
| In this module abnormal behaviour is studied, from different perspectives and classification systems, with specific reference to the mental health context in South Africa.<br>*Three of the following modules:*<br>*PP Psychology 213, 223, 243, 253* | | | | |
| **324** | **12** | **Social Psychology** | 4L | **T** |
| In this module, theoretical and methodological developments in contemporary social psychology are presented. Social relationships and identity are investigated with reference to social categories like sex, race, ethnicity and sexual orientation, with emphasis on the South African context.<br>*Three of the following modules:*<br>*PP Psychology 213, 223, 243, 253* | | | | |
| **348** | **24** | **Psychological Interventions** | 4L | **T** |
| Psychologists operate in a range of contexts, from individual psychotherapies to community interventions. This module critically discusses the principles behind the contributions psychologists make to human health, development and individual and collective well-being, with specific reference to the health and mental health context in contemporary South Africa.<br>*Three of the following modules:*<br>*PP Psychology 213, 223, 243, 253* | | | | |

### Psychology as a major for the BSc degree

The following modules are required: Psychology 114(12), 144(12), 213(8), 223(8), 243(8), 253(8), 314(12), 324(12) and 348(24).

## Faculty of Economic and Management Sciences
## School of Accounting

| 26883 Financial Accounting | | | | |
|---|---|---|---|---|
| **188** | **24** | **Financial Accounting** | 4L | **A & E** |
| Theoretical principles of International Financial Reporting Standards; accounting systems; preparation and presentation of financial statements for different enterprises and introduction to group statements.<br>*Note*: Students who did not pass Accounting in their matric year must attend five lectures in Financial Accounting 188 per week in the first semester. | | | | |
| **288** | **32** | **Financial Accounting** | 4L | **A & E** |
| Continuation of generally accepted accounting practice.<br>Preparation and presentation of financial statements for different enterprises.<br>*PP Financial Accounting 178 or 188* | | | | |
| **389** | **48** | **Financial Accounting** | 4L | **A+i** |
| Advanced aspects of International Financial Reporting Standards; continuation of group statements and consolidated cash flow statements.<br>*PP Financial Accounting 278 or 288* | | | | |

## Department of Business Management

| 51047 Financial Management | | | | |
|---|---|---|---|---|
| **214** | **16** | **Introduction to Financial Management** | 3L, 1P | **A & E** |
| Compiling of the statement of financial position, the statement of comprehensive income and the statement of cash flow; the measurement and evaluation of financial performance with reference to profitability, liquidity and solvency analysis; case studies about financial analysis; introduction to the investment decision; the financing decision; sources of finance; the dividend decision; financial planning and the management of working capital with specific reference to cash, trade receivables and inventory control; financial failures; international financial management.<br>*Subject to continuous assessment*<br>*C Business Management 142 or*<br>*Mathematics 114 or*<br>*Mathematics (Bio) 124* | | | | |

| 48550 Business Management | | | | |
|---|---|---|---|---|
| **113** | **12** | **Business Management** | 3L, 1P | **A & E** |
| Procedures for the establishment of a new business, the business environment, business ethics, competition, idea generation and entrepreneurship, choice of form of business, determining break-even levels, resources and people involved in the business, management and managerial resources. | | | | |

## Department of Economics

| 12084 Economics | | | | |
|---|---|---|---|---|
| **114** | **12** | **Economics** | 3L, 1T | **A & E** |
| The economic problem: scarcity, priorities and opportunity cost. Introductory micro-economics: demand and supply and the determination of equilibrium in goods markets, production and cost theory, market structures and the theory of the firm, market failures and the role of the government. | | | | |
| **144** | **12** | **Economics** | 3L, 1T | **A & E** |
| Introductory macroeconomics: income and production theory, the foreign sector and monetary economics. National Accounting and macroeconomic data. The South African economy: history and features.<br>*C Economics 114* | | | | |
| **214** | **16** | **Economics** | 3L, 1T | **A & E** |
| Macroeconomics: the IS-LM-model, total demand and supply, inflation, monetary transmission mechanism, stabilisation policy.<br>Microeconomics: goods and factor markets, demand theory, production and cost theory, market structures and the theory of the firm, welfare theory.<br>*PP Economics 114, 144* | | | | |
| **244** | **16** | **Economics** | 3L, 1T | **A & E** |
| South African monetary policy. International trade and finance: the theory of international trade, barriers to free trade, the World Trade Organisation and regional economic integration, the balance of payments, international financial markets, adjustment mechanisms, policy options, exchange rate determination, the international monetary system and South African exchange rate policy.<br>*PP Economics 114, 144*<br>*C Economics 214* | | | | |

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|---|---|---|---|---|
| **318** | **24** | **Economics** | 4L, 1S | **E+i** |
| Macroeconomics: economic growth, business cycle, monetary and fiscal policy. Quantitative economics: general data analysis, mathematical and econometric techniques, input/output analysis. Microeconomics: industrial structures, market structures, the theory of the firm, introduction to game theory.<br>*PP Economics 214*<br>*P Economics 244* | | | | |
| **348** | **24** | **Economics** | 4L, 1S | **E+i** |
| This module focuses on the economic policy debate in a developing country. This includes economic policy criteria, structural characteristics of the South African economy, economic thought and systems, and growth and development policies, which include demand and supply aspects of economic growth, sectoral and spatial development, distribution of income and social expenditure, competition policy, environmental economics, labour policy, education and investment in human capital and the macroeconomic policy debate.<br>*PP Economics 214*<br>*P Economics 244*<br>*C Economics 318* | | | | |

## Department of Logistics

| **50407 Logistics Management** | | | | |
|---|---|---|---|---|
| **214** | **16** | **Logistics Management** | 3L, 1P | **A & E** |
| Introduction to Logistics Management: the role of logistics in the firm, the elements of logistics, integrated logistics management, channels of distribution, client/customer service, strategic aspects of logistics management, organisation for effective logistics, international logistics, new trends.<br>*P Business Management 113* | | | | |

| **55336 Operations Research** | | | | |
|---|---|---|---|---|
| **214** | **16** | **Network Optimisation** | 3L, 3P | **A+i** |
| Introduction to network modelling. Heuristics *vs.* exact methods, connectedness of directed and undirected networks, shortest paths (algorithms of Dijkstra and Floyd), longest paths (project scheduling), shortest spanning trees (algorithms of Kruskal and Prim), location problems (generalised centres and medians), maximum flow problems. Applications using suitable software.<br>*Continuous assessment*<br>*PP Mathematics 114, 144 (No Quantitative Management modules may be taken in combination with Operations research modules)* | | | | |

| | | | | |
|---|---|---|---|---|
| **244** | **16** | **Linear Programming** | 3L, 3P | **A+i** |
| Modelling by means of linear programming. Geometry of LP's, properties of solutions, fundamental theorem of LP, simplex algorithm, big M and two-phase-methods, sensitivity analysis, duality and complementary slackness, matrix slackness, special cases of the simplex algorithm (transport, transhipment, assignment and minimum cost flow). Applications using suitable software.<br>*Continuous assessment*<br>*PP Mathematics 114, 144 (No Quantitative Management modules may be taken in combination with Operations research modules)* | | | | |
| **314** | **16** | **Combinatorial Optimisation** | 3L, 3P | **A+i** |
| Binary and integer programming (branch-and-bound methods, cut level methods ), heuristics (*n*-Opt procedures). Applications with respect to assignment problems, colouring problems, covering problems and domination problems, Hamiltonian graphs (the travelling salesman problem).Kitbag problems. Applications using suitable software.<br>*Continious assessment*<br>*P Operations Research 214, 244 (No Quantitative Management modules may be taken in combination with Operations research modules)* | | | | |
| **326** | **16** | **Methods of Operational Research** | 3L, 3P | **A+i** |
| Problem structuring and modelling, preference modelling (utility theory, ranking, relative importance of criteria), pair-wise comparisons of alternatives, determining weights for criteria, sensitivity and robustness of solutions, the AHP). Decicion trees, Forecasting, Stock control (determinational models). Applications using suitable software.<br>*Continuous assessment*<br>*P Operations Research 244 (No Quantitative Management modules may be taken in combination with Operations research modules)* | | | | |
| **344** | **16** | **Optimisation** | 3L, 3P | **A+i** |
| Dynamic Programming. Introduction to optimisation and functions in R*n*, unconstrained optimisation (search methods and gradient methods), constrained optimisation (Lagrange multipliers, quadratic programming, separable optimisation). Goal programming. Applications by means of suitable software.<br>*Continious assessment.*<br>*P Operations Research 244 (No Quantitative Management modules may be taken in combination with Operations research modules)* | | | | |

| 354 | 16 | Stochastic Methods of Operations Research | 3L, 3P | A+i |
|---|---|---|---|---|

Queuing theory (modelling of arrival and service processes, birth-death processes, single and multiple server queues, finite population, constant service time, open queue networks, priorities, chi-squared test), Markov-analysis, simulation (random numbers, continuous random variables, Monte Carlo simulation, discrete random event simulation, analysis of output). Stochastic dynamic programming. Applications using suitable software.

*Continious assessment*

*PP Probability Theory and Statistics 114 or 144 (No Quantitative Management modules may be taken in combination with Operations research modules)*

## Department of Statistics and Actuarial Science

### Actuarial Science

**Please note:**

Proficiency in English is an academic requirement for all Actuarial Science modules

**43214 Actuarial Science**

| 112 | 8 | Theory of Interest | 2L, 1T | E+i |
|---|---|---|---|---|

Simple and compound interest. Force of interest. Future value, present value and discount. Accumulation and discounting of amounts of money. Various types of annuities and applications.

*Notes*

1. This module is more intensive than Theory of Interest 152.
2. Students are required to complete at least 80% of all assigned class work/tutorials in order to gain access to the final examination. In cases where this requirement is not met, students will be awarded a class mark not exceeding 35%.
3. For admission to the module students must have passed Grade 12 Mathematics with a mark of at least 70% (symbol 6 (or Higher Grade B)).

| 274 | 24 | Financial Mathematics | *3L, 3P | A+i |
|---|---|---|---|---|

*First semester: 4L; Second semester: 2L

Basic concepts, compound interest functions, discounted cash flow, pricing of loans and other securities, annuities, stochastic interest rates and simple premium calculations.

*Note*

Students are required to complete at least 80% of all assigned class work/tutorials in order to gain access to the final examination. In cases where this requirement is not met, students will be awarded a class mark not exceeding 35%.

