Science

Academic programmes and faculty information

Calendar, 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.

Please note that the information in this Calendar part, and also in the other Calendar parts, is subject to change, as and when necessary, for as long as uncertainty regarding the Covid-19 situation persists.

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.

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Availability of the Calendar parts

- The electronic versions of the Calendar parts are available at www.sun.ac.za/Calendar.
- Parts 1 to 12 are available in both English and Afrikaans. Military Science (Part 13) is only available in English.
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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
  - 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; 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.

- 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
  - 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 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 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:
  o The Faculty’s postgraduate study programmes;
  o The interruption of master’s or doctoral studies; and
  o 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 Stellenbosch 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 social impact

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 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 centres, 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:


Social impact
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

<table>
<thead>
<tr>
<th>Staff</th>
<th>Telephone number</th>
<th>E-mail address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dean</td>
<td>021 808 3071</td>
<td><a href="mailto:lw@sun.ac.za">lw@sun.ac.za</a></td>
</tr>
<tr>
<td>Dean’s Office</td>
<td>021 808 3072</td>
<td><a href="mailto:se@sun.ac.za">se@sun.ac.za</a></td>
</tr>
<tr>
<td>Director: Faculty Management</td>
<td>021 808 3760</td>
<td><a href="mailto:mvdworm@sun.ac.za">mvdworm@sun.ac.za</a></td>
</tr>
<tr>
<td>Coordinator: Academic and Student Affairs</td>
<td>021 808 3931</td>
<td><a href="mailto:aatika@sun.ac.za">aatika@sun.ac.za</a></td>
</tr>
<tr>
<td>E-learning Instructional Designer</td>
<td>021 808 3535</td>
<td><a href="mailto:ilser@sun.ac.za">ilser@sun.ac.za</a></td>
</tr>
<tr>
<td>NARGA: IT Manager</td>
<td>021 808 2682</td>
<td><a href="mailto:idk@sun.ac.za">idk@sun.ac.za</a></td>
</tr>
<tr>
<td>Media and Marketing</td>
<td>021 808 2684</td>
<td><a href="mailto:science@sun.ac.za">science@sun.ac.za</a></td>
</tr>
<tr>
<td>Recruitment and Marketing</td>
<td>021 808 2681</td>
<td><a href="mailto:maambele@sun.ac.za">maambele@sun.ac.za</a></td>
</tr>
</tbody>
</table>

For more information on the Faculty of Science, visit us at www.sun.ac.za/english/faculty/science

In the Admin A-building

<table>
<thead>
<tr>
<th>Staff</th>
<th>Telephone number</th>
<th>E-mail address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Administrator</td>
<td>021 808 4832</td>
<td><a href="mailto:bpa@sun.ac.za">bpa@sun.ac.za</a></td>
</tr>
</tbody>
</table>

Mr BP Abels
2.3 Contact details of Departments

<table>
<thead>
<tr>
<th>Department</th>
<th>Telephone number</th>
<th>E-mail address</th>
<th>Web page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>021 808 5862</td>
<td><a href="mailto:biochair@sun.ac.za">biochair@sun.ac.za</a></td>
<td><a href="http://www.sun.ac.za/biochem">www.sun.ac.za/biochem</a></td>
</tr>
<tr>
<td>Botany and Zoology</td>
<td>021 808 3236</td>
<td><a href="mailto:botzoo@sun.ac.za">botzoo@sun.ac.za</a></td>
<td><a href="http://www.sun.ac.za/botzoo">www.sun.ac.za/botzoo</a></td>
</tr>
<tr>
<td>Chemistry and Polymer Science</td>
<td>021 808 3172</td>
<td><a href="mailto:ec@sun.ac.za">ec@sun.ac.za</a></td>
<td><a href="http://www.sun.ac.za/chemistry">www.sun.ac.za/chemistry</a></td>
</tr>
<tr>
<td>Earth Sciences</td>
<td>021 808 3219</td>
<td><a href="mailto:gstrydom@sun.ac.za">gstrydom@sun.ac.za</a></td>
<td><a href="http://www.sun.ac.za/earthsci">www.sun.ac.za/earthsci</a></td>
</tr>
<tr>
<td>Mathematical Sciences</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>021 808 3282</td>
<td><a href="mailto:maths@sun.ac.za">maths@sun.ac.za</a></td>
<td><a href="http://mathsci.sun.ac.za/">http://mathsci.sun.ac.za/</a></td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>021 808 4215</td>
<td><a href="mailto:appliedmaths@sun.ac.za">appliedmaths@sun.ac.za</a></td>
<td><a href="http://appliedmaths.sun.ac.za/">http://appliedmaths.sun.ac.za/</a></td>
</tr>
<tr>
<td>Computer Science</td>
<td>021 808 4232</td>
<td><a href="mailto:secretary@cs.sun.ac.za">secretary@cs.sun.ac.za</a></td>
<td><a href="http://www.cs.sun.ac.za/">http://www.cs.sun.ac.za/</a></td>
</tr>
<tr>
<td>Microbiology</td>
<td>021 808 5847</td>
<td><a href="mailto:wendyw@sun.ac.za">wendyw@sun.ac.za</a></td>
<td><a href="http://www.sun.ac.za/microbiology">www.sun.ac.za/microbiology</a></td>
</tr>
<tr>
<td>Physics</td>
<td>021 808 3391</td>
<td><a href="mailto:physoffIce@sun.ac.za">physoffIce@sun.ac.za</a></td>
<td><a href="http://www.sun.ac.za/physics">www.sun.ac.za/physics</a></td>
</tr>
<tr>
<td>Physiological Sciences</td>
<td>021 808 3146</td>
<td><a href="mailto:gas@sun.ac.za">gas@sun.ac.za</a></td>
<td><a href="http://academic.sun.ac.za/physiosciences">http://academic.sun.ac.za/physiosciences</a></td>
</tr>
</tbody>
</table>

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 at the Faculty of Science. This Society is managed by the Natural Sciences Student Committee (NSC). For more information on the committee visit the following webpage or contact them electronically:

- http://www.sun.ac.za/english/faculty/science/for-students/committees/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) is committed to engagement with knowledge in a diverse society and through the Language Policy aims to increase equitable access to SU for all students and staff. Multilingualism is promoted as an important differentiating characteristic of SU. Afrikaans, English and isiXhosa are used in academic, administrative, professional and social contexts. Pedagogically sound teaching and learning are facilitated by means of Afrikaans and English.

More information concerning language at SU is available at www.sun.ac.za/language.
5. Qualifications offered at the Faculty of Science

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

<table>
<thead>
<tr>
<th>Degree</th>
<th>Length of degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSc</td>
<td>3 years</td>
</tr>
<tr>
<td>BScHons</td>
<td>1 year</td>
</tr>
<tr>
<td>MSc (Mathematical Sciences) (AIMS)</td>
<td>3 semesters</td>
</tr>
<tr>
<td>MSc</td>
<td>1 or 2 years</td>
</tr>
<tr>
<td>PhD</td>
<td>2 years</td>
</tr>
<tr>
<td>DSc</td>
<td>1 or 3 years</td>
</tr>
</tbody>
</table>

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 at 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 dependant on the class, test and examination timetables concerned.
- At the Faculty of Science, a student will not be allowed to repeat (a) module(s) already passed. Under exceptional circumstances the Dean, in consultation with the head of the relevant department, may grant permission that (a) module(s) could be repeated. If permission to repeat a module is granted, the marks obtained by repeating the module will not count towards the degree but may be used by the department to determine whether there is a better academic grounding to enter higher degree programmes.
- If you have followed the first year of your degree programme at 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. Module requirements (prerequisite pass, prerequisite and corequisite modules)

7.1 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.

In the following tables the prerequisite pass, prerequisite and corequisite modules are listed next to the applicable subjects and modules.

- Prerequisite pass module (PP)
  - 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.
- Prerequisite module (P)
  - 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 flexible assessment, before you can take the module for which it is
prerequisite module.

- **Corequisite module (C)**
  - 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.

### 7.2 Subjects in the BSc degree programmes

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Name</th>
<th>Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>43214</td>
<td>Actuarial Science 112</td>
<td>For admission to the module students must have passed Grade 12 Mathematics with a mark of at least 70%</td>
</tr>
<tr>
<td>43214</td>
<td>Actuarial Science 211</td>
<td>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 C Mathematical Statistics 214</td>
</tr>
<tr>
<td>12558</td>
<td>Anatomy 214</td>
<td>P Biology 124, 144 or 154</td>
</tr>
<tr>
<td>12558</td>
<td>Anatomy 244</td>
<td>P Anatomy 214</td>
</tr>
<tr>
<td>12558</td>
<td>Anatomy 314</td>
<td>P Anatomy 214, 244</td>
</tr>
<tr>
<td>12558</td>
<td>Anatomy 324</td>
<td>P Anatomy 214, 244</td>
</tr>
<tr>
<td>12558</td>
<td>Anatomy 344</td>
<td>P Anatomy 214, 244, 314</td>
</tr>
<tr>
<td>12558</td>
<td>Anatomy 364</td>
<td>P Anatomy 214, 244</td>
</tr>
<tr>
<td>52078</td>
<td>Applied Chemistry 315</td>
<td>C Applied Chemistry 324</td>
</tr>
<tr>
<td>52078</td>
<td>Applied Chemistry 324</td>
<td>P Chemistry 214, 264</td>
</tr>
<tr>
<td>52078</td>
<td>Applied Chemistry 334</td>
<td>PP Chemistry 214, 264</td>
</tr>
<tr>
<td>52078</td>
<td>Applied Chemistry 344</td>
<td>P Applied Chemistry 324</td>
</tr>
<tr>
<td>52078</td>
<td>Applied Chemistry 345</td>
<td>P Applied Chemistry 315 C Applied Chemistry 344</td>
</tr>
<tr>
<td>54429</td>
<td>Applied Kinesiology 313</td>
<td>PP Kinesiology 182</td>
</tr>
<tr>
<td>54429</td>
<td>Applied Kinesiology 314</td>
<td>None</td>
</tr>
<tr>
<td>54429</td>
<td>Applied Kinesiology 324</td>
<td>None</td>
</tr>
<tr>
<td>54429</td>
<td>Applied Kinesiology 344</td>
<td>None</td>
</tr>
<tr>
<td>54429</td>
<td>Applied Kinesiology 352</td>
<td>None</td>
</tr>
<tr>
<td>54429</td>
<td>Applied Kinesiology 353</td>
<td>PP Kinesiology 182</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 144</td>
<td>P Mathematics 114 C Mathematics 144</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 214</td>
<td>P Mathematics 144</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 244</td>
<td>P Mathematics 114, 144</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 314</td>
<td>P Applied Mathematics 214 or Mathematics 214</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 324</td>
<td>P Mathematics 114</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 354</td>
<td>P Applied Mathematics 144</td>
</tr>
<tr>
<td>20710</td>
<td>Applied Mathematics 364</td>
<td>PP Mathematics 114, 144 or Engineering Mathematics 115, 145</td>
</tr>
<tr>
<td>20753</td>
<td>Applied Mathematics B 124</td>
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</tr>
<tr>
<td>20753</td>
<td>Applied Mathematics B 154</td>
<td>P Applied Mathematics B 124 C Engineering Mathematics 115</td>
</tr>
<tr>
<td>20753</td>
<td>Applied Mathematics B 224</td>
<td>P Applied Mathematics 144 or Applied Mathematics B 154</td>
</tr>
<tr>
<td>20753</td>
<td>Applied Mathematics B 252</td>
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</tr>
<tr>
<td>20753</td>
<td>Applied Mathematics B 834</td>
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<td>11053</td>
<td>Biochemistry 214</td>
<td>PP Chemistry 124 or 164, 144 PP Biology 124</td>
</tr>
<tr>
<td>11053</td>
<td>Biochemistry 244</td>
<td>P Biochemistry 214</td>
</tr>
<tr>
<td>11053</td>
<td>Biochemistry 315</td>
<td>PP Biochemistry 214, 244 PP Mathematics (Bio) 124 or Mathematics 114</td>
</tr>
<tr>
<td>11053</td>
<td>Biochemistry 323</td>
<td>PP Biochemistry 214, 244 PP Mathematics 114 or Mathematics (Bio) 124</td>
</tr>
<tr>
<td>Subject Number</td>
<td>Module Name</td>
<td>Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11053</td>
<td>Biochemistry 345</td>
<td>P Biochemistry 315, P Bioinformatics 312, P Biochemistry 323 or Bioinformatics 322</td>
</tr>
<tr>
<td>11053</td>
<td>Biochemistry 353</td>
<td>PP Biochemistry 214, 244, P Applied Chemistry 334</td>
</tr>
<tr>
<td>11053</td>
<td>Biochemistry 365</td>
<td>P Biochemistry 315, P Bioinformatics 312, P Biochemistry 323 or Bioinformatics 322</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 212</td>
<td>C Science in Context 178 or Computer Skills 171</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 214</td>
<td>PP Biology 144, C Biodiversity and Ecology 212 or Probability Theory and Statistics 114 or 144</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 224</td>
<td>PP Biology 144 or 154 and a final mark of at least 40% in the other Biology module</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 244</td>
<td>PP Biology 124 or 144 and a final mark of at least 40% in the other Biology module</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 254</td>
<td>PP Biology 124 or 154 and a final mark of at least 40% in the other Biology module</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 264</td>
<td>PP Biology 144 or 154 and a final mark of at least 40% in the other Biology module</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 315</td>
<td>PP Biodiversity and Ecology 212, 214</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 324</td>
<td>PP Biodiversity and Ecology 264</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 334</td>
<td>PP - any 4 of the following 6 modules: Biodiversity and Ecology 212, 214, 224, 244, 254, 264</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 344</td>
<td>PP Biodiversity and Ecology 212, 214, P Biodiversity and Ecology 244</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 345</td>
<td>PP - any 4 of the following 6 modules: Biodiversity and Ecology 212, 214, 224, 244, 254, 264</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 354</td>
<td>P Biodiversity and Ecology 244</td>
</tr>
<tr>
<td>53953</td>
<td>Biodiversity and Ecology 364</td>
<td>PP Biodiversity and Ecology 214, P Biodiversity and Ecology 212</td>
</tr>
<tr>
<td>12555</td>
<td>Bioinformatics 312</td>
<td>None</td>
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<tr>
<td>12555</td>
<td>Bioinformatics 322</td>
<td>P Bioinformatics 312</td>
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<tr>
<td>25046</td>
<td>Biology 124</td>
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</tr>
<tr>
<td>25046</td>
<td>Biology 144</td>
<td>C Biology 124</td>
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<tr>
<td>25046</td>
<td>Biology 146</td>
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<tr>
<td>66176</td>
<td>Biomathematics 374</td>
<td>None</td>
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<tr>
<td>11061</td>
<td>Biometry 212</td>
<td>P Mathematics (Bio) 124 or Mathematics 114</td>
</tr>
<tr>
<td>11061</td>
<td>Biometry 242</td>
<td>P Biometry 212</td>
</tr>
<tr>
<td>59404</td>
<td>Botany 354</td>
<td>PP Biology 144 or 154 and a final mark of at least 40% in the other Biology module</td>
</tr>
<tr>
<td>48550</td>
<td>Business Management 113</td>
<td>None</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 124</td>
<td>None</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 144</td>
<td>C Chemistry 124</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 164</td>
<td>If you failed Chemistry 124 in a particular year, you may register for this module in the same academic year only if you achieved a final mark of at least 40% and a practical mark of at least 60%.</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 176</td>
<td>None</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 214</td>
<td>PP Chemistry 124 or 164</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 234</td>
<td>PP Chemistry 124 or 164</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 254</td>
<td>PP Chemistry 124 or 164, P Mathematics 114, C Mathematics 144</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 264</td>
<td>PP Chemistry 124 or 164, P Mathematics 114 or 144 or Mathematics (Bio) 124 or Engineering Mathematics 115 or 145</td>
</tr>
<tr>
<td>Subject Number</td>
<td>Module Name</td>
<td>Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules</td>
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<tr>
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<tr>
<td>11479</td>
<td>Chemistry 314</td>
<td>PP Chemistry 264</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 324</td>
<td>P Chemistry 254, PP Mathematics 114, 144</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 344</td>
<td>PP Chemistry 214</td>
</tr>
<tr>
<td>11479</td>
<td>Chemistry 364</td>
<td>PP Chemistry 234, P Chemistry 264</td>
</tr>
<tr>
<td>48321</td>
<td>Chemistry C 152</td>
<td>P Engineering Chemistry 123</td>
</tr>
<tr>
<td>48321</td>
<td>Chemistry C 224</td>
<td>PP Engineering Chemistry 123, PP Chemistry C 152</td>
</tr>
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<td>Chemistry C 254</td>
<td>P Chemistry C 224</td>
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<tr>
<td>65692</td>
<td>Chemistry for Health Sciences 112</td>
<td>None</td>
</tr>
<tr>
<td>18139</td>
<td>Computer Science 113</td>
<td>C Actuarial Science 112, C Mathematics 114</td>
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<td>18139</td>
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<tr>
<td>18139</td>
<td>Computer Science 144</td>
<td>P Computer Science 113 or 114</td>
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| 44229         | Movement Education, Sport and Recreation 222     | None                                                                                                   |
| 44229         | Movement Education, Sport and Recreation 242     | None                                                                                                   |
| 44229         | Movement Education, Sport and Recreation 282     | PP Kinesiology 182                                                                                     |
| 50652         | Music Technology 112                            | None                                                                                                   |
| 50652         | Music Technology 142                            | None                                                                                                   |
| 50652         | Music Technology 222                            | None                                                                                                   |
| 50652         | Music Technology 252                            | None                                                                                                   |
| 50652         | Music Technology 379                            | None                                                                                                   |
| 36323         | Numerical Methods 262                           | P Engineering Mathematics 214                                                                          |
| 55336         | Operations Research 214                         | P Mathematics 114, 144                                                                                 |
| 55336         | Operations Research 244                         | PP Mathematics 144  
P Mathematics 114                                                                 |
| 55336         | Operations Research 314                         | P Operations Research 214, 244                                                                          |
| 55336         | Operations Research 322                         | PP Probability Theory and Statistics 114 or 144                                                         |
| 55336         | Operations Research 344                         | P Operations Research 244                                                                               |
| 55336         | Operations Research 352                         | PP Mathematics 114, 144                                                                                 |
| 13005         | Physics (Bio) 134                               | C Mathematics (Bio) 124 or Mathematics 114                                                              |
| 13005         | Physics (Bio) 154                               | P Physics (Bio) 134                                                                                    |
| 12998         | Physics 114                                     | C Mathematics 114                                                                                      |
| 12998         | Physics 144                                     | P Physics 114  
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| 12998         | Physics 176                                     | None                                                                                                   |
| 12998         | Physics 224                                     | PP Physics 114, 144  
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P Physics 254               |
| 12998         | Physics 344                                     | P Mathematics 214 or Applied Mathematics 214 or Physics 224                                             |
| 12998         | Physics 352                                     | P Physics 254, 334                                                                                      |
| 12998         | Physics 372                                     | None                                                                                                   |
| 12998         | Physics 384                                     | C Physics 342, 352 or 372                                                                               |
| 13080         | Physiology 114                                  | None                                                                                                   |
| 13080         | Physiology 144                                  | P Physiology 114                                                                                       |
| 13080         | Physiology 214                                  | For the Human Life Sciences programme, and the interdisciplinary stream Applied Medicinal Chemistry:  
P Biology 124, 154  
C Biochemistry 214  
For the interdisciplinary stream Biomedical Mathematical Sciences:  
P Biology 124  
C Biochemistry 214 |
| 13080         | Physiology 244                                  | P Physiology 214  
C Biochemistry 244                                                                                   |
<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Name</th>
<th>Prerequisite pass (PP), prerequisite (P) or corequisite (C) modules</th>
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<tr>
<td>13080</td>
<td>Physiology 314</td>
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<tr>
<td>13080</td>
<td>Physiology 314</td>
<td>PP Physiology 214, 244 P Biochemistry 214, 244</td>
</tr>
</tbody>
</table>

8. Rules for the Dean's Concession Examinations

8.1 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 8.2, 8.3 and 8.4 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 have been registered for the module(s) concerned in the specific year and that you must have obtained a final mark of at least 35% in the(se) module(s).