*PP Actuarial Science 112*
*PP Mathematics 114, 144 (with an average final mark of at least 60%)*
*PP Probability Theory and Statistics 144 (with a final mark of at least 65%)*
*C Mathematics 214, 244*
*C Mathematical Statistics 214, 244*

| 54690 Financial Risk Management | | | | |
|---|---|---|---|---|
| **212** | **8** | **Institutional Investment Management** | 3L, 2P | **A+i** |
| Evaluating of the investment properties and the study of the mathematical methodology underlying the following financial asset classes: Government bonds, corporate debt, equity, properties, index linked government bonds, Foreign investments. South African financial market. Liabilities and risk profile of the following Institutional Investors: Banks, life insurers, pension funds, short-term insurers, medical aid schemes, unit trusts, investment trusts.<br>Corporate finance: Financial instruments to raise finance and manage financial risk.<br>*PP Mathematics 114, 144*<br>*PP Probability Theory and Statistics 144*<br>*PP Theory of Interest 152 or*<br>*PP Actuarial Science 112*<br>*C Financial Risk Management 274 or*<br>*C Actuarial Science 274*<br>*C Mathematical Statistics 214, 244* | | | | |
| **242** | **8** | **Derivatives** | 2L, 1P | **A+i** |
| Introduction to derivatives with emphasis on mathematical methodology; Mechanics of futures and option markets; Pricing of Futures and Forwards; Hedging strategies using derivatives; Interest Rate Markets; Swaps; Properties of stock options; Trading strategies involving options.<br>*PP Mathematics 114, 144*<br>*PP Probability Theory and Statistics 144*<br>*PP Theory of Interest 152 or*<br>*PP Actuarial Science 112*<br>*P Financial Risk Management 212*<br>*C Financial Risk Management 274 or*<br>*C Actuarial Science 274*<br>*C Mathematical Statistics 214, 244* | | | | |

| 56820 Probability Theory and Statistics | | | | |
|---|---|---|---|---|
| **114** | **16** | **Probability Theory and Statistics** | 3L, 3T | **T** |
| (For BSc students)<br>Combinatorial analysis; the basic counting principles; permutations and combinations. Random phenomena; sample spaces and events; the probability axioms; the probability of an event; random selection; probability rules; conditional probability; the rule of Bayes; stochastic independence. Discrete and continuous stochastic variables; expected value and variance of stochastic variables; important discrete distributions: binomial, Poisson, geometric, hyper-geometric, negative binomial; important continuous distributions; uniform, exponential, normal.<br>*Please note:* This module is identical to Probability Theory and Statistics 144(16), which is offered in the second semester by the Department of Statistics and Actuarial Science for BCom students. | | | | |
| **144** | **16** | **Probability Theory and Statistics** | 3L, 3T | **A & E** |
| Combinatorial analysis; the basic counting principles; permutations and combinations. Random phenomena; sample spaces and events; the probability axioms; the probability of an event; random selection; probability rules; conditional probability; the rule of Bayes; stochastic independence. Discrete and continuous stochastic variables; expected value and variance of a stochastic variable; important discrete distributions: binomial, Poisson, geometric, hyper-geometric, negative binomial; important continuous distributions, uniform, exponential, normal | | | | |

## Mathematical Statistics

Students, who wish to take programmes in Mathematical Statistics, are required to take and pass Probability Theory and Statistics 114 or 144, as well as Mathematics 114, 144 in their first year of study. This grants admission to Mathematical Statistics 214. Please note that the module Probability Theory and Statistics 114 is offered to BSc students in the first semester by the Department of Mathematical Sciences (Division: Applied Mathematics), and that exactly the same module is offered to BCom students as Probability Theory and Statistics 144 in the second semester by the Department of Statistics and Actuarial Science. For Mathematical Statistics as major for a BSc degree, the modules Probability Theory and Statistics 114 or 144, Mathematical Statistics 214(16), 244(16), 318(32), 344(16) and 364(16) are required.

| 22853 Mathematical Statistics | | | | |
|---|---|---|---|---|
| **214** | **16** | **Distribution Theory and Introduction to Statistical Inference** | 4L, 2P | **A+i** |
| Further continuous distributions: gamma- and beta distributions. Moments and moment-generating functions for discrete and continuous distributions. Determine distributions of functions of variables with moment-generating functions. The central limit theorem (without proof). Samples and sampling distributions: the standard parametric cases. Principles of point estimation: the Cramer-Rao theorem and its application, efficiency, minimum variance unbiased estimators, consistency. Method-of-moments estimators. Maximum likelihood estimators. Interval estimation and hypothesis testing: applying these principles in various standard cases of parametric inference. The Neyman-Pearson lemma: proof and applications. Likelihood ratio tests. Data representation and description, calculating and interpreting sample measures.<br>*PP Mathematics 114, 144*<br>*PP Probability Theory and Statistics 114 or 144* | | | | |
| **244** | **16** | **Statistical Intervention Sampling theory and Regression** | 4L, 2P | **A+i** |
| Bivariate probability distributions. Marginal and conditional distributions. The multinomial distribution and the bivariate normal distribution. Bivariate transformations. Sampling theory: sampling techniques in finite and infinite populations, surveys and sequential analysis. Introduction to nonparametric statistical analysis.<br>The relationship between two random variables: the correlation coefficient and the regression function. The method of least squares. Inference in the simple linear regression model. Introduction to multiple regression analysis: underlying assumptions, influential points and robust regression techniques. One- and two way analysis of variance and introduction to categorical data analysis. Introduction to R software for matrix operations, regression- and variance analysis.<br>*PP Mathematical Statistics 214* | | | | |
| **318** | **32** | **Probability, Inference and Linear Models** | 6L, 2P | **A** |
| Advanced distribution theory, sequences of random variables, limit theory for sequences, generating functions, sampling distributions. Different approaches to inference. Parametric estimation theory and hypothesis testing, goodness-of-fit tests, non-parametric inference. Bayes inference. Decision theory.<br>Stochastic vectors and the multivariate normal distribution. The general linear model: estimation and error spaces, sums of squares and quadratic forms, Cochran's theorem. Projections. Model identification, estimable functions, best estimators, Gauss-Markov theorem. Testability of hypotheses, hypothesis testing, confidence regions and simultaneous confidence intervals. Analysis of covariance. The use R software for covariance analysis and application of the general linear model in practice.<br>*PP Mathematical Statistics 214, 244*<br>*P Mathematics 214, 244* | | | | |

| | | | | |
|---|---|---|---|---|
| **344** | **16** | **Stochastic Processes** | 3L, 1P | **A** |
| Introduction to stochastic processes. Markov chains, Markov processes and their applications. Markov jump processes. Elementary martingale theorem and applications. Brownian movements. Renewal theory.<br>*P Mathematical Statistics 318* | | | | |
| **354** | **16** | **Linear Models, Variance Components Models and Generalised Linear Models** | 3L, 1P | **A** |
| Analysis of covariance: Tests of equality of factor effects with parallel and non-parallel regression lines. Components of variance model: Estimation of the various components of variance, hypothesis testing. One-way and two-way (with and without interaction) models.<br>Exponential family of distributions: Canonical form, expected value and variance function, likelihood function.<br>Generalised linear models: Linear predictors, link functions, maximum likelihood estimators, Fisher scoring, information matrix, iterative weighted least squares, sampling distributions of score statistics, m.l. estimators and deviance, Taylor series expansions, hypothesis testing.<br>Applied generalised linear models: Logistic regression, Poisson regression, survival analysis.<br>The programming language R for implementing covariance analysis, components of variance models and generalised linear models in practice.<br>*P Mathematical Statistics 318* | | | | |
| **364** | **16** | **Time Series** | 3L, 1P | **A** |
| Stationarity, filters for time series, autoregressive, moving average, autoregressive moving average and autoregressive integrated moving average time series, shift operators for time series, model identification and estimation and diagnostic testing of time series, multivariate time series, non-stationarity and non-linearity of time series. Applications of time series, with emphasis on econometrics and investments.<br>*P Mathematical Statistics 318* | | | | |

| **19690 Statistical Methods** | | | | |
|---|---|---|---|---|
| **176** | **18** | **Statistical Methods with Computer Implementation** | *3L, 2T | **A & E** |
| *First semester: 3L, 1½T; Second semester: 2L, 1½T<br>*Sampling techniques*: Simple random; Stratified; Systematic; Cluster; Probability proportional to size.<br>*Descriptive Statistics*: Various data types; Stem-and-leaf display; Frequency distributions; Graphical representation of data (histogram, polygons, bar and pie charts);<br>Descriptive measures of location and spread (mean, median, mode, variance, standard deviation, percentiles); Approximate measures for grouped data; Box plots; Measure of | | | | |

association (coefficient of correlation).

*Probability theory*: Basic probability concepts (sample spaces, events, addition and multiplication rules, conditional probabilities, probability trees, contingency tables);

Bayes' theorem; Counting rules.

*Discrete random variables and probability distributions:* Expected value, variance, and standard deviation of a discrete random variable; Covariance between discrete random variables; Expected value and variance of a portfolio; Binomial and Poisson distributions.

Continuous random variables and probability distributions: Normal and exponential distributions.

*Sampling distributions*: The central limit theorem; Sampling distribution of the mean and a proportion.

*Inferential Statistics*: Interval estimation and hypothesis testing for the mean and a proportion; Interval estimation and hypothesis testing for the difference between two means; Sample size calculation based on interval estimation.

*Analysis of variance*: One-way and two-way designs.

*Regression analysis*: The simple linear regression model; Inference about model parameters and the coefficient of correlation; Multiple linear regression.

*Time series analysis*: The components of a time series; Smoothing; Least squares trend fitting and forecasting.

*Notes*

1. Microsoft® Excel will be used throughout the module for the application of the different statistical techniques.
2. Students who passed Statistical Methods 176(18) will be allowed to continue with Statistics 214(16), provided that they obtained a final mark of at least 60%.

*Differences between Statistics 186 and Statistical Methods 176:*

In Statistics 186 and Statistical Methods 176 similar statistical techniques are covered. However, in Statistics 186 basic mathematical techniques are revised and expanded, which are not covered in Statistical Methods 176. The Statistics 186 module is a normal exam written module with three tests that are written during the year and a final examination written at the end of the year. The Statistical Methods 176 module is a more practical module that focuses on applications in Excel and computer assignments. These assignments form an important component, 40% of the module, of this continuously assessed module.