8.2 Such students shall be identified by the faculty administrator, 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 administrator 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.

8.3 If the student fails the module in the DCE, no further DCE shall be granted.
8.4 DCEs in modules subject to flexible assessment shall be taken at the same time as referred to in Paragraph 8.2 above, subject to the procedures laid down in Paragraph 8.2 above.

8.5 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.

8.6 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.

8.7 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 administrator.

8.8 Dean’s concession examinations are conducted on a date and at a time determined by the Dean and as arranged by the particular department that allows the DCE.
**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 at 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;
- For degree programmes in the Biological Sciences and Physical Sciences, a final mark of 50% (4) for Physical Sciences;
- For degree programmes in the Mathematical Sciences when you choose Chemistry and/or Physics, a final mark of 50% (4) for Physical Sciences;
- 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 (NBTs), 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, please 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% and 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.
*See the table with programme specific minimum requirements for admission to the BSc (Extended Degree Programmes) in the back of this Calendar part.

The Faculty of Science selects a limited number of students for the extended BSc programmes and preference is given to socio-economically disadvantaged South African 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. Please note 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 with prior tertiary learning
If you have already completed applicable modules before enrolling for a BSc programme at the Faculty of Science, you may apply for the modules that you have completed to be recognised in the place of modules in the relevant BSc programme. Your application will be considered by the Academic Committee, for recognition of prior learning (RPL/CAT). The Faculty Administrator will give you written feedback. Refer to the document “RPL/CAT Procedures for the Faculty of Science” for details. Contact the Faculty Administrator for access to the document.
- Please note: Only credits completed in the preceding five years are normally considered to be transferable.
- Recognition will be granted per module (in other words, recognition is not granted for parts of modules) and is subjected to the curriculum, outcomes and credits of the completed module which must largely meet or exceed the requirements of the corresponding module within the programme you want to follow.

To obtain a BSc degree at the Faculty of Science with recognition for modules from other programmes or institutions, 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 register for the specific degree programme for at least two academic years at the Faculty of Science, 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 the Faculty of Science, Stellenbosch University.
- The content and outcomes of the modules that you are asking recognition for, must be included in the application.
1.6.1 Applicants from other programmes; or with a qualification obtained at Stellenbosch University

1.6.1.1 This section applies to you if you began your studies in another programme at Stellenbosch University and want to change to a BSc programme at the Faculty of Science.

Admission requirements

To change in the middle of an academic year

- You must meet the admission requirements, as well as the selection threshold mark as applied in that specific year (also applicable to applicants without any prior tertiary learning). (See Section 1.2 above.)
- You must be in a position to comply with the Faculty of Science specific minimum HEMIS credit requirements at the end of the year of the planned change. These credits must be obtained by following modules that are prescribed in the curriculum of the programme to which you plan to change.
- The following will be taken into consideration, where applicable:
  - Marks achieved for Mathematics 114 and 144, or Engineering Mathematics 115 and 145 for admission to programmes in the Physical or Mathematical Sciences; or
  - Marks achieved in Mathematics Bio 124, Physics Bio 134,154 and Chemistry 124,144 (or Mathematics 114, 144 and Physics 114, 144) for admission to programmes in the Biological Sciences.
- If you performed poorly in general in a previous degree programme, you will normally not be admitted for a degree programme at the Faculty of Science.
- Transferring module credits already obtained in another programme will be evaluated on an individual basis.

Admission requirements

To change at the beginning of an academic year

- You must meet the admission requirements that also apply to applicants without any prior tertiary learning. (See Section 1.2 above.)
- You must be in a position to comply with the Faculty of Science specific minimum HEMIS credit requirements.
- The following will be taken into consideration, where applicable:
  - Marks achieved for Mathematics 114 and 144, or Engineering Mathematics 115 and 145 for admission to programmes in the Physical or Mathematical Sciences; or
  - Marks achieved in Mathematics Bio 124, Physics Bio 134, 154 and Chemistry 124, 144 for admission to programmes in the Biological Sciences.
- If you performed poorly in general in a previous degree programme, you will normally not be admitted for a degree programme at the Faculty of Science.
- Transferring module credits already obtained in another programme will be evaluated on an individual basis.

Application procedure

Contact the Academic Coordinator for more information on the application procedure. The application will serve at the Faculty’s Academic Committee, chaired by the Vice-dean: Teaching and Learning.

1.6.1.2 This section applies to you if you obtained a qualification at Stellenbosch University and want to enrol for a BSc programme at the Faculty of Science

Admission requirements

- You must meet the admission requirements that also apply to applicants without any prior tertiary learning. (See Section 1.2 above.)
- If you have completed a previous degree programme in more than the minimum duration + 1 year, or performed poorly in general, you will normally not be admitted for a degree programme at the Faculty of Science.

Application procedure

Contact the Faculty Administrator for more information on the application procedures.

1.6.2 Applicants from programmes; or with qualifications obtained from other universities in South Africa

1.6.2.1 This section applies to you if you began your studies at another university but want to continue your studies in a BSc programme at Stellenbosch University (SU). A minimum of two years registration at SU is required to obtain a degree from SU.

Admission requirements

To be admitted to a BSc degree programme on the basis of your prior studies at another university, you must meet the following requirements:

- You must meet the minimum admission requirements that also apply to applicants without any prior tertiary learning (See Section 2.1 above.); or
- If you do not meet the admission requirements you may apply for admission based on prior learning. See Section 1.6 above and refer to the document “RPL/CAT Procedures for the Faculty of Science” for more details relating to RPL/CAT. Contact the Faculty Administrator to request access to this document.
- You must meet the requirements to continue with your studies at the university where you have studied before, or where you are studying at the time of your application.
• If you performed poorly in a previous degree programme in general, you will normally not be admitted to for a degree at the Faculty of Science.

Application procedure
Complete the online application form for undergraduate students on maties.com before **30 June** of the year preceding your planned BSc studies at Stellenbosch University. The status of the application will be available on your profile on maties.com by the end of September of the application year.

Your application must include:
- the compulsory application documents as required when applying on maties.com;
- an official copy of your complete previous academic record; and
- the content and outcomes of the modules that you are asking recognition for.

Your application will be considered by the Academic Committee of the Faculty. If you are admitted to a BSc programme, the committee will also decide which of those modules that you have already completed can be recognised in the place of modules in the BSc programme. Also see Section 1.6 above on how to obtain recognition for modules. The Faculty Administrator will give you written feedback.

1.6.2.2 This section applies to you if you **have obtained a qualification at another university in South Africa** and want to enrol for a BSc programme at the Faculty of Science, Stellenbosch University (SU). A minimum of two years registration at SU is required to obtain a degree from SU.

Admission requirements
To be admitted to a BSc degree programme on the basis of your prior studies at another university, you must meet the following requirements:
- You must meet the admission requirements that also apply to applicants without any prior tertiary learning (See Section 1.2 above); or
- if you do not meet the admission requirements you may apply for admission based on prior learning. See Section 6.1 above and refer to the document “RPL/CAT Procedures for the Faculty of Science” for more details relating to RPL/CAT. Contact the Faculty Administrator to request access to this document.
- If you have completed a degree programme in more than the minimum duration + 1 year, or performed poorly in general, you will normally not be admitted to for a degree at the Faculty of Science.

Application procedure
Complete the online application form for undergraduate students on maties.com before **30 June** of the year preceding your planned BSc studies at Stellenbosch University. The status of the application will be available on your profile on maties.com by the end of September of the application year.

Your application must include:
- the compulsory application documents as required when applying on maties.com;
- an official copy of your complete previous academic record; and
- the content and outcomes of the modules that you are asking recognition for.

Your application will be considered by the Academic Committee of the Faculty. If you are admitted to a BSc programme, the committee will also decide which of those modules that you have already completed can be recognised in the place of modules in the BSc programme. Also see Section 1.6 above on how to obtain recognition for modules. The Faculty Administrator will give you written feedback.

1.6.3 Applicants from universities outside of South Africa
If you have studied at a university outside of South Africa and want recognition for qualifications or modules from that university, you must:
- Complete the online application for undergraduate students on maties.com before **30 June** of the year preceding your planned BSc studies at Stellenbosch University. The status of the application will be available on your profile on maties.com by the end of September of the application year.
- Your application must include:
  - the compulsory application documents as required when applying;
  - your complete academic record; and
  - the content and outcomes of the modules that you are asking recognition for.

Admission requirements
To be admitted to a BSc degree programme on the basis of your prior studies at another university, you must meet the following requirements:
- You must meet the minimum admission requirements that also apply to applicants without any prior tertiary learning (See Section 1.2 above); or
- if you do not meet the admission requirements you may apply for admission based on prior learning. See Section 1.6 above and refer to the document “RPL/CAT Procedures for the Faculty of Science” for more details relating to RPL/CAT. Contact the Faculty Administrator to request access to this document.
- In the case of an incomplete qualification, you must meet the requirements to continue with your studies at the university where you have studied before, or where you are studying at the time of your application.
- If you have completed a previous degree programme in more than the minimum duration + 1 year, or performed poorly in general, you will normally not be admitted for a degree programme at the Faculty of Science.
Your application will be considered by the Academic Committee of the Faculty. If you are admitted to a BSc programme the committee will also decide which of those modules that you have already completed can be recognised in the place of modules in the BSc programme. Also see Section 1.6 above on how to obtain recognition for modules. The International Office will assist with the assessment of foreign qualifications and prior learning. The Faculty Administrator will give you written feedback.

1.6.4 Recognition of prior learning not covered in the sections above

If you want to apply for admission based on the recognition of modules completed elsewhere, but your situation is not covered in Sections 1.6.1; 1.6.2 or 1.6.3 above, contact the Faculty Administrator for procedures for recognition of prior learning. The following details of prior learning must be included with your application:

- the name of the programme,
- a description (contents, scope and outcomes),
- the assessment criteria,
- the type of assessments,
- the accreditation of the institution, and
- when the learning was obtained.

Please note: If you leave out any of this information, your application cannot be processed. Experience in itself is not recognised; it must be learning that has been assessed in a recognised manner.

The Academic Committee of the Faculty will consider your application by comparing your education with relevant module contents, outcomes and credits. The committee can:

- refuse your application with relevant reasons;
- recognise certain module(s);
- recommend that you complete mainstream assessments for certain modules; and/or
- request a personal interview (which will be considered as an oral assessment). At least two academic staff members must be present during this interview.

The Faculty Administrator will give you written feedback

1.7 Summary of undergraduate programmes and admission requirements per programme

The curricula or combination of subjects that you can take for a 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 two diagrams below offer a representation of the programmes and streams for a BSc degree. The nine degree programmes are grouped together in three main directions, namely the Biological, Physical and Mathematical Sciences. We also offer a tenth degree programme, comprising three streams, leading to interdisciplinary postgraduate options. The various programmes and their additional streams, where applicable, are set out in the blocks under the Biological, Physical and Mathematical Sciences, and the Interdisciplinary Offering.
The Faculty's Programmes and Streams

Biological Sciences
- BSc Biodiversity and Ecology
- BSc Molecular Biology and Biotechnology
- BSc Human Life Sciences
  - Biology
  - Biology with Psychology
- BSc Sport Science

Physical Sciences
- BSc Chemistry
  - Chemistry and Polymer Science
  - Chemical Biology
  - Materials Technology
- BSc Physics
  - Laser Physics (Physical), Nuclear Physics, Radiation and Health Physics
  - Laser Physics (Biological)
  - Theoretical Physics
- BSc Earth Science
  - Applied Earth Science
  - Geo-environmental Science
- BSc GeoInformatics
### The Faculty's Programmes and Streams

#### Mathematical Sciences

**BSc Mathematical Sciences**
- Financial Mathematics
- Applied Mathematics
- Mathematics
- Mathematical Statistics
- Operations Research
- Abstract Mathematics
- Biomathematics
  - Molecular Biology
  - Ecology

**BSc Computer Science**
- General Computer Science
- Computer Systems
- Data Science
- Computer Science with Genetics as second major
- Computer Science with Geographical Information Technology as second major

#### Interdisciplinary offering

**BSc**
- Biomedical Mathematical Sciences
- Applied Medicinal Chemistry
- Bioinformatics and Computational Biology

**BDatSci (Interfaculty)**
The four 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

<table>
<thead>
<tr>
<th>Programmes, streams in programmes and first-year curriculum</th>
<th>Admission requirements</th>
</tr>
</thead>
</table>
| **Biodiversity and Ecology**  
*(Curriculum 1)* | An average final mark of 65%, excluding Life Orientation  
Afrikaans or English  
(Home Language or First Additional Language) 4 |
| **Molecular Biology and Biotechnology**  
*(Curriculum 1, or adapted curriculum 3)* | Physical Sciences 4 |
| **Human Life Sciences**  
1. Stream: Biology  
*(Curriculum 1, or adapted curriculum 3)*  
2. Stream: Biology with Psychology  
*(Curriculum 2)* | 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) |
| **Sport Science**  
*(Curriculum specific to programme)* | |

### Physical Sciences

<table>
<thead>
<tr>
<th>Programmes, streams in programmes and first-year curriculum</th>
<th>Admission requirements</th>
</tr>
</thead>
</table>
| **Chemistry**  
1. Stream: Chemistry and Polymer Science  
*(Curriculum 3, or 4, or 5, or 6)*  
2. Stream: Chemical Biology  
*(Curriculum 3)*  
3. Stream: Materials Technology  
*(Curriculum 3, or 5, or 6)* | An average final mark of 65%, excluding Life Orientation  
Afrikaans or English  
(Home Language or First Additional Language) 4  
Physical Sciences 4  
Mathematics 6 |
| **Physics**  
1. Streams: Laser Physics (Physical), Nuclear Physics,  
Radiation and Health Physics  
*(Curriculum 5, or 6, or 7)*  
2. Stream: Laser Physics (Biological)  
*(Curriculum 3)*  
3. Stream: Theoretical Physics  
*(Curriculum 7)* | |
| **Earth Science**  
*(Curriculum specific to streams)*  
2. Stream: Geo-environmental Science | An average final mark of 65%, excluding Life Orientation  
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) |
| **GeoInformatics**  
*(Curriculum specific to programme)* | |
## Mathematical Sciences

<table>
<thead>
<tr>
<th>Programme, streams in the programme and first-year curriculum</th>
<th>Admission requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Sciences</td>
<td>An average final mark of 65%, excluding Life Orientation</td>
</tr>
</tbody>
</table>
(Curriculum specific to programme) | Afrikaans or English  
(Home Language or First Additional Language) 4 |
| 2. Stream: Applied Mathematics  
(Curriculum specific to programme) | Mathematics 6 |
| 3. Stream: Mathematics  
(Curriculum specific to programme) | Any other school subject from the designated subject list for university admission 4 |
| 4. Stream: Mathematical Statistics  
(Curriculum specific to programme) | OR |
| 5. Stream: Operations Research  
(Curriculum specific to programme) | Physical Sciences 4  
(If you will be taking Physics or Chemistry) |
(Curriculum specific to programme) | |
| 7. Stream: Biomathematics | An average final mark of 65%, excluding Life Orientation |
| 7.1 Option 1: Molecular Biology  
(Curriculum specific to programme) | Afrikaans or English  
(Home Language or First Additional Language) 4 |
| 7.2 Option 2: Ecology  
(Curriculum specific to programme) | Physical Sciences 4  
Mathematics 6 |

<table>
<thead>
<tr>
<th>Computer Science</th>
<th>An average final mark of 65%, excluding Life Orientation</th>
</tr>
</thead>
</table>
| 1. Stream: General Computer Science  
(Curriculum specific to programme) | Afrikaans or English  
(Home Language or First Additional Language) 4 |
| 2. Stream: Computer Systems  
(Curriculum specific to programme) | Mathematics 6 |
| 3. Stream: Data Science  
(Curriculum specific to programme) | Any other school subject from the designated subject list for university admission 4 |
| 4. Stream: Computer Science with Genetics as second major  
(Curriculum specific to programme) | OR |
| 5. Stream: Computer Science with Geographical Information Technology as second major  
(Curriculum specific to programme) | Physical Sciences 4  
(If you will be taking Physics or Chemistry) |

## Interdisciplinary Offering

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<thead>
<tr>
<th>Programme, streams in the programme and first-year curriculum</th>
<th>Admission requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary BSc Offering</td>
<td>An average final mark of 65%, excluding Life Orientation</td>
</tr>
</tbody>
</table>
| 1. Stream: Biomedical Mathematical Sciences  
(Curriculum specific to programme) | Afrikaans or English  
(Home Language or First Additional Language) 4 |
| 2. Stream: Applied Medicinal Chemistry  
(Curriculum specific to programme) | Physical Sciences 4  
Mathematics 6 |
| 3. Stream: Bioinformatics and Computational Biology  
(Curriculum specific to programme) | |

<table>
<thead>
<tr>
<th>BDatSci (Interfaculty)</th>
<th>An average final mark of 80%, excluding Life Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 80%</td>
<td>One of the following:</td>
</tr>
<tr>
<td>Afrikaans Home Language 60% or</td>
<td></td>
</tr>
<tr>
<td>English Home Language 60% or</td>
<td></td>
</tr>
<tr>
<td>Afrikaans First Additional Language 75% or</td>
<td></td>
</tr>
<tr>
<td>English First Additional Language 75%</td>
<td></td>
</tr>
</tbody>
</table>
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, generally leading to 2 majors making provision for at least 2 postgraduate options. The remaining 2 standard modules may 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 a 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.