*Continuous assessment*

## Faculty of Education
## Department of Sport Science

| 54429 Applied Kinesiology | | | | |
|---|---|---|---|---|
| **313** | **12** | **Coaching Strategies** | 2L, 2P | **A** |
| Analysis of performance for strategic development; team cooperation; social behaviour in physical context; coaching tips and incentives; scientific principles of a training year; taking on the role of coach in the school or community; data collection and processing.<br>*PP Kinesiology 182 or*<br>*PP Sport Science 184* | | | | |
| **314** | **12** | **Scientific Base of the Fitness Industry** | 2L, 2P | **A** |
| BA and BSc<br>The scientific base of the health, exercise and fitness industry; national and international trends in the fitness industry;<br>structure of the fitness industry in SA; presentation and analysis of exercise regimes; exercise programme planning; compilation and management of exercise programmes; medical considerations for the fitness industry; assessment strategies in exercise and fitness; presentation and conducting various health and fitness tests. | | | | |
| **324** | **12** | **Principles of Adapted Movement** | 2L, 2P | **A** |
| Value of participation of disabled persons; assessing the performance of persons with disabilities; problem as of participants with chronic illnesses; teaching adaptations regarding disabled persons; data collection and processing. | | | | |
| **344** | **12** | **Sport and Recreation for Persons with Disabilities** | 2L, 2P | **A** |
| Sport classification for participation; competition opportunities for persons with disabilities; adaptation of rules and special requirements regarding sports types for persons with disabilities; support of sport development and recreations programmes in special schools and communities; conclusions of research for professional applications. | | | | |
| **352** | **12** | **Exercise and Fitness Training** | 2L, 2P | **A** |
| BA and BSc<br>Presentation of selected professional fields in the fitness industry; planning, presentation and managing of fitness education for special population groups; analysis of exercise areas and exercise modalities; handling a case study personally; presentation of final case study; marketing; business management; risk management; legal considerations in the fitness industry. | | | | |

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|---|---|---|---|---|
| **353** | **12** | **Scientific Base of Sport Coaching** | 2L, 2P | **A** |
| Apply the principles that influence fitness and skills development to the design of sport specific programmes; understand the role and responsibilities of the coach; incorporate scientific principles in the organisation of a training year.<br>*PP Kinesiology 182 or*<br>*PP Sport Science 184* | | | | |

| **19305 Kinesiology** | | | | |
|---|---|---|---|---|
| **162** | **8** | **Anatomy** | 2L, 1P | **A** |
| Anatomical and movement terminology; structure and function of tissue types of the human body; knowledge of the human body as a unit of mobility (skeletal and muscular) structure and function; knowledge of selected supporting systems to the mobility unit. | | | | |
| **182** | **8** | **The Sport Experience** | 2L, 2P | **A** |
| Sport performance as a personal experience; demonstration, strategies, insight, enhancement of selected team and individual sport types played by different cultural groups in Southern Africa.<br>*Continuous assessment.* | | | | |
| **312** | **8** | **Sport Injuries** | 2L | **A** |
| General principles and classification of sport injuries. Biomechanics of sport injuries. Overuse syndrome. Sport injuries of upper and lower limbs. Injuries in sport for persons with disabilities. | | | | |
| **332** | **8** | **Peak Performance** | 2L | **A** |
| Programme design through principles of classification and the application thereof on elite sport performance. Periodisation of training. Recovery strategies. Applied nutritional aspects of sport. | | | | |
| **342** | **8** | **Sociological and Psychological Aspects of Sport Performance** | 2L | **A** |
| Relationship between sport and social institutions; specific considerations for the coaching of children; the sport credo; sport and the media; use of specific psychological skills for enhancement of sport performance; psychometrics. | | | | |

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| **352** | **8** | **Tests and Measurement** | 2L | **A** |
| Principles of valid and reliable assessment of fitness and sporting performance by means of statistical techniques and general assessment strategies. | | | | |
| **372** | **8** | **Values and Ethics in Professional Applications** | 2L, 2P | **A** |
| Philosophical context of physical activities; social and cultural tendencies with regards to physical activities in SA; heterogeneous groups and physical activity; moral behaviour in physical activity, sport and recreation. | | | | |

| **44229 Movement Education, Sport and Recreation** | | | | |
|---|---|---|---|---|
| **212** | **8** | **Teaching and Programme Development** | 2L, 4P | **A** |
| Teaching expertise, management skills and motivational strategies, design of physical activity programmes, planning and presenting teaching. | | | | |
| **222** | **8** | **Adapted movement programmes** | 2L | **A** |
| The importance of correct body alignments for successful motor performance; analysis of causes of posture deviations; introductory knowledge of various disabilities. | | | | |
| **242** | **8** | **Sport and Recreation Management** | 2L | **A** |
| Principles of planning, organising, leading and control in sport and recreation; marketing management: market differentiation, identification of target groups, needs assessment, formulation of objectives, marketing strategies, the marketing recipe and strategic planning. | | | | |
| **282** | **8** | **Structure of Physical Activities** | 2L, 5P | **A** |
| Performance enhancement in various sport types and movement forms; team co-operation; social behaviour within the physical environment; teaching tips and incentives; learning of motor skills and development of fitness; knowledge of the role of a coach, official and referee.<br>*Continuous assessment.*<br>*PP Sport Science 184 or*<br>*PP Kinesiology 182* | | | | |

| 54607 Sport Science | | | | |
|---|---|---|---|---|
| **222** | **8** | **Motor Learning** | 2L | **A** |
| Perceptual-motor development and behaviour; perceptual-motor learning taking the learning environment into consideration; the role of perception and decision-making in sport performance. | | | | |
| **232** | **8** | **Exercise Physiology** | 2L | **A** |
| Aerobic and anaerobic metabolism during exercise; acute cardiovascular, respiratory and muscle responses to endurance and resistance training; effect of strength and endurance training on physiological systems and the physiological mechanisms of training.<br>For the programme BA (Sport Science):<br>*P Physiology 114, 144* | | | | |
| **252** | **8** | **Sport Physiology** | 2L | **A** |
| Physiological factors that influence sport performance; physiological training principles and adaptations; training for special populations; nutrition and sport performance; training at altitude; legal and illegal ergogenic aids in sport.<br>For the programme BA (Sport Science):<br>*P Physiology 114, 144* | | | | |
| **262** | **8** | **Applied Biomechanics** | 2L, 1P | **A** |
| Kinematic and kinetic concepts for the analysis of human movement; the biomechanics of human upper and lower body limbs and spinal column; linear and angular kinematics and kinetics of human movement; equilibrium and human movement; human movement in a fluid medium; applications of biomechanical principles in qualitative analysis of sport skills and exercise.<br>*P Kinesiology 112 or 162* | | | | |
| **382** | **6** | **Professional Applications** | 2L, 2P | **A** |
| Application of education and programme design; skills training and fitness development; alternative approaches to learning in physical activities; educational and career opportunities.<br>*Continuous assessment.* | | | | |

## Faculty of Medicine and Health Sciences
## Biomedical Sciences Division, Anatomy and Histology

| 12558 Anatomy | | | | |
|---|---|---|---|---|
| **214** | **16** | **Basic Anatomy of the Human Body** | 3L, 3P | **T** |
| Dissection-based study of the human body commencing with a detailed study of the skeleton in the normal individual, as well as tracking of age-related changes from birth to 70+ years of age. A detailed study of physical anthropology and its relevance to forensic and other similar sciences. Dissection-based study of the muscular system including developmental and/or congenital abnormalities.<br>*P Biology 124, 144 or 154* | | | | |
| **244** | **16** | **Basic Anatomy of the Human Body** | 3L, 3P | **T** |
| Dissection-based study of the anatomy of the cardiovascular and respiratory systems including the heart, lungs, pulmonary and systemic circulations, and arterial and venous systems of the torso, head and neck and limbs with reference to environmental and other influences on normal development and/or congenital abnormalities.<br>*P Anatomy 214* | | | | |
| **314** | **16** | **Advanced Anatomy of the Human Body** | 3L, 3P | **T** |
| Dissection-based study of the anatomy of the digestive, urogenital and endocrine systems. Text book-based study of the organs of special sense, namely vision, hearing, posture and balance, taste, smell, proprioception and co-ordination.<br>*P Anatomy 214, 244* | | | | |
| **324** | **16** | **Applied Anatomy** | 4T | **T** |
| An e-learning based study of applied anatomy topics, mainly of the nervous and musculo-skeletal systems of the human body.<br>*Continuous assessment*<br>*P Anatomy 214, 244* | | | | |
| **344** | **16** | **Advanced Anatomy of the Human Body** | 3L, 3P | **T** |
| This module is a cadaver-based study of the brain and spinal cord and its related structures, as well as how each relates to function. A detailed study of development of the brain and nervous system from birth to 5 years of age.<br>*P Anatomy 214, 244, 314* | | | | |

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|---|---|---|---|---|
| **364** | **16** | **Clinical Anatomy** | 4T | **T** |
| An e-learning based study of aspects of clinical anatomy, mainly of the nervous and musculoskeletal systems of the human body.<br>*Continuous assessment*<br>*P Anatomy 214, 244* | | | | |

## Division for Learning and Teaching Enhancement
## SU Language Centre

(In consultation with Faculties of Science and Arts and Social Sciences)

| **64866 Scientific communication skills** | | | | |
|---|---|---|---|---|
| **116** | **12** | **Scientific Communication Skills** | 3L, 3T | **A & E** |
| For students in the BSc (Extended Degree Programmes). This module focuses on the development of speaking, listening, and reading skills in the academic environment in general and specifically in the natural sciences. Aspects such as engaging with and understanding relevant academic and natural science texts, understanding text components, the use of fluent, correct and proper language, and the interpretation of graphic data, will be addressed.<br>*Continuous assessment* | | | | |
| **146** | **6** | **Scientific Communication Skills** | 3L | **A & E** |
| For BSc students in the BSc (Extended Degree Programmes). This module focuses on the development of writing skills in the academic environment in general and specifically in the natural sciences. Aspects such as engaging with and understanding relevant academic and natural science texts, understanding text components, presenting data in an edited and coherent text, the use of correct and proper language, the employment of accurate language, correct referencing technique and using graphics to clarify data will be addressed.<br>*Continuous assessment* | | | | |
| **172** | **8** | **Scientific Communication Skills** | 2L | **T** |
| The development of the basic principles of scientific and academic communication, with a focus on reading, writing, listening and speaking in the academic (formal) context; engaging with and understanding relevant academic and scientific texts; understanding text components; presenting data in a coherent, edited text; using referencing methods correctly to avoid plagiarism; using graphics to clarify data.<br>*Continuous assessment.* | | | | |

# Postgraduate module contents of specific postgraduate programmes

## Department of Botany and Zoology

### BScHons in Biodiversity and Ecology

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| **66184 - 715** | **24** | **Generic Scientific Skills** | | |
| The aim of this module is to provide honours students with the philosophical background and tools required to perform independent research, from planning through implementation and analysis to reporting. All students attend a natural-history field excursion and participate in short workshops on topics which may include: (1) Science methodology and statistical analysis; (2) Philosophy of Biology; (3) Communication skills; (4) Reading and reviewing popular scientific literature (5) Writing of project proposals; (6) Research and funding structures; (7) Applying for a job; (8) GIS; (9) Microscopy; and (10) General molecular skills. | | | | |
| **55867 - 717** | **60** | **Research Project** | | |
| Each student selects a research project proposed by an academic staff member and will be involved in the design and execution of the research under close direction of the supervisor. This component consists of the research project, a research proposal, research seminars, a poster, a popular article and an oral. The results shall be submitted in the form of a scientific paper and presented at a seminar to a scientific audience. | | | | |
| **12249 - 796** | **36** | **Theoretical Topics in Biodiversity Sciences** | | |
| Members of the academic staff present focused, integrated, interactive modules in their fields of expertise designed to provide in-depth exposure to theory and/or relevant techniques in the Biodiversity Sciences. Students choose topics from four broad subject areas:<br>(1) Biodiversity and Systematics<br>(2) Functional Ecology and Environmental Stress<br>(3) Evolutionary Ecology of Plants and Animals<br>(4) Conservation and utilisation of natural resources – applying molecular and other tools.<br>More information on these topics can be found at academic.sun.ac.za/botzoo/ | | | | |

## Department of Chemistry and Polymer Science

### BScHons in Chemistry

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|---|---|---|---|---|
| **10382 - 711** | **20** | **Analytical techniques** | | |
| Molecular spectroscopy: NMR, IR, MS; separation science. | | | | |
| **10638 - 712** | **20** | **Organic chemistry** | | |
| Modern synthetic methods. | | | | |
| **10462 - 713** | **20** | **Physical chemistry** | | |
| Theoretical molecular models, applications of symmetry, advanced reaction kinetics. | | | | |
| **10384 - 714** | **20** | **Inorganic chemistry** | | |
| Macrocyclic chemistry; advanced classical coordination chemistry; advanced organometallic chemistry and application in homogeneous catalysis; X-ray crystallography; supramolecular chemistry. | | | | |
| **56030 - 741** | **10** | **Special topics in Chemistry** | | |
| Special topics | | | | |
| **63258 - 744** | **30** | **Research project in Chemistry** | | |
| Research project in Chemistry | | | | |

### BScHons in Polymer Science

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|---|---|---|---|---|
| **10382 - 711** | **20** | **Analytical techniques** | | |
| Molecular spectroscopy: NMR, IR, MS; separation science. | | | | |
| **10490 - 712** | **20** | **Advanced Analytical Polymer Science** | | |
| Application of analytical techniques for polymers; atomic force microscopy, gel permeation chromatography and liquid chromatography; dynamic mechanical analysis and dielectric analysis; crystallisation analysis by fractionation; thermal and thermogravimetric techniques; mechanical testing. | | | | |
| **64440 - 714** | **30** | **Research Project in Polymer Science** | | |
| A research project must be completed by the student (under supervision). | | | | |

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| **10658 - 724** | **20** | **Polymer Chemistry** | | |
| Structure/property relationships; polymer morphology; synthesis of polymers; degradation and stabilisation of polymer materials; inorganic polymers. | | | | |
| **10463 - 744** | **15** | **Physical Polymer Science** | | |
| Phase diagrams; classification systems; crystallisation; morphology; flow; the glassy state; viscoelasticity; refraction; yield; fatigue; complex rheology; reinforcement; environmental stress resistance of polymers. | | | | |
| **11421 - 754** | **15** | **Special Topics in Polymer Science** | | |
| The composition, processing and degradation of plastics; elastomer technology and advanced analytical techniques. *Capita Selecta* from other topics like polymer blends, biopolymers and medical polymers, organometallic chemistry, reinforced polymers and material applications. | | | | |
| **12237 - 764** | **15** | **Special Topics in Textile Science** | | |
| *Capita selecta* of subjects covering the latest research and developments in textile science and textile related study fields, including advanced textile finishing, colouration and colour physics, modification of textile behavioural properties, and micro- and nanofibre technology. | | | | |

## Department of Earth Science

### BScHons in Earth Science

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| **12240 - 771** | **15** | **Geology of Southern Africa** | | |
| Plate tectonic scenarios in the evolution of Southern Africa; geological settings, structural and lithological inventories; interpretation of geological maps and sections; practical application of geological concepts to field-based problems; advanced field techniques; field-based sedimentological and stratigraphic concepts and relationship to tectonic models. Includes two weeks' fieldwork. | | | | |
| **12241 - 772** | **15** | **Research Methods in Earth Sciences** | | |
| Theoretical and practical techniques in Earth Sciences, including sample selection and characterisation, sample preparation and analytical techniques, geostatistical analysis of datasets, data presentation, report writing, spatial analysis and modelling with GIS; application of GIS to understanding geological problems. | | | | |
| **12242 - 773** | **15** | **Special Topics in Earth Science** | | |
| Examination of new ideas in Earth Science research; evolution of Earth Science concepts and theories; special topics offered on an *ad hoc* basis by the Department. | | | | |
| **54895 - 795** | **35** | **Research project** | | |
| An independent research project involving approximately 14 weeks of data acquisition and manipulation. The project is normally organised in collaboration with industry or with the aim of furthering the research goals of the Department. Each project is designed according to the interests of an individual student and supervisor. If a student wishes to include vacation work preceding the honours year, this must be arranged beforehand with the specific honours supervisor. A project report is submitted at the end of this module and an oral presentation made to the Department. | | | | |
| **12243 - 712** | **20** | **Concepts in Crustal Evolution** | | |
| Advanced petrological concepts in igneous, metamorphic and sedimentary rocks; modelling of whole-rock and mineral-geochemical datasets in the interpretation of rock suites and physicochemical conditions of formation; techniques in geochronology and application to solving geological problems, applied structural geology, analysis of complexly deformed terrains. | | | | |

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| **12247 - 742** | **20** | **Economic Geology** | | |
| Mineral markets and commodities, ore reserve calculations, ore microscopy, genetic implications of ore textures and paragenesis, geophysical exploration for ore deposits, introduction to geological modelling software, mine data-management systems. | | | | |
| **12244 - 714** | **20** | **Hazardous Waste Site Assessment** | | |
| Geological, geophysical and engineering techniques for reconnaissance, sampling and assessment of hazardous waste sites, analytical techniques relevant to hazardous environmental systems, construction and monitoring of hazardous waste sites. | | | | |
| **12275 - 744** | **20** | **Environmental Systems** | | |
| Application of geochemical proxies for environmental processes; environmental sampling, analysis and interpretation of environmental datasets, hydrogeological concepts, use of isotope tracers to understand element movement in the regolith and water systems. | | | | |

## Department of Mathematical Sciences
## Division: Computer Science

### BScHons in Computer Science

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| **63452 - 711** | **16** | **Automata Theory and Applications** | | |
| A broad overview of efficient implementation methods for automata, for application in selected fields from Computer Science and Applied Computer Science. Such fields include physical modelling, image processing, compression, random number generation, graphics animation, pattern matching and system design. | | | | |
| **64947 - 712** | **16** | **Advanced Algorithms** | | |
| This module continues from Computer Science 214 and covers advanced topics in the design and analysis of algorithms and associated data structures. Topics include a selection from: algorithm-design techniques, linear programming, approximation algorithms, randomised algorithms, probabilistic algorithms, parallel algorithms, number-theoretic algorithms, cryptanalysis, computational geometry, computational biology, network algorithms, and complexity theory. | | | | |
| **64955 - 713** | **16** | **Theoretical Computer Science** | | |
| The module continues from Computer Science 324 and covers time and space complexity, NP completeness, probabilistic algorithms, interactive proofs, and zero knowledge proofs. It concludes with a overview of quantum computers and quantum algorithms. | | | | |
| **64963 - 714** | **16** | **Concurrent Programming 1** | | |
| This module covers an overview of the field of concurrency, its theoretical principles, the design, implementation and verification of concurrent systems, and practical aspects of distributed and parallel programming. It is focused around selected important topics. | | | | |
| **63401 - 715** | **16** | **Databases** | | |
| This module covers advanced database management system design principles and techniques. Possible topics include access methods, query processing and optimization, transaction processing, distributed databases, object-oriented and object-relational databases, data warehousing and data mining. | | | | |
| **64971 - 716** | **16** | **Advanced Topics in Computer Science 1** | | |
| Selected topics of current interest presented by lecturers or visiting researchers. | | | | |

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| **11788 - 741** | **16** | **Machine Learning** | | |
| This module is an introduction to selected topics in machine learning. | | | | |
| **64998 - 742** | **16** | **Computer Graphics** | | |
| This module offers a broad introduction to computer graphics. Its contents include mathematical background for graphics (such as vector algebra) and a study of the data structures and algorithms used for object representation, transformation, and rendering. In addition to the theoretical work, there is a strong emphasis on implementation and the use of libraries. | | | | |
| **65005 - 743** | **16** | **Simulation of Networks** | | |
| This module investigates the theoretical and practical aspects of the simulation of telecommunication networks for the performance evaluation, optimisation and control of networks. Topics include traffic measurement, statistical analysis and modelling, in both circuit-switched and packet-switched networks. | | | | |
| **65013 - 744** | **16** | **Concurrent Programming 2** | | |
| This module continues from Computer Science 714. The focus is much narrower and one or two selected topics are covered in depth. Possible topics include: implementation of model checkers, concurrency in operating systems, formal methods, the use of a specific tool for concurrency and case studies. | | | | |
| **65021 - 745** | **16** | **Software Construction** | | |
| One of a range of possible topics centred on software construction. Examples include aspect-oriented software development, object-oriented software development, agile methods, XP (extreme programming), as well as specialised application areas such as game programming and compiler construction. | | | | |
| **65048 - 746** | **16** | **Advanced Topics in Computer Science 2** | | |
| Selected topics of current interest presented by lecturers or visiting researchers. | | | | |
| **12264 - 747** | **16** | **Biological Sequence Analysis** | | |
| The use of probability modelling for modelling and analysis of sequential data, with emphasis on application to biological sequences (DNA and protein sequences). Introduction to basic molecular biology and probability modelling; algorithms for sequence alignment; hidden Markov models (with biological applications); phylogenetic models; inference in both the maximum likelihood and Bayesian frameworks. | | | | |