<table>
<thead>
<tr>
<th>Curriculum 1 (credits = 140)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
</tr>
<tr>
<td>Chemistry</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
</tr>
<tr>
<td>Science in Context</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Curriculum 2 (credits = 148)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
</tr>
<tr>
<td>Chemistry</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
</tr>
<tr>
<td>Psychology</td>
</tr>
<tr>
<td>Science in Context</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Curriculum 3 (credits = 140)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
</tr>
<tr>
<td>Chemistry</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Physics</td>
</tr>
<tr>
<td>Science in Context</td>
</tr>
</tbody>
</table>
Curriculum 4 (credits = 140)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

Curriculum 5 (credits = 140)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

Curriculum 6 (credits = 140)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

Curriculum 7 (credits = 140)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

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

Year 1 (146 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>146(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>176(32)</td>
</tr>
<tr>
<td>Computer Skills</td>
<td>176(8)</td>
</tr>
<tr>
<td>Physics</td>
<td>176(32)</td>
</tr>
<tr>
<td>Scientific Communication Skills</td>
<td>116(12), 146(6)</td>
</tr>
<tr>
<td>University Practice in the Natural Science</td>
<td>176(8)</td>
</tr>
</tbody>
</table>

and

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics (Bio)</td>
<td>176(32) OR</td>
</tr>
<tr>
<td>Mathematics</td>
<td>186(32)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Curriculum 1</th>
<th>124(16), 144(16), 154(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (128 credits)

Compulsory Modules (credits = 96)

<table>
<thead>
<tr>
<th>Biodiversity and Ecology</th>
<th>212(16), 214(16), 224(16), 244(16), 254(16), 264(16)</th>
</tr>
</thead>
</table>

plus

Elective Modules (credits = 32)

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

<table>
<thead>
<tr>
<th>Biochemistry</th>
<th>214(16), 244(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Biodiversity and Ecology</th>
<th>315(16), 324(16), 334(16), 344(16), 345(16), 354(16), 364(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation Ecology</td>
<td>314(16)</td>
</tr>
</tbody>
</table>

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
Third-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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**or**

### Adapted Curriculum 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (144 credits)

**Compulsory Modules**

(credits = 128)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biometry</td>
<td>212(8), 242(8)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16), 245(16)</td>
</tr>
<tr>
<td>Microbiology</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

**plus**

### Elective Modules

(credits = 16)

Choose one of the following two modules.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>214(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>215(16)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3rd year (128 credits)

**Compulsory Modules**

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

**Major subject 1**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>315(16), 323(8), 345(16), 365(16) AND</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

Adapted Curriculum 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science In Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (144 credits)

Compulsory Modules
(credits = 112)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biometry</td>
<td>212(8), 242(8)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 32)
Choose one of the following subjects. You must take both modules of your chosen subject.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Microbiology</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

A maximum of 30 students will be selected on merit for Anatomy 214 and 244. To be considered, you must obtain an average of 60% for the first year, with 60% for Biology 124 and 154, respectively.

The Faculty of Medicine and Health Sciences may however decide not to select any students in a particular year.
3rd year (128 credits)

Compulsory Modules
(credits = 64)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiology</td>
<td>314(16), 334(16), 344(16), 364(16)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 64)

Choose one of the following subject options: Anatomy; or Biochemistry and Bioinformatics; or Genetics. You must take all the modules of your chosen subject option.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>314(16), 324(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>315(16), 323(8), 345(16), 365(16) AND 312(8)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
<tr>
<td>Genetics</td>
<td>314(16), 324(16), 344(16), 354(16)</td>
</tr>
</tbody>
</table>

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, Genetics or Psychology.

For more information on admission to the honours programme in Physiological Sciences, please consult the relevant honours programme’s details in the chapter “Postgraduate Programmes” of this Calendar part. For more information on admission to the honours programme in Psychology, please consult the Faculty of Arts and Social Sciences Calendar, Part 4.

1st year (148 credits)

Compulsory Modules

Curriculum 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
<tr>
<td>Psychology</td>
<td>114(12), 144(12)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (136 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biometry</td>
<td>212(8), 242(8)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Psychology</td>
<td>213(8), 223(8), 243(8)</td>
</tr>
</tbody>
</table>

3rd year (144 credits)

Compulsory Modules

Choose one of the following two options.

Option 1

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics</td>
<td>314(16), 344(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>314(16), 334(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Psychology</td>
<td>314(12), 324(12), 348(24)</td>
</tr>
</tbody>
</table>

or

Option 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics</td>
<td>314(16), 324(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>314(16), 364(16)</td>
</tr>
<tr>
<td>Psychology</td>
<td>314(12), 324(12), 348(24)</td>
</tr>
</tbody>
</table>
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 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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Kinesiology</td>
<td>162(8), 182(8)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Movement Education, Sport and Recreation</td>
<td>212(8), 222(8), 242(8), 282(8)</td>
</tr>
<tr>
<td>Physiology</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Sport Science</td>
<td>222(8), 232(8), 252(8), 262(8)</td>
</tr>
</tbody>
</table>

3rd year (134 credits)

Compulsory Modules (credits = 110)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kinesiology</td>
<td>312(8), 332(8), 342(8), 352(8), 372(8)</td>
</tr>
<tr>
<td>Physiology</td>
<td>314(16), 334(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Sport Science</td>
<td>382(6)</td>
</tr>
</tbody>
</table>

plus

Elective Modules (credits = 24)

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

- Applied Kinesiology (Adapted Physical Activity) 324(12), 344(12)
- Applied Kinesiology (Sport Coaching) 313(12), 353(12)
- 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 Materials Technology.

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16) or 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

Curriculum 4

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

Curriculum 5

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

Curriculum 6

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)

Compulsory Modules

(credits = 69)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>214(16), 234(16), 254(16), 264(16)</td>
</tr>
</tbody>
</table>

plus
Science

**Computer Skills** 272(5)

**or**

**Scientific Computing** 272(5)

**plus**

**Elective Modules**

(credits = 64)

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Environmental Geochemistry</td>
<td>214(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Geology</td>
<td>224(16), 244(16), 254(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16), 278(32)</td>
</tr>
<tr>
<td>Microbiology</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
<tr>
<td>Textile Science</td>
<td>254(16)</td>
</tr>
</tbody>
</table>

**3rd year (133 credits)**

**Compulsory Modules**

(credits = 69)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>314(16), 324(16), 344(16), 364(16)</td>
</tr>
</tbody>
</table>

*plus*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Skills</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

*or*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

**Elective Modules**

(credits = 64)

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

If you take Applied Chemistry (recommended), then you must take both modules, and choose only two modules of a second subject. If you do not take Applied Chemistry, you must take all modules of your chosen subject.

**Please note:** Some of the following elective modules 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.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Chemistry</td>
<td>315(16), 324(16), 345(16)</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Environmental Geochemistry</td>
<td>314(16)</td>
</tr>
<tr>
<td>Geology</td>
<td>324(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 344(16), 365(16), 378(32)</td>
</tr>
<tr>
<td>Microbiology</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 352(8), 384(16)</td>
</tr>
</tbody>
</table>

**Please note:** Timetable clashes

- Applied Mathematics 324, 354 clash with Chemistry 314, 344
- Computer Science 314, 344 clash with Chemistry 324, 364
- Geology 314, 344 clash with Chemistry 324, 364

**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

<table>
<thead>
<tr>
<th>Curriculum 3</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16) or 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)

Compulsory Modules

| Biochemistry                          | 214(16), 244(16) |
| Chemistry                             | 214(16), 234(16), 254(16), 264(16) |
| Microbiology                          | 214(16), 244(16) |

plus

- Computer Skills                      | 272(5) |
- Scientific Computing                 | 272(5) |

3rd year (133 credits)

Compulsory Modules

| Biochemistry                          | 315(16), 323(8), 345(16), 365(16) |
| Bioinformatics                        | 312(8) |
| Chemistry                             | 314(16), 324(16), 344(16), 364(16) |

plus

- Computer Skills                      | 372(5) |
- Scientific Computing                 | 372(5) |

4.2.1.3 Stream: Materials Technology

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 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) or 154(16) |
| Chemistry                             | 124(16), 144(16) |
| Mathematics                           | 114(16), 144(16) |
| Physics                               | 114(16), 144(16) |
| Science in Context                    | 178(12) |
### Curriculum 5

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**or**

### Curriculum 6

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

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

**Special Provision**
It is expected that you gain at least two weeks’ practical experience in the textile, chemicals or related industry during the holidays in your second or third year.

**Compulsory Modules**
(credits = 85)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>214(16), 234(16), 254(16), 264(16)</td>
</tr>
<tr>
<td>Textile Science</td>
<td>254(16)</td>
</tr>
</tbody>
</table>

**plus**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Skills</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

**or**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**
(credits = minimum 48, maximum 52)
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.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12), 144(12) AND 113(12)</td>
</tr>
<tr>
<td>Business Management</td>
<td>113(12)</td>
</tr>
<tr>
<td>Microbiology</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

### 3rd year (133 credits)

**Special Provision**
It is expected that you gain at least two weeks’ practical experience in the textile, chemicals or related industry during the holidays in your second or third year.

**Compulsory Modules**
(credits = 117)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Chemistry</td>
<td>324(16), 344(16), 315(16), 345(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>314(16), 324(16), 344(16), 364(16)</td>
</tr>
</tbody>
</table>

**plus**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Skills</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

**or**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>
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
Third-year module study possibilities lead to the following:
- All Options: 1, 2 and 3 modules lead to an honours programme in Physics (including Theoretical Physics) and to an honours programme in Physical and Mathematical Analysis.
- Option 1 modules also lead to an honours programme in Chemistry, Applied Mathematics or Mathematics (including Abstract Mathematics).
- Option 3 modules, with the applicable elective modules, also lead to an honours programme in Computer 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 5

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

Curriculum 6

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

Curriculum 7

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)
Compulsory Modules
(credits = 69)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>
**Elective Modules**

(credits = 64)

Choose modules to the value of 64 credits from the following list, depending on the first-year curriculum you followed. Your choice depends on there being no timetable clashes. Also take into consideration the additional major subject modules that you will be taking in your third year.

<table>
<thead>
<tr>
<th>Applied Mathematics</th>
<th>214(16), 244(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>214(16), 234(16), 254(16), 264(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
</tbody>
</table>

**3rd year**

You can choose from the following three options:

**Option 1: (133 credits)**

*Compulsory Modules*

(credits = 69)

<table>
<thead>
<tr>
<th>Physics</th>
<th>314(16), 334(16), 342(8), 352(8), 384(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus

*Elective Modules*

(credits = 64)

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

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

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

- **Mathematics**
  
  324(16)

- **Mathematics**
  
  324(16) OR 325(16), 365(16), 378(32)

**Option 2: (minimum 133, maximum 141 credits)**

*Compulsory Modules*

(credits = 101)

<table>
<thead>
<tr>
<th>Applied Mathematics</th>
<th>364(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 344(16), 352(8), 384(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus

*Elective Modules*

(credits = minimum 32, maximum 40)

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

<table>
<thead>
<tr>
<th>Applied Mathematics</th>
<th>324(16), 354(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>324(16), 325(16), 378(32)</td>
</tr>
<tr>
<td>Physics</td>
<td>372(8)</td>
</tr>
</tbody>
</table>

**Option 3: (minimum 133, maximum 165 credits)**

*Compulsory Modules*

(credits 117)

<table>
<thead>
<tr>
<th>Computer Science</th>
<th>314(16), 334(16), 344(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 352(8), 344(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus
**Elective Modules**

*(credits = minimum 16, maximum 48)*

Choose modules to a minimum value of 16 credits and a maximum value of 48 credits from the list below.

<table>
<thead>
<tr>
<th>Applied Mathematics</th>
<th>324(16), 364(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>354(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>384(16)</td>
</tr>
</tbody>
</table>

### 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 (all elective options).
- It also leads to an honours programme in Biochemistry (elective option 4 in 3rd year).

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**

<table>
<thead>
<tr>
<th>Biology</th>
<th>124(16), 144(16) or 154(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

### 2nd year (133 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Biochemistry</th>
<th>214(16), 244(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>214(16), 264(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

### 3rd year (133 credits)

**Compulsory Modules**

*(credits = 85)*

<table>
<thead>
<tr>
<th>Biochemistry</th>
<th>315(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 352(8), 384(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**

*(credits = 48)*

Choose one of the following options.

**Option 1**

<table>
<thead>
<tr>
<th>Applied Mathematics</th>
<th>364(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>323(8)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>314(16) or 344(16)</td>
</tr>
</tbody>
</table>
Option 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>323(8)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>314(16), 344(16)</td>
</tr>
</tbody>
</table>

or

Option 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>364(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

or

Option 4

If you choose option 4, you need to liaise with the Department of Physics to reschedule Physics 384 practicals in first semester to accommodate timetable clash with Biochemistry 323 and Bioinformatics 312; and to reschedule Physics 342 and 352 tutorials in the second semester to accommodate timetable clash with Biochemistry 345 tutorial.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>323(8), 345(16), 365(16)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)

Compulsory Modules

(credits = 69)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

plus

Elective Modules

(credits = 64)

Choose modules to the value of 64 credits from the following list, depending on the elective modules you took in your first year.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
</tbody>
</table>
3rd year (133 credits)

Compulsory Modules
(credits = 101)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>324(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 344(16), 352(8) OR 372(8)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 32)

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>324(16), 354(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>314(16), 315(16), 334(16), 344(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 325(16), 344(16), 378(32)</td>
</tr>
<tr>
<td>Physics</td>
<td>384(16)</td>
</tr>
</tbody>
</table>

4.2.3 Earth Science

This programme consists of two streams, namely Applied Earth Science; and Geo-environmental Science.

4.2.3.1 Stream: Applied 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
(84 credits)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Earth Science Field Skills</td>
<td>172(8)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(64 credits)

Choose one of the following three subject combinations.

Subject Combination 1

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>

or

Subject Combination 2

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
</tbody>
</table>

or
Subject Combination 3

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>114(16), 144(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)

Compulsory Modules (credits = 117)

<table>
<thead>
<tr>
<th>Computer Skills</th>
<th>272(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Science Field Skills</td>
<td>272(16)</td>
</tr>
<tr>
<td>Environmental Geochemistry</td>
<td>214(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>214(16), 241(16)</td>
</tr>
<tr>
<td>Geology</td>
<td>224(16), 244(16), 254(16)</td>
</tr>
</tbody>
</table>

plus

Elective Modules (credits = 16)

Choose a module to the value of 16 credits from the subjects below.

<table>
<thead>
<tr>
<th>Chemistry</th>
<th>234(16), 264(16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical Information Technology</td>
<td>211(16)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

Compulsory Modules (credits = 101)

<table>
<thead>
<tr>
<th>Computer Skills</th>
<th>372(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth Science Field Skills</td>
<td>374(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>312(16)</td>
</tr>
<tr>
<td>Geology</td>
<td>314(16), 324(16), 344(16), 354(16)</td>
</tr>
</tbody>
</table>

plus

Elective Modules (credits = 32)

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

| Geographical Information Technology | 311(16), 341(16) |
| Geology                            | 364(16)   |
| Soil Science                       | 214(16)   |

4.2.3.2 Stream: Geo-environmental 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 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 (148 credits)

Compulsory Modules
(credits = 84)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Earth Science Field Skills</td>
<td>172(8)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 64)

Choose one of the following three subject combinations.