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| **11261 - 748** | **16** | **Software Development for Mobile Devices** | | |
| This module exposes students to software engineering principles applicable to software development for mobile devices, by using current, popular mobile-software development platforms. The practical component of the module, which consists of writing applications for Android and/or iOS and/or other platforms, exposes students to the software stack and standard application programming interfaces of the platforms under consideration. | | | | |
| **62847 - 792** | **16** | **Computer Vision** | | |
| Module at honours level presented by the Department of Mathematical Sciences, Division: Applied Mathematics. | | | | |
| **64572 - 793** | **16** | **Digital Image Processing** | | |
| Module at honours level presented by the Department of Mathematical Sciences, Division: Applied Mathematics. | | | | |
| **62855 - 796** | **16** | **Statistical Pattern Recognition** | | |
| Module at honours level presented by the Department of Mathematical Sciences, division: Applied Mathematics. | | | | |
| **63444 - 771** | **32** | **Honours Project in Computer Science** | | |
| The Honours project consists of the independent development of a larger computer application. The project must illustrate the student's expertise with regards to all aspects of software engineering, including formal specification, prototype development, testing and documentation. | | | | |
| **13360 - 771** | **12** | **Statistical Learning Theory** | | |
| Module at honours level presented by the Faculty of Economic and Management Sciences, Department of Statistics and Actuarial Science. | | | | |
| **13361 - 771** | **12** | **Mathematical Statistics for Data Scientists** | | |
| Module at honours level presented by the Faculty of Economic and Management Sciences, Department of Statistics and Actuarial Science. | | | | |
| **58777 - 741** | **12** | **Data Mining** | | |
| Module at honours level presented by the Faculty of Economic and Management Sciences, Department of Statistics and Actuarial Science. | | | | |

## Department of Microbiology

### BScHons in Microbiology

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| **10439 - 772** | **64** | **Experimental Microbiology** | | |
| *Research Projects*: Students are allocated to a research laboratory where they conduct an independent research project. Assessment is based on presentations of proposed research, independent research in the laboratory and oral presentation of results.<br>*Literature Review*: A written literature review and oral presentation on a Microbiology related topic. | | | | |
| **10721 - 773** | **24** | **Techniques in Molecular Microbiology** | 2L, 8P, 1T | **E** |
| Theory and practicals on techniques in molecular biology such as DNA cloning, bacterial and yeast transformations, plasmid isolations, isolation of genomic DNA from bacteria and fungi, specialised computer programs and databases via the internet. Advanced techniques in molecular biology, e.g. DNA sequencing, isolation and analysis of gDNA, mRNA and proteins, construction of DNA libraries. | | | | |
| **10483 - 774** | **32** | **Selected Topics** | 3L, 4P | |
| Selected topics are presented as mini-modules by lecturers or visiting researchers. Topics such as genome dynamics, biology of yeasts, transcriptional control of eukaryotic genes, taxonomy of fungi and environmental microbiology are covered. | | | | |

## Department of Physics

### BScHons in Physics

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| **10445 - 711** | **8** | **Electromagnetism** | 1.5L, 1.5P | |
| Electrostatics and applications to boundary value problems; electric multipoles and electric fields in media. Similar topics for magnetostatics. Time-dependent fields, gauge transformations. Electromagnetic waves, their absorption in and transition between different media. Relativity and electromagnetism. Theory of radiation. | | | | |
| **10590 - 712** | **8** | **Lagrange and Hamilton Mechanics** | 1.5L, 1.5P | |
| Degrees of freedom, generalised co-ordinates, Lagrange equations of the first and second kind, applications, small oscillations, variational calculus, Hamilton's principle, Noether's theorem. | | | | |
| **10752 - 713** | **8** | **Solid State Physics** | 1.5L, 1.5P | |
| Diffraction by crystals and the reciprocal lattice. Periodic crystal potentials, the tight-binding model, semi-conductors. Magnetism: para-, dia-, ferro- and antiferromagnetism. Super-conductivity. | | | | |
| **10586 - 714** | **16** | **Quantum Mechanics B (Advanced Formalism and Applications)** | 3L, 3P | |
| Bra-ket notation, the axioms of quantum mechanics, basis transformations and unitary operators, position and momentum representations, Schrödinger and Heisenberg images, spin, formal theory of angular momentum, time-dependent perturbation theory, scattering theory, identical particles. | | | | |
| **10390 - 716** | **8** | **Atomic Physics** | 1.5L, 1.5P | |
| Multi-electron atoms, exclusion principle, electrostatic interaction and exchange degeneracy, Hartree model, angular momentum coupling: L-S and j-j coupling, transition probability and selection rules. | | | | |
| **10708 - 718** | **8** | **Radiation Interaction** | 1.5L, 1.5P | |
| Radiation sources, the process of radioactive decay as source of radiation, interaction of photons and neutrons with matter, isotope production with reactors and accelerators, nuclear fission as a source of radiation, lasers and microwaves as sources of radiation. | | | | |

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| **10587 - 719** | **8** | **Quantum Mechanics C (Functional Integral Formulation)** | 1.5L, 1.5P | |
| Discrete and continuous stochastic processes, diffusion and Brownian motion, functional calculus, Feynman-Kac theorem, propagators and their functional integral representation, free particle and harmonic oscillator, determinants, correlation functions and generating functionals, perturbation theory and saddle point approximation. | | | | |
| **10702 - 721** | **16** | **Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems)** | 3L, 3P | |
| Phase transitions and critical phenomena, phenomenological theories (Landau-Ginsburg, scaling hypothesis), simple model systems, approximation methods (mean field theory, self-consistent approach). Statistical physics of liquid crystals and polymers. Simulation methods. Dynamic correlation and response functions, Langevin theory, stochastic differential equations (Fokker-Planck equations). | | | | |
| **63274 - 741** | **32** | **Physics Project** | 6L, 6P | |
| Independent work on a topic that forms part of Physics, chosen in consultation with lecturers in the Department of Physics. The project should form part of the research activities of the Physics Department under supervision of a suitable supervisor. The project must be approved by the research committee of the Physics Department. A written report has to be submitted and an oral presentation must be given. Each student must also complete an oral examination. | | | | |
| **12546 - 744** | **8** | **Laser Spectroscopy** | 1.5L, 1.5P | |
| Optical spectroscopic diagnostic instrumentation and techniques. Laser spectroscopy techniques for atoms, molecules and plasmas. High-frequency and time-resolved spectroscopy and related diagnostic instrumentation and methods. Attosecond spectroscopy, spectroscopy of organic molecular solids. | | | | |
| **10589 - 745** | **16** | **Quantum Optics and Laser Technology** | 3L, 3P | |
| Stimulated emission and absorption, introduction to lasers, laser rate equations, population inversion, threshold gain and saturation; laser output calculations by means of the uniform field approach, multi- and single-mode oscillations, mode locking, laser resonator theory, introduction to non-linear optics.<br>Laser media: solid state, gas and dye lasers. Excitation techniques: optical, discharge, chemical. Resonator types and designs. Q-switching, gain switching, mode locking, single-mode operation, wavelength tuning. Current laser systems: Flash lamp an diode-pumped solid-state lasers, gas lasers, diode lasers, ultra-short pulse lasers, high-intensity laser systems. Applications: Scientific, industrial, communications, medical, military. | | | | |

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| **10610 - 747** | **8** | **Molecular Physics** | 1.5L, 1.5P | |
| Quantum mechanics of rotational and vibrational degrees of freedom of molecules. Electronic spectra of molecules. The use of symmetries in molecular physics. The interaction of light with molecules. Kinetics and dynamics of elementary molecular reactions. | | | | |
| **10563 - 748** | **8** | **Nuclear Reactions and Nuclear Structure** | 1.5L, 1.5P | |
| Nuclear reactions: Scattering kinematics basic concepts. Elastic scattering, the optical model. The study of reaction mechanisms, e.g. compound nucleus formation, direct reactions, pre-equilibrium processes. Reactions with light projectiles, e.g. inelastic scattering, transfer reactions, knockout reactions. Heavy ion reactions, fragmentation. Electron scattering and high-energy nuclear reactions.<br>Nuclear structure: Two-nucleon systems (e.g. deuteron): interaction of nucleons and the inclusion of properties like charge independence and spin dependence. The Yukawa theory of meson exchange. Multiple nucleon systems: The nuclear shell model (single and multi-particle, introductory). Rotational and vibrational effects in nuclei (the collective model). | | | | |
| **10467 - 750** | **8** | **Physics of Radiation Dosimetry/Radiology** | 1.5L, 1.5P | |
| *Radiation Dosimetry*: Measurement of radiation, definitions of physical quantities, energy transfer, electronic equilibrium, Bragg-Gray cavity, interaction of charged particles with matter, radiation quality and range, proton dosimetry, interaction with human tissue.<br>*Physics of Radiology*: The X-ray machine, Conventional radiography, Fluoroscopy, Mammography, Computed Tomography, Ultrasound, Magnetic Resonance Imaging. | | | | |
| **10465 - 751** | **8** | **Physics of Nuclear Medicine** | 1.5L, 1.5P | |
| Radiation detectors, the gamma camera, quality control of the gamma camera, computers in nuclear medicine, principles of SPECT, principles of PET, statistics of counting, basic principles of tracer studies, whole body counters. | | | | |
| **10466 - 752** | **8** | **Physics of Radiotherapy** | 1.5L, 1.5P | |
| Dosimetry of teletherapy, filters, treatment planning, geometry of the beam, teletherapy units, quality assurance, electron therapy, brachytherapy, unsealed sources and beta irradiators. | | | | |
| **10706 - 753** | **8** | **Radiation Protection** | 1.5L, 1.5P | |
| Radiological protection, the shielding of neutrons and gamma rays. | | | | |

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| **10753 - 754** | **8** | **Many-body Theory** | 1.5L, 1.5P | |
| Multi-particle wave functions and the symmetrisation postulate; creation and annihilation operators for fermions and bosons (second quantisation); variational principles and the Hartree-Fock approximation; screening and linear response; Boqoliubov transformations; superconductivity and magnetic flux quantisation. | | | | |
| **10674 - 755** | **16** | **Relativistic Quantum Mechanics and Quantum Field Theory** | 3L, 3P | |
| Module introduces concepts from relativistic quantum mechanics and field theory.<br>Dispersion relations and quantum mechanics. Klein-Gordon, Dirac and Maxwell equations, free-particle solutions, non-relativistic limit. Covariance of the Dirac equation, chirality. Lagrange formalism in field theory, Noether currents. Gauge symmetries and electromagnetic interactions. Relativistic treatment of hydrogen atom. Quantisation of Klein-Gordon, Dirac and Maxwell fields. Particle interpretation, spin and statistics. Perturbation theory and Feynman rules. Cross-sections and decay widths in particle physics. Further alternatives in response to student demand: Higgs mechanism and standard model or renormalisation. | | | | |
| **10539 - 757** | **8** | **Entropy and Information** | 1.5L, 1.5P | |
| (Presentation subject to staff availability and student numbers.)<br>Introduction to the Bayesian world view. Conditional probability, product rule, Bayes' Theorem. Multivariate Bernoulli and multinomial distributions. Parameter estimation and model comparison using Bayesian inference. Information and entropy as a limiting case of inference. Hartley, Shannon, conditional and mutual information; Information Gain. Principle of Maximum Entropy under the influence of information. Applications, varying additional topics. | | | | |
| **10424 - 758** | **8** | **Dynamic Systems and Complexity** | 1.5L, 1.5P | |
| (Presentation subject to staff availability and student numbers)<br>Introduction to non-linear dynamical systems: Modelling, continuous and discrete mappings, stability analysis, hierarchy of chaos, strange attractors, universality and Feigenbaum constants, Hamiltonian chaos, KAM theorem. | | | | |
| **17221 - 772** | **16** | **Optics** | 3L, 3P | |
| Geometrical, physical and quantum formalisms, polarisation (Stokes and Jones vectors), reflection, transmission and dispersion (Fresnel, Brewster, total internal reflection, double refraction), geometric-optical description of paraxial optical systems (matrix optics), diffraction and interference (three-dimensional), interferometry, non-linear optics.<br>Diffraction theory. Fourier optics, diffractive optics. Anisotropy, optical modulation: Electro-optical, magneto-optical and acousto-optical modulation. Non-linear polarisation, non-linear optical coefficients, harmonic generation and phase matching. | | | | |

## MSc in Physics

| | | | | |
|---|---|---|---|---|
| **66249 - 818** | **156** | **Thesis Physics** | | |
| The student is expected to do an independent literature survey and suitable research under as supervisor's guidance. Upon completion of the research the student shall submit a thesis to be examined and approved by the appointed examiners. Each student must also complete an oral examination. Additional seminar and/or coursework as determined by the supervisor in consultation with the Department may be required in preparation of the research. | | | | |
| **12278 - 828** | **24** | **Advanced Physics Seminar and Coursework** | | |
| Relevant advanced seminar and coursework, as suggested by the supervisor and approved by the Department. The seminars and courses will be related to the specific research area of the thesis and supplement the thesis. The seminar and coursework will be examined by the appointed examiners. For the seminar work an oral examination must be completed. | | | | |

## Department of Physiological Sciences

### BScHons in Physiological Science

| | | | | |
|---|---|---|---|---|
| **10686 - 771** | **10** | **Regenerative Physiology in Injury and Disease** | | |
| Studying disease states and the use of regenerative physiology (including stem cells and gene therapy) to treat these disease states. | | | | |
| **10614 - 772** | **10** | **Physiology and Pathophysiology** | | |
| Advanced physiology and biochemistry including adaptive responses to physiological and environmental perturbations such as exercise, injury and hypoxia. | | | | |
| **10683 - 773** | **10** | **Signal Transduction in Physiology and Pathophysiology** | | |
| A selection of the signal transduction pathways involved in cellular physiology such as the mitogen-activated protein kinase (MAPK) and PI-3 Kinase/PKB pathways, as well as metabolic pathways (e.g. AMPK pathway) will be examined. Responses of these pathways to conditions of stress (e.g. hypoxia, injury, exercise and psychological) and the downstream cellular and tissue effects. Processes of cell death, including apoptosis, necrosis and autophagy, are also investigated. (Physiological and cellular responses to stress situations). | | | | |
| **66443 - 774** | **10** | **Metabolism in Health and Disease** | | |
| In-depth study of metabolism in both healthy tissue and in various pathological states (e.g. diabetes). | | | | |
| **11260 - 775** | **10** | **Stress Physiology** | | |
| Basic physiological responses to stress – both psychological and physiological – will be covered, in terms of both acute and chronic situations. Links to other systems will be highlighted, and the role of stress in the development of chronic disease will be discussed. | | | | |
| **54895 - 776** | **60** | **Research Project in Physiological Sciences** | | |
| Students must carry out independent research on a subject determined by the teaching staff concerned. A manuscript on the research work shall be completed to the satisfaction of the teaching staff and examiners. An oral examination is also required. | | | | |
| **66192 - 781** | **10** | **Research Methodology in Physiological Sciences** | | |
| Introduction to scientific method, including research ethics (animal and human), experimental design, methods of data collection including laboratory practical methods and analysis and critical evaluation of literature. Use of animal models in understanding normal physiology and pathophysiology. Use of animal models to develop pharmacological interventions and biomedical devices. Current legislation in South Africa concerning the use of animals in research and teaching. | | | | |

## MSc in Exercise Science

| | | | | |
|---|---|---|---|---|
| **10630 - 882** | **20** | **Exercise Immunology, Endocrinology and Haematology** | | |
| Acute and long-term responses of the immune system, stress hormones and red cell systems to exercise and training. Theory and methodology of related exercise tests and laboratory analyses. | | | | |
| **10614 - 883** | **20** | **Multidisciplinary Approach to Muscle Physiology** | | |
| Advanced muscle physiology, including adaptive responses to exercise and injury. Muscle-structure function relationships and mechanisms of hypertrophy and atrophy. Applications of these topics illustrated in the current Exercise Physiology literature. Theory and methodology of exercise science testing. | | | | |
| **64548 - 884** | **10** | **Metabolic Factors influencing Performance** | | |
| Exercise performance, metabolism and muscle adaptation may be influenced by factors such as macronutrients, anabolic steroids and various supplements: Background and application.<br>Bone density and muscle tissue catabolism are influenced in a variety of ways by exercise and chronic disease: Background and application.<br>Theory and methodology of anthropometry (the science of body composition and the measurement thereof). | | | | |
| **62421 - 885** | **10** | **Exercise Biochemistry** | | |
| Metabolic responses to exercise at the whole body, intermediary and tissue levels. Integration of exercise physiology and biochemical knowledge to understand metabolism during exercise fatigue and metabolic adaptations to training. The scientific basis for the design of training programmes. Theory and methodology of metabolic tests and related analyses. | | | | |
| **12919 - 827** | **120** | **Thesis in Exercise Science** | | |
| The topic of a research project must be chosen in conjunction with the programme coordinator and other available study leaders. The research must be carried out reasonably independently and a thesis must be written up. | | | | |

## Faculty of AgriSciences
## Department of Genetics
### BScHons in Genetics

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|---|---|---|---|---|
| **10481 - 711** | **16** | **Genetics: Molecular Techniques** | | |
| The advancement in the field of molecular genetic techniques has revolutionised Genetics and many of its applications. This module provides a theoretical platform (lectures, discussions, etc.) with concurrent hands-on practical sessions, which include DNA and RNA characterisation and manipulation. | | | | |
| **47295 - 712** | **8** | **Human Genetics** | | |
| This module focuses on current medical and ethical aspects of human genetics in practice. By means of lectures, guest speakers, round-table discussions, a visit to a diagnostic laboratory, etc. the latest technology, applications and consequences of human genetics will be reviewed. | | | | |
| **10478 - 713** | **8** | **Genetic Data Analysis** | | |
| The Genetic Data Analysis module is goal orientated and focused on the acquiring of practical skills by means of computer packages and web-based tasks, for the completion of basic genetic data analysis. Examples taken from case studies and data from relevant fields of application are used as a training-model on a continuous basis. | | | | |
| **12555 - 714** | **8** | **Bioinformatics** | | |
| This module focuses on the use of web-based and other computer programs for the analysis of different types of conventional and high-throughput biological data. These include data mining, basic and advanced protein and nucleotide sequence analyses, different types of genomics applications (structural, functional and comparative), phylogenetic relationship reconstructions, as well as assembly and annotation of datasets generated by next-generation sequencing platforms. Students are also introduced to a number of different relevant databases. | | | | |
| **18007 - 741** | **64** | **Honours Project in Genetics** | | |
| The research project is the main component of the Honours programme. This module involves the planning, execution, analysis and reporting of hands-on practical research which is performed within an established research group. | | | | |

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|---|---|---|---|---|
| **12557 - 716** | **16** | **Plant Genomics** | | |
| A good understanding of the plant genome, as well as the effective analysis thereof, is a prerequisite to succeed in plant improvement, especially considering the complexities associated with the diversity of plant genomes. This module aims to improve your understanding of the fundamentals in plant genetics and genomics. Concepts like genetic manipulation, gene regulation and expression, as well as technologies to study these concepts, will be discussed. | | | | |

**BScHons in Plant Biotechnology**

| | | | | |
|---|---|---|---|---|
| **10481 - 715** | **16** | **Genetics: Molecular Techniques** | | |
| The advancement in molecular genetic techniques has revolutionised Genetics and many of its applications. This module provides a theoretical platform (lectures, discussions, etc.) with concurrent hands-on practical sessions, which include DNA and RNA characterisation and manipulation. | | | | |
| **12582 - 790** | **64** | **Research Module in Plant Biotechnology** | | |
| An approved research project is compulsory. This component consists of the research project, a research proposal, research seminars, a poster, a popular article and an oral. The results are submitted in the form of a scientific paper and presented at a seminar to a scientific audience. | | | | |
| **17523 - 712** | **8** | **Plant Physiology** | | |
| Plants are sessile and therefore they must be efficient in taking up mineral elements from the soil, and then using them to grow and reproduce. This requires the expenditure of energy and the utilisation of metabolites resulting in tight integration between carbon and nutritional metabolism. The first part of the module deals with the light and dark reactions of photosynthesis providing the energy required for the uptake and assimilation of minerals. The second part deals with plant nutrition and water uptake and their relation to crop productivity, whereas the third part deals with aspects of plant growth and development. | | | | |
| **10475 - 713** | **8** | **Integrated Plant Metabolism** | | |
| The underlying principles and current status of the following topics will be discussed: source-sink relations, phloem loading and unloading; compartmentalisation of metabolism; interconversion of starch and sucrose; cell wall components; gluconeogenesis; protein phosphorylation and metabolism; integration of nitrogen and sugar metabolism; sugars as metabolic signals. | | | | |

| | | | | |
|---|---|---|---|---|
| **12555 - 714** | **8** | **Bioinformatics** | | |
| This module focuses on the use of web-based and other computer programs for the analysis of different types of conventional and high-throughput biological data. These include data mining, basic and advanced protein and nucleotide sequence analyses, different types of genomics applications (structural, functional and comparative), phylogenetic relationship reconstructions, as well as assembly and annotation of datasets generated by next-generation sequencing platforms. Students are also introduced to a number of different relevant databases. | | | | |
| **12557 - 716** | **16** | **Plant Genomics** | | |
| A good understanding of the plant genome, as well as the effective analysis thereof, is a prerequisite to succeed in plant improvement, especially considering the complexities associated with the diversity of plant genomes. This module aims to improve your understanding of the fundamentals in plant genetics and genomics. Concepts like genetic manipulation, gene regulation and expression, as well as technologies to study these concepts, will be discussed. | | | | |