Subject Combination 1

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>

or

Subject Combination 2

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
</tbody>
</table>

or

Subject Combination 3

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
</tbody>
</table>

2nd year (141 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>234(16), 264(16)</td>
</tr>
<tr>
<td>Computer Skills</td>
<td>272(5)</td>
</tr>
<tr>
<td>Environmental Field Skills</td>
<td>271(8)</td>
</tr>
<tr>
<td>Environmental Geochemistry</td>
<td>214(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>214(16), 241(16)</td>
</tr>
<tr>
<td>Geography and Environmental Studies</td>
<td>265(16)</td>
</tr>
<tr>
<td>Geology</td>
<td>224(16), 244(16)</td>
</tr>
</tbody>
</table>

3rd year (141 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Skills</td>
<td>372(5)</td>
</tr>
<tr>
<td>Environmental Field Skills</td>
<td>372(8)</td>
</tr>
<tr>
<td>Environmental Geochemistry</td>
<td>314(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>312(16), 341(16)</td>
</tr>
<tr>
<td>Geography and Environmental Studies</td>
<td>334(16), 358(16)</td>
</tr>
<tr>
<td>Geology</td>
<td>324(16), 344(16), 364(16)</td>
</tr>
</tbody>
</table>

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 a BScHons programme in Computer Science or a BComHons programme in Information Systems Management (Faculty of Economic and Management 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 the relevant Calendar part.

1st year (140 credits)

Compulsory Modules
(44 credits)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(96 credits)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Biology</td>
<td>124(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics (Bio)</td>
<td>124(16)</td>
</tr>
<tr>
<td>Physics (Bio)</td>
<td>134(16), 154(16)</td>
</tr>
</tbody>
</table>

2nd year (minimum 127, maximum 135 credits)

Compulsory Modules
(credits = 95)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical Information Technology</td>
<td>211(16), 214(16), 241(16), 242(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
<tr>
<td>Socio-informatics</td>
<td>262(8)</td>
</tr>
<tr>
<td>Statistics and Data Science</td>
<td>188(18)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = minimum 32, maximum 40)

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>Socio-informatics</td>
<td>212(8), 224(16), 254(16)</td>
</tr>
</tbody>
</table>

3rd year (minimum 133, maximum 141 credits)

Compulsory Modules
(credits = 69)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical Information Technology</td>
<td>311(16), 312(16), 341(16), 342(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = minimum 64, maximum 72)

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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Socio-informatics</td>
<td>314(18), 334(18), 354(18), 364(18)</td>
</tr>
</tbody>
</table>
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 (minimum 124, maximum 140 credits)

Compulsory Modules

(credits = 124)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Science</td>
<td>112(8)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12), 144(12)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

plus

Elective Modules

(credits = 16)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>154(16)</td>
</tr>
</tbody>
</table>

2nd year (minimum 125, maximum 141 credits)

Compulsory Modules

(credits = 109)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Science</td>
<td>211(18)</td>
</tr>
<tr>
<td>Financial Risk Management</td>
<td>212(8), 242(8), 252(6)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

plus

Elective Modules

(credits = minimum 16, maximum 32)

Choose modules to a minimum value of 16 credits or a maximum value of 32 credits from the list below. Your choice depends on there being no timetable clashes.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

Compulsory Modules

(credits = 85)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Mathematics</td>
<td>378(32)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>324(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus
Elective Modules
(credits = 48)

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

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>314(16), 344(16), 365(16)</th>
</tr>
</thead>
</table>

or

If you choose Mathematical Statistics, you must choose another elective module of your choice to the value of 16 credits. Your choice depends on there being no timetable clashes.

<table>
<thead>
<tr>
<th>Mathematical Statistics</th>
<th>344(16), 364(16)</th>
</tr>
</thead>
</table>

4.3.2 Stream: Computer Science

Please note:

A new programme, BSc in Computer Science, will be offered from 2022. This new programme will replace the Computer Science stream (and its three options) in the BSc Mathematical Sciences programme. Current students in this stream may submit a request to the Academic Committee (http://bit.ly/AcademicRequest) to change his/her registered programme to BSc Computer Science. The latter may result in an additional academic year to incorporate compulsory modules.

Continued Study Possibilities

- This stream leads to an honours programme in Computer Science.
- If applicable elective modules from the stated options are taken, this stream also leads to honours programmes in Applied Mathematics, Economics, Genetics, Geographical Information Technology, Mathematics, Mathematical Statistics 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.

4.3.2.1 Option 1: Computer Science (excluding Genetics or Geographical Information Technology as second major)

2nd year (minimum 133, maximum 149 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 = minimum 64, maximum 80)

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), 245(8), 246(8)   |
| Mathematics                  | 214(16), 244(16)          |
| Operations Research          | 214(16), 244(16)          |
| Physics                      | 224(16), 254(16)          |

You may choose additional modules to a maximum value of 48 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.

| Chemistry                    | 234(16), 254(16)          |
| Economics                    | 214(16), 244(16)          |
| General Linguistics          | 278(32)                   |
| Mathematics                  | 278(32)                   |
| Music Technology             | 222(8), 252(8)            |
3rd year (133 credits)

Compulsory Modules
(credits = 69)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>324(16), 364(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>315(16), 345(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>318(24), 348(24)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>318(24), 348(24)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 325(16), 344(16), 345(16), 365(16), 378(32)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>379(48)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>314(16), 322(16), 344(16), 352(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 344(16), 384(16)</td>
</tr>
</tbody>
</table>

4.3.2.2 Option 2: Computer Science with Genetics as second major

2nd year (144 credits)

Compulsory Modules
(credits = 112)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biometry</td>
<td>212(8), 242(8)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 32)

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
<tr>
<td>Genetics</td>
<td>314(16), 324(16), 344(16), 354(16)</td>
</tr>
</tbody>
</table>

4.3.2.3 Option 3: Computer Science with Geographical Information Technology as second major

2nd year (133 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>211(16), 214(16), 241(16), 242(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>
3rd year (133 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>311(16), 312(16), 341(16), 342(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16) or 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12), 144(12)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>178(24)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>154(16)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>112(6), 142(6)</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>
Elective Modules
(credits = 56 to 64)

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

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 most of the modules in the list below have prerequisite modules that are elective modules in your first year.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>234(16), 254(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>211(16), 241(16), 242(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>222(8), 252(8)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

Compulsory Modules
(credits = 69)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 64)

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>324(16), 364(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>314(16), 315(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>318(24), 348(24)</td>
</tr>
<tr>
<td>Financial Mathematics</td>
<td>378(32)</td>
</tr>
<tr>
<td>Geography and Environmental Studies</td>
<td>358(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 325(16), 344(16), 345(16), 365(16), 378(32)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>379(48)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>314(16), 322(16), 344(16), 352(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 342(8), 344(16), 352(8), 384(16)</td>
</tr>
</tbody>
</table>

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, 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)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**
(credits 88 to 96)

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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Biology</td>
<td>124(16), 144(16) OR 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16) AND 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16) AND 144(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12) AND 144(12)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>178(24)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>154(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16) AND 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)

**Compulsory Modules**
(credits = 37)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**
(credits = 96)

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

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 most of the modules in the list below have prerequisite modules that are elective modules in your first year.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>234(16), 254(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

**Compulsory Modules**
(credits = 69)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 344(16), 365(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Elective Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Biomathematics</td>
</tr>
<tr>
<td>Chemistry</td>
</tr>
<tr>
<td>Computer Science</td>
</tr>
<tr>
<td>Economics</td>
</tr>
<tr>
<td>Financial Mathematics</td>
</tr>
<tr>
<td>General Linguistics</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Operations Research</td>
</tr>
<tr>
<td>Physics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>314(16), 324(16), 354(16), 364(16)</td>
<td>64</td>
</tr>
<tr>
<td>324(16), 364(16)</td>
<td></td>
</tr>
<tr>
<td>314(16), 315(16), 334(16), 344(16), 345(16), 354(16)</td>
<td></td>
</tr>
<tr>
<td>318(24), 348(24)</td>
<td></td>
</tr>
<tr>
<td>378(32)</td>
<td></td>
</tr>
<tr>
<td>318(24), 348(24)</td>
<td></td>
</tr>
<tr>
<td>312(16), 316(16), 344(16), 364(16)</td>
<td></td>
</tr>
<tr>
<td>325(16), 345(16), 378(32)</td>
<td></td>
</tr>
<tr>
<td>322(16), 352(16)</td>
<td></td>
</tr>
<tr>
<td>314(16), 334(16), 342(8), 344(16), 352(8)</td>
<td></td>
</tr>
</tbody>
</table>

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 (minimum 132, maximum 140 credits)

Compulsory Modules
(credits = 76)

<table>
<thead>
<tr>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
</tr>
<tr>
<td>Science in Context</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>144(16)</td>
<td></td>
</tr>
<tr>
<td>114(16), 144(16)</td>
<td></td>
</tr>
<tr>
<td>114(16)</td>
<td></td>
</tr>
<tr>
<td>178(12)</td>
<td></td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = minimum 56, maximum 64)
Choose any modules from the list below to reach your required credit total. Your choice depends on there being no timetable clashes.

<table>
<thead>
<tr>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
</tr>
<tr>
<td>Chemistry</td>
</tr>
<tr>
<td>Computer Science</td>
</tr>
<tr>
<td>Economics</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
</tr>
<tr>
<td>Physics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>124(16), 144(16) OR 154(16)</td>
<td></td>
</tr>
<tr>
<td>124(16) AND 144(16)</td>
<td></td>
</tr>
<tr>
<td>114(16) AND 144(16)</td>
<td></td>
</tr>
<tr>
<td>114(12) AND 144(12)</td>
<td></td>
</tr>
<tr>
<td>154(16)</td>
<td></td>
</tr>
<tr>
<td>124(16) AND 154(16)</td>
<td></td>
</tr>
<tr>
<td>114(16) AND 144(16)</td>
<td></td>
</tr>
</tbody>
</table>
2nd year (133 credits)

**Compulsory Modules**
(credits = 69)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**
(credits = 64)

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

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 most of the modules in the list below have prerequisite modules that are elective modules in your first year.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>211(16), 214(16), 241(16), 242(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

**Compulsory Modules**
(credits = 69)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>314(16), 315(16), 334(16), 344(16), 345(16), 354(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>318(24), 348(24)</td>
</tr>
<tr>
<td>Financial Mathematics</td>
<td>378(32)</td>
</tr>
<tr>
<td>Geography and Environmental Studies</td>
<td>358(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 325(16), 344(16), 345(16), 365(16), 378(32)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>314(16), 322(16), 344(16), 352(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 344(16), 384(16)</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16) OR 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12), 144(12)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>154(16)</td>
</tr>
</tbody>
</table>

2nd year (133 credits)

**Compulsory Modules**
(credits = 37)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**
(credits = 96)

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

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 most of the modules on the list below have prerequisite modules that are elective modules in your first year.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>211(16), 214(16), 241(16), 242(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

**Compulsory Modules**
(credits = 69)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Research</td>
<td>314(16), 322(16), 344(16), 352(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Elective Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>348(24)</td>
</tr>
<tr>
<td>Financial Mathematics</td>
<td>378(32)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>378(32)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 344(16), 352(8), 384(16)</td>
</tr>
</tbody>
</table>

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
- 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, 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.

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

If you are planning to take Biochemistry, Chemistry, Genetics or Physics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16) OR 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

If you are planning to take Biochemistry, Chemistry or Genetics as second major subject, or plan a double major in Mathematics

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

If you are planning to take Chemistry, Computer Science or Physics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>
If you are planning to take Applied Mathematics, Chemistry, Mathematical Statistics or Physics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

If you are planning to take Applied Mathematics, Computer Science, Mathematical Statistics or Physics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

or

If you are planning to take Computer Science or Physics as second major subject, or plan a double major in Mathematics

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (minimum 133, maximum 144 credits)

Compulsory Modules
(credits = minimum 69, maximum 80)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16), 278(32)</td>
</tr>
</tbody>
</table>

plus

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biometry (only if you take Genetics as second major subject)</td>
<td>212(8), 242(8)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 64)

Choose modules to the value of 64 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.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>214(16), 234(16), 254(16), 264(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

3rd year (133 credits)

Compulsory Modules
(credits = 32)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>378(32)</td>
</tr>
</tbody>
</table>
Elective Modules
(credits = 101)
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 take Biochemistry as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>315(16), 323(8), 345(16), 365(16)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>325(16), 365(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

or

If you take Chemistry as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>314(16), 324(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 344(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

or

If you take Physics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>325(16), 365(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 342(8), 352(8), 384(16) OR 314(16), 334(16), 342(8), 344(16), 372(8) to specialise in Theoretical Physics.</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

or

If you take Genetics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetics</td>
<td>314(16), 324(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 344(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

or

If you take Computer Science as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 345(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

or

If you take Applied Mathematics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>324(16), 365(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

or

If you take Mathematical Statistics as second major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 345(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

or

If you take only Mathematics as major subject

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 325(16), 344(16), 345(16), 365(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

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 and 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**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**2nd year (133 credits)**

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16), 278(32)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>

**3rd year (133 credits)**

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 364(16)</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>315(16), 323(8), 345(16), 365(16)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8)</td>
</tr>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

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.

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**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**2nd year (133 credits)**

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity and Ecology</td>
<td>214(16), 264(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16), 278(32)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>272(5)</td>
</tr>
</tbody>
</table>
3rd year (133 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Biodiversity and Ecology</td>
<td>324(16), 364(16)</td>
</tr>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>344(16)</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>372(5)</td>
</tr>
</tbody>
</table>

---

**4.4 BSc programme in Computer Science**

This programme consists of five different streams, namely General Computer Science; Computer Systems; Data Science; Computer Science with Genetics as second major; and Computer Science with Geographical Information Technology as second major.

**4.4.1 Stream: General 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, General Linguistics, Mathematical Statistics, Mathematics, Operations Research, or Statistics

For more information on admission to the honours programme you are considering, please consult the specific honours programme’s details in the chapter “Postgraduate Programmes” of the relevant faculty Calendar part.

1st year (minimum 124, maximum 140 credits)

**Compulsory Modules**

*(credits = 112)*

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

**plus**

Choose one of the following modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>141(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>154(16)</td>
</tr>
</tbody>
</table>

**Elective Modules**

*(credits = minimum 16, maximum 32)*

Choose any modules from the list below to reach your required credit total. Your choice depends on there being no timetable clashes, and you having the appropriate prerequisites for the modules.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Biology</td>
<td>124(16), 144(16) or 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>141(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12), 144(12)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>178(24)</td>
</tr>
<tr>
<td>Geo-Environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>154(16)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>112(6), 142(6)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>

*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 (128 credits)

**Compulsory Modules**

**credits = 32**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**

**credits = 96**

Choose any modules from the list below to reach your required credit total. Your choice depends on there being no timetable clashes, and you having the appropriate prerequisites for the modules.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>214(16), 234(16), 254(16), 264(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>278(32)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16), 278(32)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>222(8), 252(8)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

### 3rd year (128 credits)

**Compulsory Module**

**credits = 64**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**

**credits = 64**

Choose any modules from the list below to reach your required credit total. Your choice depends on there being no timetable clashes, and you having the appropriate prerequisites for the modules.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>314(16), 324(16), 354(16), 364(16)</td>
</tr>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>344(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>315(16), 345(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>318(24), 348(24)</td>
</tr>
<tr>
<td>General Linguistics</td>
<td>318(24), 348(24)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 344(16), 345(16), 365(16), 378(32)</td>
</tr>
<tr>
<td>Music Technology</td>
<td>379(48)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>314(16), 322(16), 344(16), 352(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 344(16), 384(16)</td>
</tr>
<tr>
<td>Statistics</td>
<td>318(24), 348(24)</td>
</tr>
</tbody>
</table>

### 4.4.2 Stream: Computer Systems

**Note:** This stream includes modules assessed during the Engineering test week. In the case of test timetable clashes, please consult the divisional head of Computer Science during the first two weeks of the semester.

**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

For more information on admission to the honours programme you are considering, please consult the specific honours programme's details in the chapter “Postgraduate Programmes” of this Calendar part.
1st year (139 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Electrotechnique</td>
<td>143(15)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (130 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics B</td>
<td>224(15)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Systems</td>
<td>214(15), 245(15)</td>
</tr>
<tr>
<td>Engineering Mathematics</td>
<td>214(15), 242(8)</td>
</tr>
<tr>
<td>Systems and Signals</td>
<td>214(15), 244(15)</td>
</tr>
</tbody>
</table>

3rd year (127 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>324(16), 364(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 345(16), 354(16)</td>
</tr>
<tr>
<td>Design E</td>
<td>314(15)</td>
</tr>
</tbody>
</table>

4.4.3 Stream: Data Science

Note: This stream includes modules assessed during the Engineering test week. In the case of test timetable clashes, please consult the divisional head of Computer Science during the first two weeks of the semester.

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

- All Options: Option 1, 2, 3 and 4 modules lead to an honours programme in Computer Science
- Option 2 modules and Option 3 modules also lead to an honours programme in Statistics
- Option 4 modules also lead to an honours programme in Mathematical Statistics

For more information on admission to the honours programme you are considering, please consult the specific honours programme’s details in the chapter “Postgraduate Programmes” of the relevant faculty Calendar part.

1st year (minimum 124, maximum 140 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>141(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

plus

Elective Modules

(credits = minimum 16, maximum 32)

Choose any modules from the list below to reach your required credit total. Your choice depends on there being no timetable clashes, and you having the appropriate prerequisites for the modules.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Economics</td>
<td>114(12), 144(12)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>
2nd year (minimum 124, maximum 128 credits)

Compulsory Modules
(credits = 112)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = minimum 12, maximum 16)

Choose one of the modules below. Your choice depends on there being no timetable clashes, and you having the appropriate prerequisites for the modules.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Engineering</td>
<td>245(12)</td>
</tr>
<tr>
<td>Data Science</td>
<td>241(16)</td>
</tr>
</tbody>
</table>

3rd year (minimum 127, maximum 128 credits)

Compulsory Modules
(credits = 64)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>315(16), 334(16), 344(16), 354(16)</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = minimum 63, maximum 64)

Choose one of the following options. Only certain options may be possible, depending on your choice of elective in your second year.

Option 1

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Engineering</td>
<td>344(15)</td>
</tr>
<tr>
<td>Data Science</td>
<td>311(16), 341(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16)</td>
</tr>
</tbody>
</table>

or

Option 2

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Science</td>
<td>311(16)</td>
</tr>
<tr>
<td>Statistics</td>
<td>318(24), 348(24)</td>
</tr>
</tbody>
</table>

or

Option 3

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Engineering</td>
<td>344(15)</td>
</tr>
<tr>
<td>Statistics</td>
<td>318(24), 348(24)</td>
</tr>
</tbody>
</table>

or

Option 4

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Statistics</td>
<td>312(16), 316(16), 344(16), 364(16)</td>
</tr>
</tbody>
</table>

4.4.4 Stream: Computer Science with Genetics as second major

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 or Genetics.

For more information on admission to the honours programme you are considering, please consult the specific honours programme’s details in the chapter “Postgraduate Programmes” of the relevant faculty Calendar part.
1st year (140 credits)

*Compulsory Modules*

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Biology</td>
<td>124(16), 144(16) or 154(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (128 credits)

*Compulsory Modules (credits = 112)*

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16)</td>
</tr>
</tbody>
</table>

*Elective Modules (credits = 16)*

Choose modules to the value of 16 credits from the list below. Your choice depends on there being no timetable clashes, and you having the appropriate prerequisites for the modules.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Statistics</td>
<td>245(8), 246(8)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

*Compulsory Modules*

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>314(16), 324(16), 344(16), 354(16)</td>
</tr>
</tbody>
</table>

4.4.5 Stream: Computer Science with Geographical Information Technology as second major

*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 or GeoInformatics.

For more information on admission to the honours programme you are considering, please consult the specific honours programme’s details in the chapter “Postgraduate Programmes” of this Calendar part.

1st year (140 credits)

*Compulsory Modules*

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Geo-environmental Science</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (128 credits)

*Compulsory Modules*

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>211(16), 214(16), 241(16), 242(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>
3rd year (128 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>314(16), 334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Geographical Information Technology</td>
<td>311(16), 312(16), 341(16), 342(16)</td>
</tr>
</tbody>
</table>

### 4.5 Interdisciplinary BSc programme

#### 4.5.1 Stream: Biomedical Mathematical Sciences

**Specific Admission Requirements**

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

**Continued Study Possibilities**

- This stream leads to an honours programme in Mathematics or Physiological Sciences.
- This stream also leads to a postgraduate diploma in Engineering Science (PGDip Engineering Science), which could further lead to a master’s programme (MEngSci) and a PhD (Biomedical Engineering) at the Faculty of Engineering.

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 the relevant Faculty Calendar part.

1st year (140 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Biology</td>
<td>124(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (minimum 128, maximum 144 credits)

**Compulsory Modules**

(credits = 112)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biometry</td>
<td>212(8), 242(8)</td>
</tr>
<tr>
<td>Physiology</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**

(credits = minimum 16, maximum 32)

Choose modules to a minimum value of 16 credits and a maximum value of 32 credits from the list below.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>278(32)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

**Compulsory Modules**

(credits = 80)

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physiology</td>
<td>314(16), 334(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Biomathematics</td>
<td>374(16)</td>
</tr>
</tbody>
</table>

**plus**

**Elective Modules**

(credits = 48)

Choose modules to the value of 48 credits from the list below.

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
<td>324(16), 354(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>314(16), 324(16), 344(16), 365(16), 378(32)</td>
</tr>
</tbody>
</table>
4.5.2 Stream: Applied Medicinal Chemistry

Specific Admission Requirements

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

Continued Study Possibilities

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

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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16), 154(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>

2nd year (144 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Biometry</td>
<td>212(8), 242(8)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>214(16), 234(16), 254(16), 264(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>214(16), 244(16)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botany</td>
<td>354(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>314(16), 324(16), 344(16), 364(16)</td>
</tr>
<tr>
<td>Intellectual Property Law for Science, Engineering and Technology</td>
<td>341(16)</td>
</tr>
<tr>
<td>Physiology</td>
<td>314(16), 364(16)</td>
</tr>
</tbody>
</table>

4.5.3 Stream: Bioinformatics and Computational Biology

Specific Admission Requirements

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

Continued Study Possibilities

- This stream leads to an honours programme in Bioinformatics and Computational Biology.
- If applicable additional modules are taken, this stream also leads to honours programmes in Biochemistry, Computer Science, or 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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>124(16)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>124(16), 144(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>144(16)</td>
</tr>
<tr>
<td>Science in Context</td>
<td>178(12)</td>
</tr>
</tbody>
</table>
2nd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>315(16), 345(16)</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>312(8), 322(8)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>334(16), 344(16), 354(16)</td>
</tr>
<tr>
<td>Genetics</td>
<td>314(16), 344(16)</td>
</tr>
</tbody>
</table>

4.6 Interdisciplinary BDatSci programme

BDatSci: General

Interdepartmental and Interfaculty Collaboration

This programme is presented in four faculties, namely Economic and Management Sciences, Science, AgriSciences and Arts and Social Sciences. The faculty where you are registered, awards the degree.

Specific Admission Requirements

- Overall NSC average of at least 80%, excluding Life Orientation
- Mathematics 80%
- One of the following:
  - Afrikaans Home Language 60% or
  - English Home Language 60% or
  - Afrikaans First Additional Language 75% or
  - English First Additional Language 75%

Duration of Programme

Four years

Programme Structure

The BDatSci programme consists of a set of core compulsory modules on all year levels. The core modules lay the foundation for studies in the field of data science. For the rest, you have a relatively free choice of modules to enable you to focus on a very specific field within the data science environment. In choosing your modules, please take note of the stipulations regarding timetable clashes in the general section at the beginning of this chapter.

It is also possible within this programme to focus on a specific area of study, called a focal area. You will register for the BDatSci in the faculty that offers the focal area.

Focal areas

The objective of focal areas is to help you choose a specific career focus within the BDatSci programme. The focal area is not a programme, and the module combinations are only recommendations for you to make more focussed module choices. Nevertheless, there are several compulsory modules that must be taken within each focal area. The module choices in the tables describing each focal area fit in with the lecture and assessment timetables.

There are eight focal areas in the BDatSci programme, and three of these focal areas are offered in the Faculty of Science. Only these three focal areas are described further down under “Focal areas within the BDatSci programme”. For the sake of completeness, however, all eight focal areas of BDatSci are listed below. An indication of the faculty where the programme is offered is given in brackets, and you will find the description of the focal area in that faculty’s Calendar part.

- Applied Mathematics (Science);
- Computer Science (Science);
- Statistical Physics (Science);
- Statistical Learning (Economic and Management Sciences);
- Analytics and Optimisation (Economic and Management Sciences);
- Behavioural Economics (Economic and Management Sciences);
- Geoinformatics (Arts and Social Sciences); and
- Statistical Genetics (AgriSciences)
Enquiries
For further information about the BDatSci programme, visit www.sun.ac.za/datascience or use the contact details below.

For general enquiries about the programme:
Prof Paul Mostert
Department of Statistics and Actuarial Science
Tel: 021 808 3536
E-mail: pjmos@sun.ac.za

For enquiries about specific focal areas in the Faculty of Science:

Applied Mathematics focal area
Prof Willie Brink
Applied Mathematics Division
Tel: 021 808 4218
E-mail: wbrink@sun.ac.za

Computer Science focal area
Prof Steve Kroon
Computer Science Division
Tel: 021 808 9375
E-mail: kroon@sun.ac.za

Statistical Physics focal area
Prof Kristian Müller-Nedebock
Department of Physics
Tel: 021 808 3386
E-mail: kkmn@sun.ac.za

Focal areas within the BDatSci programme

Focal area: Computer Science (credits = 508)
(Faculty of Science, Home Department: Mathematical Sciences, Computer Science Division)

Description of focal area
Computer Science studies the principles and practice of computation and data processing. It considers problem-solving techniques and data manipulation for everything from routing data over the Internet and powering your social media feeds, to controlling GPS satellites, manufacturing robots and even your computer.

1st year (120 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Science</td>
<td>112(8)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>113(16), 144(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>141(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16), 154(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
</tbody>
</table>

2nd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>241(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Operations Research</td>
<td>214(16)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>315(16), 334(16), 344(16), 345(16), 354(16),</td>
</tr>
<tr>
<td>Data Science</td>
<td>314(16), 344(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16)</td>
</tr>
</tbody>
</table>
### 4th year (132 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Module</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Algorithms</td>
<td>412(16)</td>
</tr>
<tr>
<td>Concurrent Programming I</td>
<td>414(16)</td>
</tr>
<tr>
<td>Data Science Research Assignment</td>
<td>471(40)</td>
</tr>
<tr>
<td>Functional Programming</td>
<td>495(16)</td>
</tr>
<tr>
<td>Introduction to Statistical Learning</td>
<td>471(12)</td>
</tr>
<tr>
<td>Machine Learning</td>
<td>441(16)</td>
</tr>
<tr>
<td>Space Science Algorithms</td>
<td>491(16)</td>
</tr>
</tbody>
</table>

**Focal area: Applied Mathematics (credits = minimum 508, maximum 516)**

(Faculty of Science, Home Department: Mathematical Sciences, Applied Mathematics Division)

**Description of focal area**

Applied mathematics looks at real-world applications of mathematical methods in fields such as science, engineering, business, computer science and industry. It is therefore a combination of mathematics, science and domain knowledge.

### 1st year (minimum 120 credits, maximum 128 credits)

**Compulsory Modules**

<table>
<thead>
<tr>
<th>Credits = 112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Mathematics</td>
</tr>
<tr>
<td>Computer Science</td>
</tr>
<tr>
<td>Data Science</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
</tr>
</tbody>
</table>

**plus**

**Elective Module**

<table>
<thead>
<tr>
<th>Credits = minimum 8, maximum 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuarial Science</td>
</tr>
<tr>
<td>or</td>
</tr>
<tr>
<td>Physics</td>
</tr>
</tbody>
</table>

### 2nd year (128 credits)

**Compulsory Modules**

| Applied Mathematics | 214(16), 244(16) |
| Computer Science    | 214(16), 244(16) |
| Data Science        | 241(16) |
| Mathematics         | 214(16) |
| Mathematical Statistics | 214(16), 245(8), 246(8) |

### 3rd year (128 credits)

**Compulsory Modules**

| Applied Mathematics | 314(16), 354(16), 364(16) |
| Computer Science    | 315(16), 344(16) |
| Data Science        | 314(16), 344(16) |
| Mathematical Statistics | 312(16) |

### 4th year (132 credits)

**Compulsory Modules**

| Computer Vision     | 492(16) |
| Data Science Research Assignment | 471(40) |
| Digital Image Processing   | 493(16) |
| Introductory Graph Theory | 482(16) |
| Introduction to Statistical Learning | 471(12) |
| Machine Learning      | 441(16) |
| Numerical Methods     | 476(16) |
Focal area: Statistical Physics (credits = 516)
(Faculty of Science, Home Department: Physics)

Description of focal area

Statistical physics uses sophisticated mathematics and simulations to explore and understand the physics underlying everything from quantum mechanics to phase transitions to factory nuts and bolts.

1st year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>141(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>114(16), 144(16)</td>
</tr>
<tr>
<td>Probability Theory and Statistics</td>
<td>114(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>114(16), 144(16)</td>
</tr>
</tbody>
</table>

2nd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>214(16), 244(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>241(16)</td>
</tr>
<tr>
<td>Mathematics</td>
<td>214(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>214(16), 245(8), 246(8)</td>
</tr>
<tr>
<td>Physics</td>
<td>224(16), 254(16)</td>
</tr>
</tbody>
</table>

3rd year (128 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>315(16), 344(16)</td>
</tr>
<tr>
<td>Data Science</td>
<td>314(16), 344(16)</td>
</tr>
<tr>
<td>Mathematical Statistics</td>
<td>312(16)</td>
</tr>
<tr>
<td>Physics</td>
<td>314(16), 334(16), 344(16)</td>
</tr>
</tbody>
</table>

4th year (132 credits)

Compulsory Modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Markov Processes</td>
<td>483(16)</td>
</tr>
<tr>
<td>Data Science Research Assignment</td>
<td>471(40)</td>
</tr>
<tr>
<td>Introduction to Statistical Learning</td>
<td>471(12)</td>
</tr>
<tr>
<td>Lagrange and Hamilton Mechanisms</td>
<td>412(16)</td>
</tr>
<tr>
<td>Statistical Physics B</td>
<td>421(16)</td>
</tr>
<tr>
<td>Stochastic Simulation</td>
<td>418(12)</td>
</tr>
<tr>
<td>Time Series Analysis</td>
<td>441(12)</td>
</tr>
</tbody>
</table>

plus

Elective Module

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayesian Physics</td>
<td>457(8)</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Modules</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic Systems and Complexity</td>
<td>458(8)</td>
</tr>
</tbody>
</table>
## 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 at the Faculty of Science lead to the following postgraduate programmes at the Faculty of Science and at other faculties:

<table>
<thead>
<tr>
<th>Postgraduate Programme</th>
<th>Offered by Faculty of Science</th>
<th>Offered by other Faculties</th>
</tr>
</thead>
<tbody>
<tr>
<td>BScHons (Biological Sciences)</td>
<td>Biochemistry; Biodiversity and Ecology; Microbiology; Physiological Sciences</td>
<td>Faculty of AgriSciences: Applied Plant Physiology; Genetics; Plant Biotechnology; Plant Pathology; Wine Biotechnology Faculty of Medicine and Health Sciences: Anatomy; Biokinetics; Epidemiology; Human Genetics; Medical Physiology; Medical Virology; Molecular Biology; Morphological Science; Nuclear Medicine; Pathology; Pharmacology; Reproductive Biology; Sport Science (Performance Sport); Sport Science (Kinder Kinetics)</td>
</tr>
<tr>
<td>BScHons (Physical Sciences)</td>
<td>Chemistry; Earth Sciences; Physics; Polymer Science; Theoretical Physics; Physical and Mathematical Analysis</td>
<td>Faculty of Arts and Social Sciences: GeoInformatics</td>
</tr>
<tr>
<td>BScHons (Mathematical Sciences)</td>
<td>Applied Mathematics; Computer Science; Mathematics</td>
<td>Faculty of Economic and Management Sciences: Mathematical Statistics; Operations Research</td>
</tr>
<tr>
<td>BScHons (Interdisciplinary)</td>
<td>Bioinformatics and Computational Biology</td>
<td>Faculty of Engineering Postgraduate Diploma in Engineering Science</td>
</tr>
<tr>
<td>MSc (Biological Sciences)</td>
<td>Biochemistry; Botany; Exercise Science; Microbiology; Physiological Sciences; Zoology</td>
<td>Faculty of AgriSciences: Entomology; Genetics; Plant Biotechnology; Wine Biotechnology Faculty of Medicine and Health Sciences: Epidemiology; Sport Science</td>
</tr>
<tr>
<td>MSc (Physical Sciences)</td>
<td>Chemistry; Earth Sciences; Polymer Science; Physics; Physical and Mathematical Analysis</td>
<td>Faculty of Arts and Social Sciences: Geography and Environmental Studies; GeoInformatics</td>
</tr>
<tr>
<td>MSc (Mathematical Sciences)</td>
<td>Applied Mathematics; Computer Science; Mathematics</td>
<td>Faculty of Economic and Management Sciences: Mathematical Statistics; Operations Research</td>
</tr>
<tr>
<td>Structured MSc</td>
<td>MSc in Machine Learning and Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>MSc (Interdisciplinary)</td>
<td>Bioinformatics and Computational Biology</td>
<td>Faculty of Engineering: Engineering Science</td>
</tr>
<tr>
<td>PhD</td>
<td>Applied Mathematics; Biochemistry; Bioinformatics and Computational Biology; Botany; Chemistry; Computer Science; Earth Sciences; GeoInformatics; Mathematics; Microbiology; Physical and Mathematical Analysis; Physics; Physiological Sciences; Polymer Science; Zoology</td>
<td>Faculty of AgriSciences: Entomology; Genetics; Plant Biotechnology; Wine Biotechnology Faculty of Arts and Social Sciences: Geography and Environmental Studies Faculty of Economic and Management Sciences: Mathematical Statistics; Operations Research Faculty of Engineering: Biomedical Engineering Faculty of Medicine and Health Sciences:</td>
</tr>
</tbody>
</table>
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.

2.2.4 After three years of full-time MSc studies, you must reapply for continuation of studies.

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.

2.3.2 After four years of full-time PhD studies, you must reapply for continuation of studies.
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. Provisions regarding enrolment for, and the conversion of programmes

3.1 Periods of enrolment for master’s and doctoral studies

<table>
<thead>
<tr>
<th>Programme</th>
<th>The year of enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>MSc Full-time</td>
<td>M</td>
</tr>
<tr>
<td>PhD Full-time</td>
<td>M</td>
</tr>
</tbody>
</table>

Legend

<table>
<thead>
<tr>
<th>M</th>
<th>Minimum enrolment period</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Normal enrolment period</td>
</tr>
<tr>
<td>F</td>
<td>Final concessional year</td>
</tr>
<tr>
<td>X</td>
<td>Enrolment only if readmission has been approved by the Faculty Board or, for PhD, the Senate</td>
</tr>
<tr>
<td>-</td>
<td>Further registration not allowed</td>
</tr>
</tbody>
</table>

Please note: in the case of a conversion from master’s to doctoral studies, the first registration for the PhD is considered the start of the enrolment. See Section “Conversion from Master’s to Doctorate” at 5 below).