## Department of Plant Pathology

### BScHons in Plant Pathology

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|---|---|---|---|---|
| **32891 - 771** | **16** | **Advanced plant disease dynamics** | | |
| Components of plant diseases, such as the plant pathogens that cause them, the host factors that influence their development and the environmental conditions that favour them. Diseases of national and international importance and the damage they cause to food production in the world. The dynamics of pathogens associated with seed and nursery plants, as well as those causing soil-borne, foliar and fruit diseases before harvest, and decay and damage after harvest. | | | | |
| **32891 - 772** | **16** | **Advanced disease management** | | |
| The importance of epidemiology in control and management of plant diseases through the integration of cultivation practices, physical, biological and chemical strategies (seed technology, minimum manipulation, plant quarantine, sanitation practices and resistance). The mode of action of fungicides and the management of fungicide resistance in fungal populations. Biological control. Development and production of biocontrol systems for soil-borne, plant and fruit pathogens. | | | | |
| **32891 - 773** | **10** | **Research methodology** | | |
| Relevant and current experimental approaches and methods of analysis used in plant pathology. Experimental design and statistical analysis, molecular methods, phylogenetic analysis, paper reviews.<br>*Continuous assessment.* | | | | |
| **32891 - 774** | **60** | **Project management and presentation** | | |
| Course work will include lessons in project identification, planning and execution, writing of research proposals and reports, presentation of research findings, scientific collaboration and ethics in science. Exercises in project planning and execution will be conducted under supervision. A literature study and scientific findings will be presented as scientific manuscripts and as an oral presentation.<br>*Continuous assessment.* | | | | |
| **32891 - 775** | **18** | **Advanced topics in plant pathology** | | |
| Topical issues in plant pathology will be discussed in this module. These include aspects such as climate change, food security and genetic modification. Students are expected to prepare properly for these discussions by doing internet searches and reading research papers and books on the individual topics. The topic will be introduced by an expert, after which a class discussion will follow. Students will be expected to prepare a one-page document of their views on the topic and list the literature sources that they have accessed.<br>*Subject to continuous assessment.* | | | | |

## Department of Viticulture and Oenology

### BScHons in Wine Biotechnology

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|---|---|---|---|---|
| **50997 - 714** | **5** | **Chemical components of grapes and wine** | | |
| Water and sugars; polysaccharides; alcohols; acids; phenols; aldehydes and ketones; acetals; esters; lactones; terpenes; nitrogenous components; hydrogen sulphide and sulphur components; hydrocarbons and derivatives; macromolecules and growth factors; dissolved gases and minerals. | | | | |
| **50997 - 771** | **40** | **Research methodology for grapevine and wine biotechnology** | | |
| Project planning, communication and writing skills; oral presentation of research project proposal; carrying out experimental research; data processing; written reporting on and oral presentation of research results; writing and presenting a seminar.<br>*Subject to continuous assessment.* | | | | |
| **50997 - 772** | **25** | **Techniques in grapevine and wine biotechnology** | | |
| General laboratory safety and etiquette, biological calculations; project planning; general molecular biology techniques; polymerase chain reaction (PCR); agarose gel electrophoresis; cloning of DNA fragments; transforming bacterial, yeast and plant cells; DNA sequencing; plant tissue culture; hybridisation techniques; protein isolation and analysis; introduction to bioinformatics, genomics, transcriptomics and proteomics. Small-scale winemaking and analyses of wine, including sensory evaluation.<br>*Subject to continuous assessment.* | | | | |
| **50997 - 773** | **30** | **Biotechnology of wine-related microbes** | | |
| Isolation, identification and classification of wine-associated yeasts and bacteria. Fermentation biochemistry and kinetics; metabolic end products; nitrogen and sulphur metabolism during fermentation; fermentation problems; ethanol tolerance; fermentation bouquet and other volatile esters. Biotechnology of lactic acid bacteria; malolactic fermentation and microbial spoilage of wines. Techniques and targets for the genetic improvement of wine yeasts; legal, ethical and consumer aspects relating to the use of genetically manipulated wine yeasts. Role of enzymes in vinification. | | | | |
| **50997 - 774** | **20** | **Vine structure and functioning and grapevine improvement** | | |
| General viticultural concepts, including the vegetative structure and function; reproductive structure and development as well as integration into the establishment and management of vine balance in the viticultural system. Biotechnological aspects of vine plant diseases; molecular-genetic aspects of plant-pathogen interactions; use of recombinant DNA technology to genetically improve plants; techniques and targets for the genetic improvement of plants. | | | | |

## Faculty of Arts and Social Sciences
## Department of Geography and Environmental Sciences
### BScHons in GeoInformatics

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|---|---|---|---|---|
| **49611 - 713** | **30** | **Geographical Information Systems** | | |
| Advanced spatial-database use, design and development; data quality assessment; global positioning systems (GPS); data generalisation and conflation; spatial queries; 2.5D data structures and visualisation.<br>*PP Geography and Environmental Studies 214 (60%) or 363 (65%)* | | | | |
| **12187 - 716** | **30** | **Spatial Modelling and Geographical Communication** | | |
| Application and development of spatial models through the use of geographical information systems.<br>*PP Geography and Environmental Studies 334 or Geographical Information Technology 341; and*<br>*PP Computer Science 114 or Socio-Informatics 224 or Socio-Informatics 254* | | | | |
| **63363 - 742** | **30** | **Environmental Geography Research Application** | | |
| Application of scientific-thinking skills and research methodologies. Data compilation and processing techniques according to departmental guidelines. Conducting an individual research project under supervision and according to a fixed reporting programme to a departmental panel and student peers. | | | | |
| **63371 - 711** | **30** | **Environmental Analysis and Synthesis** | | |
| Environmental thought and South African environmental policy, management structures and instruments; Specialisation in environmental impact assessment; The application of GIS in environmental analysis and management of natural hazards, special environments such as mountains and coastal regions and the conduct of multicriteria decision-making. | | | | |
| **63398 - 712** | **30** | **Advanced Remote Sensing** | | |
| Characteristics and use of the salient data sources and remote sensing platforms. Advanced techniques for enhancement of images for atmospheric and topographical correction and geographical registration. Advanced classification techniques and practical use of the latest software (Definiens Erdas, PCI).<br>*PP Geographical Information Technology 342* | | | | |
| **13134 - 712** | **30** | **Disaster Risk Science and Development** | | |
| Disaster risk and its implications for sustainable development in southern Africa. Interdisciplinary perspectives on disasters, risks, hazards and vulnerability. International and national disaster-risk management frameworks. Community-based disaster risk assessment and applications. | | | | |

# Research and Service Bodies

In this chapter the research and service bodies that reside in the Faculty of Science are presented.

## 1. Bureau for Industrial Mathematics at Stellenbosch University

*History*

The Bureau for Industrial Mathematics at Stellenbosch University (BIMUS) was established in 1990 and functions as part of the Department of Mathematical Sciences (Mathematics, Applied Mathematics and Computer Science).

*Objectives*

The Bureau's objective is to encourage cooperation between the Applied Mathematics Division and industry. The Bureau facilitates consultation and research projects between lecturers and industry and supports students who do an industrial research project as part of their studies.

Fields currently supported or in which expertise are available, are: Numerical methods, numerical flow simulation, porous media, ballistics, computer simulation, image processing, pattern recognition, and computer vision.

*Contact details*

For more information, visit us at http://dip.sun.ac.za/bimus or contact Dr Milton Maritz at mfmaritz@sun.ac.za or 021 808 4228.

## 2. Centre for Experimental Mathematics

*History*

The Centre for Experimental Mathematics (CEM) in the Department of Mathematical Sciences (Mathematics, Applied Mathematics and Computer Science) focuses on fundamental and experimental mathematical research and supports three research areas, namely the analysis of algorithms and theoretical computer science, computational algebra and numbers theory, and computational analysis research.

*Objectives*

The Centre has strong ties with leading institutions abroad, such as the Technical University Graz and the Centre of Experimental Mathematics in Essen. There is an active exchange of ideas and collaboration on research projects between members of the Centre and academics at universities in Paris, Brussels, Vienna and Johannesburg. This international interaction also provides students the opportunity to be exposed to other mathematical schools.

The Centre brings together researchers and students from the fields of mathematics, engineering and computer science. Activities such as seminars, workshops, research projects for young upcoming scientists and an international exchange programme for postdoctoral fellows develop mathematicians on a postgraduate level. Graduate students are also introduced to the Centre's

interdisciplinary mathematical activities through suitable courses, computer-assisted projects and local inter-university activities such as thematic workshops.

*Contact details*

For more information, visit math.sun.ac.za or contact Prof Helmut Prodinger at hproding@sun.ac.za or 021 808 3273.

## 3. Centre for Human Performance Sciences

*History*

The Centre for Human Performance Sciences was established in 2007 to operate as a coordinating mechanism to capitalise on the interdisciplinary potential that exists among various faculties and departments within Stellenbosch University in the areas of sport, exercise and physical activity.

*Objectives*

The Centre aims to develop the interface between the academic resources of the University, the Stellenbosch University Sport Performance Institute (SUSPI) and Maties Sport. Another strategic objective is the establishment of international partnerships with other universities to pursue Africa-relevant research, learning and community engagement projects in the areas of sport, exercise and physical activity.

The Centre is currently engaged in the delivery of one of the goals of the University's HOPE Project, through which Stellenbosch University uses its key strengths of academic excellence and cutting-edge research to address seemingly intractable problems in society. The Centre's HOPE Project initiative explores ways in which participation in sport and exercise can be adapted to meet the physical, psychological and social development needs of youth, women and persons with disabilities. An emphasis is placed on combining resources through partnerships with other universities to create innovative and sustainable programmes.

*Contact details*

For more information, visit www.sun.ac.za/humanperformance or contact Prof Liz Bressan at esb@sun.ac.za or 021 808 4862.

## 4. Centre for Studies in Complexity

*History*

The Centre for Studies in Complexity was launched in 2010 and aims to harness the insights from the field of complexity theory in the search for comprehensive solutions to the challenges of human development in South Africa and the rest of Africa. Complexity theory engages in ground-breaking ways with major problems in the human and natural sciences by looking at the big picture instead of focusing on the detail. Topics studied include the behaviour of ecosystems, social and economic systems, the cellular organisation that constitutes a living organism, how meaning arise in language, the causes of political intolerance, and the functioning of health systems.

*Objectives*

The Centre is the only one of its kind in Africa and is an initiative of the Stellenbosch University HOPE Project, through which the University uses its key strengths of academic excellence and cutting-edge research to address seemingly intractable problems in society. The Centre's aims of knowledge generation and dissemination is achieved through collaborative research involving academics worldwide, and through teaching and supervising postgraduate students from various disciplines.

*Contact details*

For more information, visit www.thehopeproject.co.za or contact Prof Jan-Hendrik Hofmeyr at jhsh@sun.ac.za or 021 808 2704.

## 5. DST-NRF Centre of Excellence for Invasion Biology

*History*

The DST-NRF Centre of Excellence for Invasion Biology (CIB) was launched in 2004 in partnership with a number of academic institutes and research bodies throughout South Africa. The aim of the CIB is to improve our ability, through scientific knowledge, to understand, control and manage invasive species to improve the quality of life of all South Africans. People move species around, often unintentionally. These movements have consequences, many of which are unexpected.

*Objectives*

Research done by the Centre focuses on the implications of biological invasions for the biodiversity, ecosystems, the functioning and ecosystem services of all South African biomes, including Marion Island, as well as systems elsewhere in Africa. It covers all aspects of invasion biology, including biodiversity and ecosystem functioning, the effect of climate change, community ecology, GPS-based assessment of ecosystem services and conservation planning, impacts of invasive species on biodiversity, macroecology and landscape ecology, marine biology, pollination, risk assessment, spatial modelling and seed bank research. In addition, the Centre contributes to policy formulation and decision-making on invasive species and their impacts.

The Centre remains at the forefront of these fields by pursuing excellence in interdisciplinary research, encouraging interaction between partners on local, regional and international level, and staying relevant to the needs of the community. The Centre focuses on South Africa in the context of trends shaping Africa and the global community.

Study and research opportunities are available at the BSc (final-year only), BScHons, MSc, and PhD levels, as well as opportunities for postdoctoral research fellowships.

*Contact details*

For further information on the Centre, visit our website at www.sun.ac.za/cib or contact Prof Dave Richardson at cib@sun.ac.za or 021 808 3711.

## 6. Institute for Applied Computer Science

*History*

Founded in 1981, the Institute for Applied Computer Science (IACS) functions as part of the Department of Mathematical Sciences (Mathematics, Applied Mathematics and Computer Science). Since its inception, the Institute has worked closely with the private sector.

*Objectives*

The Institute aims to build a centre of expertise in Computer Science at Stellenbosch University and trains postgraduate students capable of developing reliable systems software.

*Contact details*

For more information, visit www.cs.sun.ac.za/iacs or contact Prof Willem Visser at visserw@sun.ac.za or 021 808 4232.

## 7. Institute of Theoretical Physics

*History*

The Institute was founded in 1984, with support from the Nuclear Development Corporation of South Africa.

*Objectives*

The Institute of Theoretical Physics functions in collaboration with the division of theoretical physics in the Department of Physics. Its primary aims are the pursuit of research projects in the field of theoretical physics and assistance with the education of postgraduate students. It serves as a centre for the development of theoretical physics and encourages co-operation in physics activities in the Department and elsewhere. It enjoys close ties with the National Institute for Theoretical Physics (NITHeP).

*Contact details*

For more information, visit www.physics.sun.ac.za/theory or contact Prof Kristian Müller-Nedebock at kkmn@sun.ac.za or 021 808 3386.

## 8. Laser Research Institute

*History*

The Laser Research Institute (LRI), which resides in the Physics Department, strives to be a centre of excellence in laser-related research and development in South Africa. The Institute boasts excellent laser facilities and is involved in world-class research projects. There is also a vibrant research atmosphere: Students, teachers and other staff members take part in the Institute's activities and this combination contributes to a unique and highly successful research environment.

*Objectives*

The Institute offers the only outcomes-based university programme in laser physics in Southern Africa. This four-year programme entails a three-year BSc programme and a one-year BScHons programme. The first three years are non-specific and consist of various modules in physics, chemistry, mathematics, applied mathematics and computer science. The BScHons year is devoted to a number of courses in the field of laser physics, such as modern optics, laser technology, quantum optics and advanced electromagnetism, as well as a practical laser project.

The Institute's excellence is due to its postgraduate research, in which local and international MSc and PhD students partake. Good research outputs are delivered thanks to the excellent facilities and project supervision. Projects range from basic research funded by National Research Foundation (NRF) and National Laser Centre (NLC) grants, to applied research and development funded by THRIP grants or contract research with private sector companies. Generous bursaries are available for MSc and PhD students in the fields of laser spectroscopy, femtosecond laser applications, $CO_2$ laser research, pulsed power supply development, solid-state and fibre laser development and non-linear optics.

Bursaries are also available for BScHons students, while a limited number of bursaries are available to selected students in the first three years of their BSc studies.

*Contact details*

For more information, visit www.laser-research.co.za or contact Prof Heinrich Schwoerer at heso@sun.ac.za or 021 808 3375.

## 9. National Institute for Theoretical Physics

*History*

The National Institute for Theoretical Physics (NIThеP) is a national asset that leads research programmes and educational opportunities in the field of theoretical physics in South Africa and Africa. NIThеP is a geographically distributed institute that includes all theoretical physicists in South Africa. Its headquarters is the Stellenbosch Institute for Advanced Study (STIAS) at Stellenbosch University, with regional nodes at the University of the Witwatersrand and the University of KwaZulu-Natal. The three nodes develop and support theoretical physics in their local regions, as well as nationally.

*Objectives*

The Institute provides South Africa with the opportunity to become an international player in a truly fundamental field of science.

*Contact details*

For more information, visit www.nithep.ac.za or contact Prof Frikkie Scholtz at fgs@sun.ac.za or 021 808 3871.

## 10. South African Centre for Epidemiological Modelling and Analysis

*History*

The South African Centre for Epidemiological Modelling and Analysis (SACEMA) is a national research centre established under the Centres of Excellence programme of the Department of Science and Technology and the National Research Foundation in South Africa. It is associated with the Stellenbosch Institute for Advanced Study (STIAS) and brings together researchers from mathematics, statistics, biology and medical research.

*Objectives*

The Centre aims to develop world-class capacity in the quantitative handling of the emergence, spreading and combat of major diseases such as HIV/Aids, tuberculosis and malaria, and to provide a more scientific basis for advice to governments and other related organisations on key questions about these diseases.

The Centre brings together researchers from Stellenbosch, Witwatersrand, KwaZulu-Natal, Zimbabwe and Botswana universities, partnered with experts from Berkeley, London, the World Health Organisation and UNAIDS (Geneva) among others.

*Contact details*

For more information, visit www.sacema.com or contact Dr Alex Welte at alexwelte@sun.ac.za or 021 808 2589.

## 11. Stellenbosch University Water Institute

*History*

The Stellenbosch University Water Institute unites established water research groups in seven Stellenbosch University faculties under one umbrella, to actively contribute towards solving South Africa and the continent's water-related challenges. It is rooted in the Faculty of Science, and was established in 2010. The positive attitude in which researchers involved with the Institute tackle water-related challenges, captures the spirit of the HOPE Project, through which Stellenbosch University uses its key strengths of academic excellence and cutting-edge research to address seemingly intractable problems in society.

*Objectives*

Current research projects already being done by its affiliates, in collaboration with government and industry, focus on health, agriculture and food, a sustainable environment, nanotechnology and filtration, effluent treatment and social aspects surrounding water. Microbiologists, polymer scientists, soil scientists, geologists, invasion biologists, engineers, zoologists, food scientists, biochemists, agricultural economists and a philosopher count among the affiliated researchers who work on topics such as the ethics of freshwater management, ownership of water, the safety of agricultural produce, biofouling and biocorrosion control, community health, financial-economic planning of water use, endocrine disruptors, hydrodynamics, water engineering,

catchment and resource management, invasion biology, the geochemical evolution of water and waste waters, and water governance and management.

*Contact details*

For more information, visit www.sun.ac.za/water or contact Prof Gideon Wolfaardt at gmw@sun.ac.za or 021 808 3039.

# Alphabetical List of Undergraduate Subjects and Postgraduate Programmes

# Appendix

## The minimum programme specific admission requirements for mainstream programmes for applicants with school-leaving qualifications other than the National Senior Certificate (NSC) and the Independent Examination Board school-leaving certificate (IEB)

(International school-leaving qualifications have to meet the requirements for university exemption as determined by the Matriculation Board, UniverSA)

| International qualifications | Minimum admission requirements |
|---|---|
| An average performance level of at least 65%<br>A performance level of at least 50% in Afrikaans or English | |
| **HIGCSE and Namibian NSSC** | |
| If you take Physics or Chemistry as university subjects: | |
| Physical Sciences OR Natural Sciences OR Chemistry AND Physics | 3 |
| If you take Mathematics 114, 144 and Physics 114, 144: | |
| Mathematics | 2 |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154: | |
| Mathematics | 3 |
| **AS-level** | |
| If you take Physics or Chemistry as university subjects: | |
| Physical Sciences OR Natural Sciences OR Chemistry AND Physics | D |
| If you take Mathematics 114, 144 and Physics 114, 144: | |
| Mathematics | B |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154: | |
| Mathematics | C |
| **A-level** | |
| If you take Physics or Chemistry as university subjects: | |
| Physical Sciences OR Natural Sciences OR Chemistry AND Physics | E |
| If you take Mathematics 114, 144 and Physics 114, 144: | |
| Mathematics | D |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154: | |
| Mathematics | E |

| **IB HL** | |
|---|---|
| If you take Physics or Chemistry as university subjects: | |
| Physical Sciences OR Chemistry AND Physics | 2 |
| If you take Mathematics 114, 144 and Physics 114, 144: | |
| Mathematics | 4 |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154: | |
| Mathematics | 3 |
| **IB SL** | |
| If you take Physics or Chemistry as university subjects: | |
| Physical Sciences OR Chemistry AND Physics | 2 |
| If you take Mathematics 114, 144 and Physics 114, 144: | |
| Mathematics | 5 |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154: | |
| Mathematics | 4 |

1. Mathematics, Chemistry and Physics on IGSCE/GCSE/NSSC OL Gr 11 level does **not** qualify for admission.
2. Contact the International Office at interoff@sun.ac.za or +2721 808 2565 for the minimum admission requirements for school leaving qualifications not listed in the table above.

## School of Tomorrow*

| **Programmes** | **Admission requirements** | **National Benchmark Tests** |
|---|---|---|
| All programmes | As for NSC/IEB | Academic Literacy<br>60<br>Quantitative Literacy<br>60<br>Mathematics<br>55 |

* As applicant from the "School of Tomorrow" school system you can only obtain a university exemption certificate on recommendation of the Faculty of Science. Your selection is thus dependent on meeting the programme specific admission requirements, as well as performance in the National Benchmark Tests (unless you sit the NSC exams in which case these results will apply).