3.2 Continued enrolment during the maximum period of enrolment

You must register as a student every year for the full duration of your studies, until you are awarded the degree, except if the Faculty Board approves an interruption of your studies (see Section “Interruption of studies” below). You must make sufficient progress in your studies each year to be permitted to register again. If your progress is insufficient, the relevant
departmental chairperson may recommend to the Faculty Board that the Board prevent you from continuing your postgraduate studies.

3.3 Continued enrolment after the maximum period of enrolment

After the normal maximum enrolment period (status F), you may only re-register as a postgraduate student if a departmental panel convened by the chairperson recommends approving your application to continue (status X). Such approval will only be granted more than once in exceptional circumstances.

4. Interruption of master's or doctoral studies

4.1 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:

4.1.1 Work situation;
4.1.2 Medical reasons;
4.1.3 Financial reasons; or
4.1.4 Highly special personal circumstances if thoroughly and convincingly supported.

4.2 Procedure to apply for permission to interrupt studies

4.2.1 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.

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

4.2.3 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.

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

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

4.2.6 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.

5. 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 –

5.1 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;

5.2 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;

5.3 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;

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

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

5.5 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;
5.6 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;

5.7 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

5.8 tuition fees will not be adjusted retrospectively after the conversion.
6. Postgraduate programmes per department

6.1 Centre for Bioinformatics and Computational Biology

6.1.1 BScHons in Bioinformatics and Computational Biology

Programme Code
14166 – 778 (120)

Specific Admission Requirements

- An applicable BSc degree in either Bioinformatics, Genetics, Biochemistry, Molecular Biology, Computer Science or Mathematics or any other, related BSc degree approved by the Postgraduate Committee of the Centre for Bioinformatics and Computational Biology.
- An average final mark of at least 60% for the applicable third-year modules.
- Proficiency in both written and spoken English.
- The Postgraduate Committee may prescribe supplementary studies depending on your previous training and experience.

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 – dependent on places being 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 Bioinformatics and Computational Biology is compiled annually and consists of a compulsory research project (721(50)) supervised by a member or associate member of the Centre for Bioinformatics and Computational Biology; a seminar (715(5)); a facilitated group discussion of relevant classic and current publications in bioinformatics (713(5)); and lectures and practical sessions on Algorithms in Bioinformatics (716(5)), Machine Learning in Bioinformatics (717(5)) and a range of topics in Advanced Bioinformatics (714(40)) currently relevant to the field, including statistics, databases, genomics and functional genomics, sequence analysis of RNA/DNA and proteins, genomes and disease, evolution and phylogenetics, structural bioinformatics, networks and pathways, and microbiomes.

Depending on your training and experience, one elective module, either Scientific Computing in Bioinformatics 711(10) or Cell Biology in Bioinformatics 712(10), must be chosen. This choice has to be approved by the Postgraduate Committee of the Centre for Bioinformatics and Computational Biology.

Duration of Programme

The duration of the programme usually is one year, but under exceptional circumstances, and at the discretion of the Postgraduate Committee of the Centre for Bioinformatics and Computational Biology, it is possible to repeat a module. The programme begins one week prior to the general start of classes.

Programme Content

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

Compulsory Modules
(credits = 110)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14234</td>
<td>713</td>
<td>5</td>
<td>Current Topics in Bioinformatics</td>
<td>1</td>
</tr>
<tr>
<td>14235</td>
<td>714</td>
<td>40</td>
<td>Advanced Bioinformatics</td>
<td>1</td>
</tr>
<tr>
<td>14236</td>
<td>715</td>
<td>5</td>
<td>Bioinformatics Seminar</td>
<td>1</td>
</tr>
<tr>
<td>14237</td>
<td>716</td>
<td>5</td>
<td>Algorithms in Bioinformatics</td>
<td>1</td>
</tr>
<tr>
<td>14238</td>
<td>717</td>
<td>5</td>
<td>Machine Learning in Bioinformatics</td>
<td>1</td>
</tr>
<tr>
<td>14240</td>
<td>721</td>
<td>50</td>
<td>Project in Bioinformatics</td>
<td>2</td>
</tr>
</tbody>
</table>

plus

Elective Module

Choose one of the following modules.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14241</td>
<td>711</td>
<td>10</td>
<td>Scientific Computing in Bioinformatics</td>
<td>1</td>
</tr>
<tr>
<td>14242</td>
<td>712</td>
<td>10</td>
<td>Cell Biology in Bioinformatics</td>
<td>1</td>
</tr>
</tbody>
</table>
Assessment and Examination

The programme is assessed by means of flexible assessment. The research project is assessed by means of a research report and an oral presentation. The performance mark is calculated as a weighted mark according to the credit values of each module. To obtain this honours degree, a performance mark of at least 50% must be achieved in each module.

6.1.2 MSc in Bioinformatics and Computational Biology

Programme Code
14166 – 879 (180)

Specific Admission Requirements

- A BScHons degree in Bioinformatics and Computational Biology, Biochemistry, Genetics, or Molecular Biology or;
- An applicable BScHons degree in a biological field or;
- A BScHons degree in Computer Science, Informatics, Mathematics, Applied Mathematics or Statistics or;
- An applicable BScHons degree in a Mathematics-related field or;
- Any other academic degree qualification and appropriate experience (assessed using the regular RPL procedures) approved by the Senate
- Depending on your previous training and experience, the Postgraduate Committee of the Centre for Bioinformatics and Computational Biology may prescribe additional studies.

Programme Content

Independent research on an approved topic as determined by the supervisor(s) and leading to a thesis is required. The main supervisor must be a member or an associate member of the Centre for Bioinformatics and Computational Biology. This programme consists of a 100% thesis

Compulsory Module

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14165</td>
<td>828</td>
<td>180</td>
<td>Thesis Bioinformatics and Computational Biology</td>
<td>Both</td>
</tr>
</tbody>
</table>

Assessment and Examination

After completion of the research you must submit a thesis for examination to the satisfaction of the appointed examiners and do an oral examination. See also section 2.2 in this chapter for general information on the MSc degree at the Faculty of Science.

Enquiries

Programme coordinator: Prof Hugh Patterton
Centre for Bioinformatics and Computational Biology
Tel: 021 808 2774
E-mail: hpatterton@sun.ac.za

6.1.3 PhD in Bioinformatics and Computational Biology

Programme Code
14166 – 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 at the Faculty of Science.
6.2 Department of Biochemistry

6.2.1 BScHons in Biochemistry

Programme Code
11053 – 778 (120)

Specific Admission Requirements
- An applicable BSc degree with Biochemistry 214, 244, 315, 345, 365, Bioinformatics 312 and Biochemistry 323, or Bioinformatics 322 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/](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 places 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, but under exceptional circumstances, and at the discretion of the department, it is possible to repeat a module. The programme begins one week before the general start of classes.

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11412</td>
<td>711</td>
<td>10</td>
<td>Practical Protein Biochemistry</td>
<td>1</td>
</tr>
<tr>
<td>11413</td>
<td>712</td>
<td>10</td>
<td>Steroid Hormones</td>
<td>1</td>
</tr>
<tr>
<td>14046</td>
<td>713</td>
<td>10</td>
<td>Soft Skills and Data Analysis</td>
<td>1</td>
</tr>
<tr>
<td>11415</td>
<td>714</td>
<td>10</td>
<td>Systems Biology</td>
<td>1</td>
</tr>
<tr>
<td>14069</td>
<td>715</td>
<td>10</td>
<td>Advanced Gene Expression</td>
<td>1</td>
</tr>
<tr>
<td>14047</td>
<td>716</td>
<td>10</td>
<td>Biophysical and Bio-analytical Techniques</td>
<td>1</td>
</tr>
<tr>
<td>11418</td>
<td>717</td>
<td>10</td>
<td>Specialised Topics</td>
<td>1</td>
</tr>
<tr>
<td>11420</td>
<td>718</td>
<td>10</td>
<td>Chemical Biology Topics</td>
<td>1</td>
</tr>
<tr>
<td>54895</td>
<td>741</td>
<td>60</td>
<td>Research project (Biochemistry)</td>
<td>2</td>
</tr>
<tr>
<td>18325</td>
<td>742</td>
<td>10</td>
<td>Seminar</td>
<td>2</td>
</tr>
</tbody>
</table>

Assessment and Examination
The programme is assessed by means of flexible assessment and the final mark is calculated as a weighted mark according to the credit values of each module.

6.2.2 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66206</td>
<td>828</td>
<td>180</td>
<td>Thesis Biochemistry</td>
<td>Both</td>
</tr>
</tbody>
</table>
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.

6.2.3 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 at the Faculty of Science.

6.2.4 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 at the Faculty of Science.

6.3 Department of Botany and Zoology
6.3.1 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 places 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins with the start of the academic year.
Programme Content

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66184</td>
<td>715</td>
<td>24</td>
<td>Generic Scientific Skills</td>
<td>2</td>
</tr>
<tr>
<td>55867</td>
<td>717</td>
<td>60</td>
<td>Research Project</td>
<td>Both</td>
</tr>
<tr>
<td>12249</td>
<td>796</td>
<td>36</td>
<td>Theoretical Topics in Biodiversity Sciences</td>
<td>Both</td>
</tr>
</tbody>
</table>

Assessment and Examination

- Assessment includes two oral examinations, written examinations, assignments, book reviews, seminars, a research project, and the production of a popular article.
- For successful completion of the honours programme, you must complete the generic scientific skills module, modules 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 50%.

If you fail a theory-based module in the honours programme, you may apply to repeat this module in the following year. You may obtain a subminimum of 40% for only one of the theory-based modules, but the average of the skills modules and theory-based modules still needs to be above 50%. However, the research project cannot be repeated and if you fail it, you will not graduate with an honours degree.

6.3.2 Postgraduate programmes in Botany

6.3.2.1 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 at 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.

Compulsory Module

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66303</td>
<td>828</td>
<td>180</td>
<td>Thesis Botany</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.

6.3.2.2 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 at the Faculty of Science.
6.3.2.3 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 at the Faculty of Science.

6.3.3 Postgraduate programmes in Zoology
6.3.3.1 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 at 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.
This programme consists of a 100% thesis.

Compulsory Module

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66338</td>
<td>828</td>
<td>180</td>
<td>Thesis Zoology</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.

6.3.3.2 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 at the Faculty of Science.

6.3.3.3 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 at the Faculty of Science.

6.4 Department of Chemistry and Polymer Science

6.4.1 Postgraduate Programmes in Chemistry
6.4.1.1 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 places 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins one week before the general start of classes.

Programme Content

The programme consists of the following compulsory modules.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10382</td>
<td>711</td>
<td>20</td>
<td>Analytical techniques</td>
<td>1</td>
</tr>
<tr>
<td>10638</td>
<td>712</td>
<td>20</td>
<td>Organic chemistry</td>
<td>1</td>
</tr>
<tr>
<td>10462</td>
<td>713</td>
<td>20</td>
<td>Physical chemistry</td>
<td>1</td>
</tr>
<tr>
<td>10384</td>
<td>714</td>
<td>20</td>
<td>Inorganic chemistry</td>
<td>1</td>
</tr>
<tr>
<td>56030</td>
<td>741</td>
<td>10</td>
<td>Special topics in Chemistry</td>
<td>2</td>
</tr>
<tr>
<td>63258</td>
<td>744</td>
<td>30</td>
<td>Research project in Chemistry</td>
<td>2</td>
</tr>
</tbody>
</table>

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%.

If you fail a first-semester module, you may apply to repeat this module in the following year. You may repeat a maximum of two first-semester modules. Admission to the relevant module(s) in the following year is solely at the discretion of the department. However, if you fail the research module or the special topics in the second semester, you fail the BScHons in Chemistry programme, as you cannot apply to repeat these modules in the following year.

6.4.1.2 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66214</td>
<td>828</td>
<td>180</td>
<td>Thesis Chemistry</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.

6.4.1.3 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 at the Faculty of Science.
6.4.1.4 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 at the Faculty of Science.

6.4.2 Postgraduate programmes in Polymer Science

6.4.2.1 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 places 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins one week before the normal start of classes.

Programme Content

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10382</td>
<td>711</td>
<td>20</td>
<td>Analytical techniques</td>
<td>1</td>
</tr>
<tr>
<td>10490</td>
<td>712</td>
<td>20</td>
<td>Advanced Analytical Polymer Science</td>
<td>1</td>
</tr>
<tr>
<td>10658</td>
<td>724</td>
<td>20</td>
<td>Polymer Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>10463</td>
<td>744</td>
<td>15</td>
<td>Physical Polymer Science</td>
<td>2</td>
</tr>
<tr>
<td>13370</td>
<td>754</td>
<td>15</td>
<td>Special Topics in Polymer Science</td>
<td>2</td>
</tr>
<tr>
<td>64440</td>
<td>714</td>
<td>30</td>
<td>Research Project in Polymer Science</td>
<td>2</td>
</tr>
</tbody>
</table>

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%.

If you fail a theory-based module you may apply to repeat this module in the following year. You may repeat a maximum of two modules. Admission to the relevant module(s) in the following year is solely at the discretion of the department. However, if you fail the research module or the module: special topics in the second semester, you fail the BScHons in Polymer Science programme, as you cannot apply to repeat these modules in the following year.

6.4.2.2 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66230</td>
<td>828</td>
<td>180</td>
<td>Thesis Polymer Science</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.

6.4.2.3 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 at the Faculty of Science.

6.4.2.4 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 at the Faculty of Science.

6.5 Department of Earth Sciences

6.5.1 BScHons in Earth Sciences

Programme Code
12918 – 778 (120)

Specific Admission Requirements

- A BSc degree with Geology or equivalent as major. Students with other comparable subject combinations should contact the department regarding admission.
- Stellenbosch graduates with a BSc in Earth Sciences must offer the following third-year modules:
  - Stream Applied Earth Science: Geology 314, 324, 344 and 354, and Earth Science Field Skills 374.
  - Stream Geo-environmental Science: Geology 324, 344, 364, and Environmental Geochemistry 314 and Environmental Field Skills 372.
- An average final mark of at least 65% for the prescribed module combinations, made up of third-year Geology, Environmental Geochemistry, Earth Science Field Skills or Environmental Field Skills modules.
- The Department of Earth Sciences will evaluate all applications individually. If you obtained an average final mark of 55–64% for third-year Geology, and if applicable, third-year Environmental Geochemistry, you could also be considered for honours.
- Please note: If you have obtained a final mark between 55 and 59% for third-year Geology, and if applicable, third-year Environmental Geochemistry, and you are recommended by the department for admission to the honours programme, the Science Faculty Board must grant final approval.

Closing Date for Applications
Apply online at [http://www0.sun.ac.za/pgstudies/](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 places 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme normally starts on the Monday of the second last week in January.

Compulsory modules

(credits = 80)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>12240</td>
<td>771</td>
<td>15</td>
<td>Geology of Southern Africa</td>
<td>Both</td>
</tr>
<tr>
<td>12241</td>
<td>772</td>
<td>15</td>
<td>Research Methods in Earth Sciences</td>
<td>Both</td>
</tr>
<tr>
<td>12242</td>
<td>773</td>
<td>15</td>
<td>Special Topics in Earth Science</td>
<td>Both</td>
</tr>
<tr>
<td>54895</td>
<td>795</td>
<td>35</td>
<td>Research project</td>
<td>Both</td>
</tr>
</tbody>
</table>

Choose one of the following streams

Stream A – Applied Geology (credits = 40)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>12243</td>
<td>712</td>
<td>20</td>
<td>Concepts in Crustal Evolution</td>
<td>1</td>
</tr>
<tr>
<td>12247</td>
<td>742</td>
<td>20</td>
<td>Economic Geology</td>
<td>2</td>
</tr>
</tbody>
</table>

Stream B – Environmental Geochemistry (credits = 40)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>12244</td>
<td>714</td>
<td>20</td>
<td>Hazardous Waste Site Assessment</td>
<td>1</td>
</tr>
<tr>
<td>12275</td>
<td>744</td>
<td>20</td>
<td>Environmental Systems</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

6.5.2 MSc in Earth Sciences

Programme Code

12918 – 879 (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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14314</td>
<td>828</td>
<td>180</td>
<td>Thesis Earth Sciences</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.
6.5.3 PhD in Earth Sciences

Programme Code
12918 – 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 at the Faculty of Science.

6.5.4 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 at the Faculty of Science.

6.6 Department of Mathematical Sciences

6.6.1 Division: Mathematics

6.6.1.1 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 places 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 at least 50% in every module of this programme.

If you fail a theory-based module, you may apply to repeat this module in the following year. You may apply to repeat a maximum of two modules. Admission to the relevant module(s) in the following year is solely at the discretion of the department. However, the honours project module cannot be repeated and if you fail this, you will not graduate with the BScHons in Mathematics.

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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins in the first week of February.

Programme Content
The following table contains the modules for the focus in Mathematics.
### First Semester

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10378</td>
<td>711</td>
<td>16</td>
<td>Algebra (Prerequisite pass module: Mathematics 314)</td>
<td>1</td>
</tr>
<tr>
<td>11202</td>
<td>712</td>
<td>16</td>
<td>Functional Analysis and Measure Theory (Prerequisite pass module: Mathematics 365)</td>
<td>1</td>
</tr>
<tr>
<td>62987</td>
<td>713</td>
<td>16</td>
<td>Real and Complex Analysis (Prerequisite pass module: Mathematics 324, 365)</td>
<td>1</td>
</tr>
<tr>
<td>62871</td>
<td>714</td>
<td>16</td>
<td>Set Theory and Topology (Prerequisite pass module: Mathematics 365 or 378)</td>
<td>1</td>
</tr>
</tbody>
</table>

### Second Semester

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11493</td>
<td>747</td>
<td>8</td>
<td>Algebraic Number Theory</td>
<td>2</td>
</tr>
<tr>
<td>11494</td>
<td>748</td>
<td>8</td>
<td>Computational Algebra</td>
<td>2</td>
</tr>
<tr>
<td>20405</td>
<td>749</td>
<td>8</td>
<td>Wavelet analysis</td>
<td>2</td>
</tr>
<tr>
<td>66389</td>
<td>751</td>
<td>8</td>
<td>Functional Analysis II</td>
<td>2</td>
</tr>
<tr>
<td>66397</td>
<td>752</td>
<td>8</td>
<td>Measure Theory II</td>
<td>2</td>
</tr>
<tr>
<td>64400</td>
<td>753</td>
<td>8</td>
<td>Category Theory</td>
<td>2</td>
</tr>
<tr>
<td>66419</td>
<td>754</td>
<td>8</td>
<td>Logic</td>
<td>2</td>
</tr>
<tr>
<td>66427</td>
<td>755</td>
<td>8</td>
<td>Concrete Mathematics</td>
<td>2</td>
</tr>
<tr>
<td>66435</td>
<td>756</td>
<td>8</td>
<td>Topics in Algebra</td>
<td>2</td>
</tr>
<tr>
<td>12250</td>
<td>757</td>
<td>8</td>
<td>Complex Analysis II</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>62928</td>
<td>741</td>
<td>8</td>
<td>Capita selecta I</td>
<td>2</td>
</tr>
<tr>
<td>62979</td>
<td>742</td>
<td>8</td>
<td>Capita selecta II</td>
<td>2</td>
</tr>
<tr>
<td>62936</td>
<td>743</td>
<td>8</td>
<td>Capita selecta III</td>
<td>2</td>
</tr>
<tr>
<td>11204</td>
<td>744</td>
<td>8</td>
<td>Capita selecta IV</td>
<td>Both</td>
</tr>
<tr>
<td>63002</td>
<td>745</td>
<td>8</td>
<td>Capita selecta V</td>
<td>2</td>
</tr>
<tr>
<td>11203</td>
<td>760</td>
<td>8</td>
<td>Advanced Analysis</td>
<td>2</td>
</tr>
<tr>
<td>12550</td>
<td>761</td>
<td>8</td>
<td>Advanced Abstract Algebra</td>
<td>2</td>
</tr>
<tr>
<td>12551</td>
<td>762</td>
<td>8</td>
<td>Number theory</td>
<td>2</td>
</tr>
<tr>
<td>14048</td>
<td>767</td>
<td>8</td>
<td>Advanced Combinatorics</td>
<td>2</td>
</tr>
<tr>
<td>14049</td>
<td>768</td>
<td>8</td>
<td>Algebraic Curves</td>
<td>2</td>
</tr>
<tr>
<td>14050</td>
<td>769</td>
<td>8</td>
<td>Algebraic Geometry</td>
<td>2</td>
</tr>
<tr>
<td>14051</td>
<td>771</td>
<td>8</td>
<td>Asymptotic Methods</td>
<td>2</td>
</tr>
<tr>
<td>14053</td>
<td>772</td>
<td>8</td>
<td>Categorical Algebra</td>
<td>2</td>
</tr>
<tr>
<td>14054</td>
<td>773</td>
<td>8</td>
<td>Differential Geometry</td>
<td>2</td>
</tr>
<tr>
<td>14055</td>
<td>774</td>
<td>8</td>
<td>Functional Analysis III</td>
<td>2</td>
</tr>
<tr>
<td>14056</td>
<td>775</td>
<td>8</td>
<td>Hilbert Spaces and C*-algebras</td>
<td>2</td>
</tr>
<tr>
<td>14057</td>
<td>776</td>
<td>8</td>
<td>Knot Theory</td>
<td>2</td>
</tr>
<tr>
<td>14058</td>
<td>780</td>
<td>8</td>
<td>Lie Groups and Lie Algebras</td>
<td>2</td>
</tr>
<tr>
<td>14059</td>
<td>784</td>
<td>8</td>
<td>Model Theory</td>
<td>2</td>
</tr>
<tr>
<td>14061</td>
<td>785</td>
<td>8</td>
<td>Operator Theory</td>
<td>2</td>
</tr>
<tr>
<td>14062</td>
<td>781</td>
<td>8</td>
<td>Universal Algebra</td>
<td>2</td>
</tr>
<tr>
<td>14063</td>
<td>782</td>
<td>8</td>
<td>Representation Theory</td>
<td>2</td>
</tr>
<tr>
<td>14064</td>
<td>783</td>
<td>8</td>
<td>Analytic Number Theory</td>
<td>2</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>62944</td>
<td>746</td>
<td>32</td>
<td>Mathematics: Honours project</td>
<td>2</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11779</td>
<td>721</td>
<td>16</td>
<td>Computational and discrete methods in Bio-Mathematics</td>
<td>Both</td>
</tr>
<tr>
<td>11780</td>
<td>722</td>
<td>16</td>
<td>Non-linear Dynamical Systems in Bio-Mathematics</td>
<td>Both</td>
</tr>
<tr>
<td>11781</td>
<td>723</td>
<td>8</td>
<td>Advanced Topics in Bio-Mathematics I</td>
<td>Both</td>
</tr>
<tr>
<td>11782</td>
<td>724</td>
<td>8</td>
<td>Advanced Topics in Bio-Mathematics II</td>
<td>Both</td>
</tr>
<tr>
<td>11785</td>
<td>725</td>
<td>8</td>
<td>Selected topics from biological sciences</td>
<td>Both</td>
</tr>
<tr>
<td>11786</td>
<td>726</td>
<td>8</td>
<td>Selected topics from biomedical sciences</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11787</td>
<td>747</td>
<td>32</td>
<td>Biomathematics: Honours project</td>
<td>Both</td>
</tr>
<tr>
<td>12553</td>
<td>749</td>
<td>16</td>
<td>Advanced Topics in Biomathematics III</td>
<td>2</td>
</tr>
<tr>
<td>12554</td>
<td>749</td>
<td>8</td>
<td>Advanced Topics in Biomathematics IV</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

**6.6.1.2 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 at 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**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11201</td>
<td>828</td>
<td>180</td>
<td>Thesis Mathematics</td>
<td>Both</td>
</tr>
</tbody>
</table>

**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.

**6.6.1.3 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 at the Faculty of Science.
6.6.1.4 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 at the Faculty of Science.

6.6.2 Division: Applied Mathematics

6.6.2.1 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 places 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 degree, you need to achieve at least 50% in every module in your programme.

If you fail a theory-based module, you may apply to repeat this module in the following year. You may apply to repeat a maximum of two modules. Admission to the relevant module(s) in the following year is solely at the discretion of the department. However, the research module cannot be repeated and if you fail it, you will not graduate with the BScHons in Applied Mathematics.

Duration of Programme
The normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme 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:

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10381</td>
<td>781</td>
<td>16</td>
<td>Analytical Methods of Applied Mathematics</td>
<td>1 or 2</td>
</tr>
<tr>
<td>36323</td>
<td>776</td>
<td>16</td>
<td>Numerical Methods</td>
<td>1</td>
</tr>
<tr>
<td>10643</td>
<td>774</td>
<td>16</td>
<td>Partial Differential Equations (Students who have taken Applied Mathematics 364 are not allowed to take Partial Differential Equations 774 as well).</td>
<td>1</td>
</tr>
<tr>
<td>10542</td>
<td>782</td>
<td>16</td>
<td>Graph Theory</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62782</td>
<td>784</td>
<td>16</td>
<td>Coding Theory</td>
<td>1 or 2</td>
</tr>
<tr>
<td>10728</td>
<td>794</td>
<td>16</td>
<td>Tensor Analysis</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62820</td>
<td>775</td>
<td>16</td>
<td>Numerical Simulation of Fluids</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62839</td>
<td>791</td>
<td>16</td>
<td>Porous Media</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62812</td>
<td>773</td>
<td>16</td>
<td>Numerical Modelling</td>
<td>1 or 2</td>
</tr>
<tr>
<td>64572</td>
<td>793</td>
<td>16</td>
<td>Digital Image Processing</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62847</td>
<td>792</td>
<td>16</td>
<td>Computer Vision</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62855</td>
<td>796</td>
<td>16</td>
<td>Statistical Pattern Recognition</td>
<td>1 or 2</td>
</tr>
<tr>
<td>11380</td>
<td>711</td>
<td>10</td>
<td>X-ray Tomography</td>
<td>1 or 2</td>
</tr>
<tr>
<td>12253</td>
<td>761</td>
<td>8</td>
<td>Capita selecta I</td>
<td>1 or 2</td>
</tr>
<tr>
<td>12255</td>
<td>762</td>
<td>8</td>
<td>Capita selecta II</td>
<td>1 or 2</td>
</tr>
<tr>
<td>12256</td>
<td>763</td>
<td>16</td>
<td>Capita selecta III</td>
<td>1 or 2</td>
</tr>
<tr>
<td>12257</td>
<td>764</td>
<td>16</td>
<td>Capita selecta IV</td>
<td>1 or 2</td>
</tr>
<tr>
<td>10557</td>
<td>772</td>
<td>32</td>
<td>Research Project in Applied Mathematics</td>
<td>Annual</td>
</tr>
<tr>
<td>13946</td>
<td>771</td>
<td>16</td>
<td>Finite Difference and Finite Element Methods</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>
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.

### 6.6.2.2 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 at 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**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66354</td>
<td>828</td>
<td>180</td>
<td>Thesis Applied Mathematics</td>
<td>Both</td>
</tr>
</tbody>
</table>

**Assessment and Examination**

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

### 6.6.2.3 MSc in Machine Learning and Artificial Intelligence

**Programme Code**

14371 – 887 (180)

**Programme Description**

This one-year structured postgraduate programme is aimed at students with a strong mathematical and computational background. It will equip you with a foundation of machine learning and artificial intelligence fundamentals, as well as a suite of sophisticated techniques and concepts at the research forefront of these fields.

**Specific Admission Requirements**

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

- An honours degree in Applied Mathematics, Computer Science, Mathematics, or Mathematical Statistics;
- A four-year Bachelor’s degree in Electrical Engineering;
- A qualification deemed equivalent to the above, in a field closely linked to machine learning.

You will also be expected to have existing and demonstrable proficiency in Python or an equivalent programming language, be comfortable with numerical linear algebra and multivariable calculus, and possess basic knowledge of probability theory and statistics.

The departmental academic committee, in collaboration with the programme coordinator, gives final approval for admission, also taking into account the infrastructure and capacity of the Department.

**Closing Date for Applications**

Apply online at [http://www0.sun.ac.za/pgstudies/](http://www0.sun.ac.za/pgstudies/) by 31 October of the previous year.

**Duration of Programme**

The programme will run over one academic year full-time, or two academic years part-time, beginning in January and ending in December.

**Programme Structure**

The programme consists of three separate blocks: compulsory core modules, elective modules, and a research project. Every block makes up 60 credits, for a programme total of 180 credits. Modules in a particular block may not all run in parallel over the entire block and will be scheduled based on inter-module content development and the availability of lecturers.
Programme Content
The programme will equip you with specialist knowledge and skills to the level where you will be able to critically evaluate the suitability of existing theories and techniques for a specific application. The modules (with their associated assignments) and the research project will also develop your abilities to design, select and apply technically advanced methods, techniques and theories to complex practical and theoretical machine learning and artificial intelligence problems.

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14398</td>
<td>814</td>
<td>15</td>
<td>Applied Machine Learning at Scale</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14396</td>
<td>813</td>
<td>15</td>
<td>Foundations of Deep Learning</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14394</td>
<td>811</td>
<td>15</td>
<td>Mathematics for Machine Learning</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14395</td>
<td>812</td>
<td>15</td>
<td>Probabilistic Modelling and Reasoning</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14399</td>
<td>885</td>
<td>60</td>
<td>Research Project (Machine Learning)</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

plus

Elective Modules

Choose six modules to the value of 60 credits. Not all of these modules will necessarily be offered every year.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14404</td>
<td>820</td>
<td>10</td>
<td>Advanced Probabilistic Modelling</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14409</td>
<td>825</td>
<td>10</td>
<td>Advanced Topics in Artificial Intelligence</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14408</td>
<td>824</td>
<td>10</td>
<td>Advanced Topics in Machine Learning</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14407</td>
<td>823</td>
<td>10</td>
<td>Artificial Intelligence and the Brain</td>
<td>1 or 2</td>
</tr>
<tr>
<td>62847</td>
<td>842</td>
<td>10</td>
<td>Computer Vision</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14406</td>
<td>822</td>
<td>10</td>
<td>Monte Carlo Methods</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14401</td>
<td>817</td>
<td>10</td>
<td>Natural Language Processing</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14405</td>
<td>821</td>
<td>10</td>
<td>Optimisation for Machine Learning</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14402</td>
<td>818</td>
<td>10</td>
<td>Reinforcement Learning and Planning</td>
<td>1 or 2</td>
</tr>
<tr>
<td>14403</td>
<td>819</td>
<td>10</td>
<td>Sequence Modelling</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

Assessment and Examination

- All the modules (except for the research project) will be assessed by means of flexible assessment. This entails a combination of practical assignments and summative assessments.
- All summative assessments will be moderated internally and at least 40% of the final mark will be moderated externally.
- The 60-credit research project will be examined by the supervisor and an independent examiner. A moderator will review the recommendations by the examiner and the supervisor and, if necessary, will also examine the project. Either the examiner or the moderator must be external and must be appointed by the Science Faculty Board.
- You must obtain a minimum of 50% for the research project, and a minimum of 50% for each module, to pass the programme.

6.6.2.4 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 at the Faculty of Science.

6.6.2.5 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 at the Faculty of Science.
6.6.3 Division: Computer Science

6.6.3.1 BScHons in Computer Science

Programme Code
18139 – 797 (128)

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

Specific Admission Requirements
- A Bachelor’s 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, a satisfactory mark in Mathematical Statistics at second-year level, at least, is also required.

Closing Date for Applications
Apply online at [http://www0.sun.ac.za/pgstudies/](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 places 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 5–8 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins with the start of the academic year.

Programme Content

Stream Computer Science
(credits = 128)

Compulsory Modules
(credits = minimum 32, maximum 48)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>63444</td>
<td>771</td>
<td>32</td>
<td>Honours Project in Computer Science</td>
<td>Both</td>
</tr>
</tbody>
</table>

Unless you have completed Computer Science 314 or an equivalent, the following Computer Science module is also compulsory.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>64963</td>
<td>714</td>
<td>16</td>
<td>Concurrent Programming I</td>
<td>Both</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = minimum 80, maximum 96)

Choose modules to a minimum value of 80 credits and a maximum value of 96 credits from the list below to reach the required credit total of 128 credits. However, you can also choose modules presented by other departments with the permission of the Computer Science Division in the Department of Mathematical Sciences.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>63452</td>
<td>711</td>
<td>16</td>
<td>Automata Theory and Applications</td>
<td>1</td>
</tr>
<tr>
<td>64947</td>
<td>712</td>
<td>16</td>
<td>Advanced Algorithms</td>
<td>1</td>
</tr>
<tr>
<td>64955</td>
<td>713</td>
<td>16</td>
<td>Theoretical Computer Science</td>
<td>1</td>
</tr>
<tr>
<td>Subject Number</td>
<td>Module Code</td>
<td>Credits</td>
<td>Module Name</td>
<td>Semester</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
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<td>--------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>63401</td>
<td>715</td>
<td>16</td>
<td>Databases</td>
<td>1</td>
</tr>
<tr>
<td>64971</td>
<td>716</td>
<td>16</td>
<td>Advanced Topics in Computer Science 1</td>
<td>2</td>
</tr>
<tr>
<td>11788</td>
<td>741</td>
<td>16</td>
<td>Machine Learning</td>
<td>Both</td>
</tr>
<tr>
<td>14195</td>
<td>742</td>
<td>16</td>
<td>Machine Learning A</td>
<td>Both</td>
</tr>
<tr>
<td>64998</td>
<td>742</td>
<td>16</td>
<td>Computer Graphics</td>
<td>2</td>
</tr>
<tr>
<td>65005</td>
<td>743</td>
<td>16</td>
<td>Simulation of Networks</td>
<td>1</td>
</tr>
<tr>
<td>65013</td>
<td>744</td>
<td>16</td>
<td>Concurrent Programming 2</td>
<td>2</td>
</tr>
<tr>
<td>65021</td>
<td>745</td>
<td>16</td>
<td>Software Construction</td>
<td>1</td>
</tr>
<tr>
<td>65048</td>
<td>746</td>
<td>16</td>
<td>Advanced Topics in Computer Science 2</td>
<td>2</td>
</tr>
<tr>
<td>12264</td>
<td>747</td>
<td>16</td>
<td>Biological Sequence Analysis</td>
<td>2</td>
</tr>
<tr>
<td>11261</td>
<td>748</td>
<td>16</td>
<td>Software Development for Mobile Devices</td>
<td>Both</td>
</tr>
<tr>
<td>14232</td>
<td>791</td>
<td>16</td>
<td>Artificial Intelligence</td>
<td>Both</td>
</tr>
<tr>
<td>62847</td>
<td>792</td>
<td>16</td>
<td>Computer Vision</td>
<td>2</td>
</tr>
<tr>
<td>64572</td>
<td>793</td>
<td>16</td>
<td>Digital Image Processing</td>
<td>2</td>
</tr>
<tr>
<td>13945</td>
<td>794</td>
<td>16</td>
<td>Search and Planning</td>
<td>Both</td>
</tr>
<tr>
<td>13944</td>
<td>795</td>
<td>16</td>
<td>Functional Programming</td>
<td>Both</td>
</tr>
<tr>
<td>14065</td>
<td>796</td>
<td>16</td>
<td>Software Verification and Analysis</td>
<td>Both</td>
</tr>
<tr>
<td>14066</td>
<td>791</td>
<td>16</td>
<td>Space Science Algorithms</td>
<td>Both</td>
</tr>
</tbody>
</table>

Stream Data Science

(credits = 128)

Compulsory Modules

(credits = minimum 78, maximum 122)

Computer Science

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11788</td>
<td>741</td>
<td>16</td>
<td>Machine Learning</td>
<td>2</td>
</tr>
<tr>
<td>63444</td>
<td>771</td>
<td>32</td>
<td>Honours Project in Computer Science</td>
<td>Both</td>
</tr>
</tbody>
</table>

Mathematical Statistics

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>13074</td>
<td>723</td>
<td>6</td>
<td>Introduction to R Programming</td>
<td>1</td>
</tr>
<tr>
<td>58777</td>
<td>741</td>
<td>12</td>
<td>Data Mining</td>
<td>1</td>
</tr>
<tr>
<td>13360</td>
<td>771</td>
<td>12</td>
<td>Statistical Learning Theory</td>
<td>Both</td>
</tr>
</tbody>
</table>

Unless you have completed Computer Science 314 or an equivalent, the following Computer Science module is also compulsory.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>64963</td>
<td>714</td>
<td>16</td>
<td>Concurrent Programming I</td>
<td>Both</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>14195</td>
<td>742</td>
<td>16</td>
<td>Machine Learning A</td>
<td>Both</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>13361</td>
<td>771</td>
<td>12</td>
<td>Mathematical Statistics for Data Scientists</td>
<td>Both</td>
</tr>
</tbody>
</table>

plus
Elective Modules
(credits = minimum 6, maximum 50)
Choose modules from the Honours in Computer Science stream to a minimum value of 6 credits and a maximum value of 50 credits to reach the required credit total of at least 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. If you do not pass all modules required for the degree in the first year, you may apply to repeat these modules in the following year.

6.6.3.2 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 at 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66362</td>
<td>828</td>
<td>180</td>
<td>Thesis Computer Science</td>
<td>Both</td>
</tr>
</tbody>
</table>

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

6.6.3.3 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 at the Faculty of Science.

6.6.3.4 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 at the Faculty of Science.

6.6.4 African Institute for Mathematical Sciences (AIMS)
6.6.4.1 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11471</td>
<td>871</td>
<td>120</td>
<td>Advanced Topics in the Mathematical Sciences</td>
<td>Both</td>
</tr>
<tr>
<td>11472</td>
<td>871</td>
<td>60</td>
<td>Research Project in the Mathematical Sciences</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.
6.7 Department of Microbiology

6.7.1 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/](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 places 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, submit your application early.

Programme Structure

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

Duration of Programme

The normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins one week before the general start of classes.

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10439</td>
<td>772</td>
<td>60</td>
<td>Experimental Microbiology</td>
<td>Both</td>
</tr>
<tr>
<td>10721</td>
<td>773</td>
<td>30</td>
<td>Techniques in Molecular Microbiology</td>
<td>Both</td>
</tr>
<tr>
<td>10483</td>
<td>774</td>
<td>30</td>
<td>Selected Topics</td>
<td>Both</td>
</tr>
</tbody>
</table>

Assessment and Examination

All modules in this honours programme are assessed continuously using a combination of theory, practical work, written assignments, reports and presentations, with an oral examination at the end of the year. The final mark is calculated as a weighted mark according to the credit value of each module. If you fail a module in the honours programme, you may apply to repeat this module in the following year. Admission to the module in the following year is solely at the discretion of the department and is subject to the availability of space.

6.7.2 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 at 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66281</td>
<td>828</td>
<td>180</td>
<td>Thesis Microbiology</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.

6.7.3 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 at the Faculty of Science.

6.7.4 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 at the Faculty of Science.

6.8 Department of Physics

6.8.1 Postgraduate programmes in Physics

6.8.1.1 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 places 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
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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins a week before the general start of classes.

Programme Content
The curricula of the respective streams are set out below.

Stream Laser Physics (128 credits)
Compulsory Modules
(credits = 104)

Compulsory modules can only be replaced by alternative modules in consultation with the coordinator of the Laser Physics Honours programme, and with approval of the departmental programme committee.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10445</td>
<td>711</td>
<td>8</td>
<td>Electromagnetism</td>
<td>1</td>
</tr>
<tr>
<td>10590</td>
<td>712</td>
<td>8</td>
<td>Lagrange and Hamilton Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>10586</td>
<td>714</td>
<td>16</td>
<td>Quantum Mechanics B (Advanced Formalism and Applications)</td>
<td>1</td>
</tr>
<tr>
<td>10390</td>
<td>716</td>
<td>8</td>
<td>Atomic Physics</td>
<td>1</td>
</tr>
<tr>
<td>10702</td>
<td>721</td>
<td>16</td>
<td>Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems)</td>
<td>2</td>
</tr>
<tr>
<td>63274</td>
<td>741</td>
<td>32</td>
<td>Physics Project</td>
<td>2</td>
</tr>
<tr>
<td>13934</td>
<td>745</td>
<td>8</td>
<td>Laser Technology</td>
<td>2</td>
</tr>
<tr>
<td>17221</td>
<td>772</td>
<td>8</td>
<td>Optics</td>
<td>1</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 24)

Please note: The elective modules available in any particular year will vary depending on availability of lecturing staff or visiting lecturers. The programme offering for a given academic year will be finalized and approved by the departmental programme committee before the start of the academic year and communicated to potential students.

Choose three of the following modules to the value of 24 credits.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10752</td>
<td>713</td>
<td>8</td>
<td>Solid State Physics</td>
<td>1</td>
</tr>
<tr>
<td>13940</td>
<td>742</td>
<td>8</td>
<td>Special Topics in Applied Photonics</td>
<td>Both</td>
</tr>
<tr>
<td>13939</td>
<td>743</td>
<td>8</td>
<td>Special Topics in Biophotonics</td>
<td>Both</td>
</tr>
<tr>
<td>12546</td>
<td>744</td>
<td>8</td>
<td>Laser Spectroscopy</td>
<td>2</td>
</tr>
<tr>
<td>13936</td>
<td>746</td>
<td>8</td>
<td>Quantum Optics</td>
<td>2</td>
</tr>
<tr>
<td>10610</td>
<td>747</td>
<td>8</td>
<td>Molecular Physics</td>
<td>2</td>
</tr>
<tr>
<td>13937</td>
<td>773</td>
<td>8</td>
<td>Nonlinear Optics</td>
<td>2</td>
</tr>
<tr>
<td>13938</td>
<td>774</td>
<td>8</td>
<td>Special Topics in Optics</td>
<td>Both</td>
</tr>
</tbody>
</table>
Stream Nuclear Physics (128 credits)

Compulsory Modules

(credits = 112)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10445</td>
<td>711</td>
<td>8</td>
<td>Electromagnetism</td>
<td>1</td>
</tr>
<tr>
<td>10590</td>
<td>712</td>
<td>8</td>
<td>Lagrange and Hamilton Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>10752</td>
<td>713</td>
<td>8</td>
<td>Solid State Physics</td>
<td>1</td>
</tr>
<tr>
<td>10586</td>
<td>714</td>
<td>16</td>
<td>Quantum Mechanics B (Advanced Formalism and Applications)</td>
<td>1</td>
</tr>
<tr>
<td>10708</td>
<td>718</td>
<td>8</td>
<td>Radiation Interaction</td>
<td>2</td>
</tr>
<tr>
<td>10702</td>
<td>721</td>
<td>16</td>
<td>Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems)</td>
<td>2</td>
</tr>
<tr>
<td>63274</td>
<td>741</td>
<td>32</td>
<td>Physics Project</td>
<td>2</td>
</tr>
<tr>
<td>10563</td>
<td>748</td>
<td>8</td>
<td>Nuclear Reactions and Nuclear Structure</td>
<td>2</td>
</tr>
<tr>
<td>10706</td>
<td>753</td>
<td>8</td>
<td>Radiation Protection</td>
<td>2</td>
</tr>
</tbody>
</table>

plus

Elective Modules

(credits = 16)

Choose two of the following modules.

Please note: All of these modules will not necessarily be presented each year

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10587</td>
<td>719</td>
<td>8</td>
<td>Quantum Mechanics C (Functional Integral Formulation)</td>
<td>1</td>
</tr>
<tr>
<td>13941</td>
<td>749</td>
<td>8</td>
<td>Selected Topics in Nuclear Physics</td>
<td>2</td>
</tr>
<tr>
<td>10753</td>
<td>754</td>
<td>8</td>
<td>Many-body Theory</td>
<td>2</td>
</tr>
<tr>
<td>10674</td>
<td>755</td>
<td>8</td>
<td>Relativistic Quantum Field Theory</td>
<td>2</td>
</tr>
</tbody>
</table>

Stream Radiation and Health Physics (128 credits)

Compulsory Modules

Compulsory modules can only be replaced by alternative Physics modules in consultation with the coordinator of the Radiation and Health Physics Honours programme, and with approval of the departmental programme committee.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10445</td>
<td>711</td>
<td>8</td>
<td>Electromagnetism</td>
<td>1</td>
</tr>
<tr>
<td>10590</td>
<td>712</td>
<td>8</td>
<td>Lagrange and Hamilton Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>10752</td>
<td>713</td>
<td>8</td>
<td>Solid State Physics</td>
<td>1</td>
</tr>
<tr>
<td>10586</td>
<td>714</td>
<td>16</td>
<td>Quantum Mechanics B (Advanced Formalism and Applications)</td>
<td>1</td>
</tr>
<tr>
<td>10390</td>
<td>716</td>
<td>8</td>
<td>Atomic Physics</td>
<td>1</td>
</tr>
<tr>
<td>10708</td>
<td>718</td>
<td>8</td>
<td>Radiation Interaction</td>
<td>2</td>
</tr>
<tr>
<td>63274</td>
<td>741</td>
<td>32</td>
<td>Physics Project</td>
<td>2</td>
</tr>
<tr>
<td>10563</td>
<td>748</td>
<td>8</td>
<td>Nuclear Reactions and Nuclear Structure</td>
<td>2</td>
</tr>
<tr>
<td>10467</td>
<td>750</td>
<td>8</td>
<td>Physics of Radiation Dosimetry/Radiology</td>
<td>2</td>
</tr>
<tr>
<td>10465</td>
<td>751</td>
<td>8</td>
<td>Physics of Nuclear Medicine</td>
<td>2</td>
</tr>
<tr>
<td>10466</td>
<td>752</td>
<td>8</td>
<td>Physics of Radiotherapy</td>
<td>2</td>
</tr>
<tr>
<td>10706</td>
<td>753</td>
<td>8</td>
<td>Radiation Protection</td>
<td>2</td>
</tr>
</tbody>
</table>
Stream Theoretical Physics (128 credits)

Compulsory Modules
(credits = 96)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10445</td>
<td>711</td>
<td>8</td>
<td>Electromagnetism</td>
<td>1</td>
</tr>
<tr>
<td>10590</td>
<td>712</td>
<td>8</td>
<td>Lagrange and Hamilton Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>10752</td>
<td>713</td>
<td>8</td>
<td>Solid State Physics</td>
<td>1</td>
</tr>
<tr>
<td>10586</td>
<td>714</td>
<td>16</td>
<td>Quantum Mechanics B (Advanced Formalism and Applications)</td>
<td>1</td>
</tr>
<tr>
<td>13948</td>
<td>719</td>
<td>8</td>
<td>Relativistic Quantum Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>10702</td>
<td>721</td>
<td>16</td>
<td>Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems)</td>
<td>2</td>
</tr>
<tr>
<td>63274</td>
<td>741</td>
<td>32</td>
<td>Physics Project</td>
<td>2</td>
</tr>
</tbody>
</table>

plus

Elective Modules
(credits = 32)

Please note: The elective modules available in any particular year will vary depending on availability of lecturing staff or visiting lecturers. The programme offering for a given academic year will be finalized and approved by the departmental programme committee before the start of the year and communicated to potential students.

Choose modules from the following list to the value of 16 credits.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>13985</td>
<td>757</td>
<td>8</td>
<td>Bayesian Physics</td>
<td>2</td>
</tr>
<tr>
<td>10424</td>
<td>758</td>
<td>8</td>
<td>Dynamic Systems and Complexity</td>
<td>1</td>
</tr>
<tr>
<td>10753</td>
<td>754</td>
<td>8</td>
<td>Many-body Theory</td>
<td>2</td>
</tr>
<tr>
<td>10674</td>
<td>755</td>
<td>16</td>
<td>Relativistic Quantum Field Theory</td>
<td>2</td>
</tr>
<tr>
<td>13942</td>
<td>756</td>
<td>8</td>
<td>Selected Topics in Theoretical Physics</td>
<td>2</td>
</tr>
</tbody>
</table>

plus

Choose modules to the value of 16 credits from honours modules in Physics, Mathematics or Applied Mathematics in consultation with the Department of Physics.

6.8.1.2 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66249</td>
<td>828</td>
<td>156</td>
<td>Thesis Physics</td>
<td>Both</td>
</tr>
<tr>
<td>12278</td>
<td>838</td>
<td>24</td>
<td>Advanced Physics Seminar and Coursework</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.
6.8.1.3 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 at the Faculty of Science.

6.8.1.4 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 at the Faculty of Science.

6.8.2 Postgraduate programmes in Physical and Mathematical Analysis

6.8.2.1 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 places 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>63274</td>
<td>741</td>
<td>32</td>
<td>Physics Project</td>
<td>2</td>
</tr>
<tr>
<td>10702</td>
<td>721</td>
<td>16</td>
<td>Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems)</td>
<td>2</td>
</tr>
</tbody>
</table>

Applied Mathematics

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>62812</td>
<td>773</td>
<td>16</td>
<td>Numerical Modelling</td>
<td>Both</td>
</tr>
</tbody>
</table>

Mathematics

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>20405</td>
<td>749</td>
<td>8</td>
<td>Wavelet analysis</td>
<td>2</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>63274</td>
<td>741</td>
<td>32</td>
<td>Physics Project</td>
<td>2</td>
</tr>
</tbody>
</table>

**Computer Science**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>64947</td>
<td>712</td>
<td>16</td>
<td>Advanced Algorithms</td>
<td>1</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>64971</td>
<td>716</td>
<td>16</td>
<td>Advanced Topics in Computer Science 1</td>
<td>2</td>
</tr>
</tbody>
</table>

**Applied Mathematics**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>62782</td>
<td>784</td>
<td>16</td>
<td>Coding Theory</td>
<td>Both</td>
</tr>
</tbody>
</table>

**Mathematics**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10378</td>
<td>711</td>
<td>16</td>
<td>Algebra</td>
<td>1</td>
</tr>
<tr>
<td>62871</td>
<td>714</td>
<td>16</td>
<td>Set Theory and Topology</td>
<td>1</td>
</tr>
<tr>
<td>10379</td>
<td>747</td>
<td>8</td>
<td>Algebraic Number Theory</td>
<td>2</td>
</tr>
<tr>
<td>62995</td>
<td>748</td>
<td>8</td>
<td>Computational Algebra</td>
<td>2</td>
</tr>
</tbody>
</table>

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.
6.8.2.2  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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>66257</td>
<td>828</td>
<td>180</td>
<td>Thesis Physical and Mathematical Analysis</td>
<td>Both</td>
</tr>
</tbody>
</table>

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 at the Faculty of Science.

6.8.2.3  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 at the Faculty of Science.

6.9 Department of Physiological Sciences

6.9.1  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 at third-year level from another university and obtained a final mark of at least 60%, your application will also be considered. In that case your marks achieved in Biochemistry courses at this same university will also be taken into consideration.

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 places available, applications will be considered until the beginning of the academic year.

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

The honours programme consists of compulsory modules (90 credits) and elective modules (30 credits). The department will select the three elective modules for each year, which is then compulsory for the students of the particular year. The lectures build on your existing knowledge of selected topics in physiology that are relevant to lecturers’ research focus areas, and include modules that integrate whole-body and systems physiology with cellular and molecular physiology. The practical component introduces students to a vast array of current and relevant research techniques. 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 normal duration of the programme is one year, but under exceptional circumstances and at the discretion of the department, it is possible to repeat a module. The programme begins with the start of the academic year.

Compulsory Modules

(credits = 90)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>13237</td>
<td>774</td>
<td>20</td>
<td>Metabolism in Health and Disease</td>
<td>1</td>
</tr>
<tr>
<td>13235</td>
<td>772</td>
<td>20</td>
<td>Physiology and Pathophysiology</td>
<td>Both</td>
</tr>
<tr>
<td>54895</td>
<td>776</td>
<td>30</td>
<td>Research Project in Physiological Sciences</td>
<td>Both</td>
</tr>
<tr>
<td>66192</td>
<td>781</td>
<td>20</td>
<td>Research Methodology in Physiological Sciences</td>
<td>Both</td>
</tr>
</tbody>
</table>

Elective Modules

(credits = 30)

Departmental staff will select modules to the value of 30 credits from the following list which will be offered in the particular year.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>13233</td>
<td>771</td>
<td>10</td>
<td>Regenerative Physiology in Injury and Disease</td>
<td>1</td>
</tr>
<tr>
<td>13236</td>
<td>773</td>
<td>10</td>
<td>Signal Transduction in Physiology and Pathophysiology</td>
<td>1</td>
</tr>
<tr>
<td>11260</td>
<td>775</td>
<td>10</td>
<td>Stress Physiology</td>
<td>1</td>
</tr>
<tr>
<td>14067</td>
<td>780</td>
<td>10</td>
<td>Haematology and Coagulation</td>
<td>1</td>
</tr>
</tbody>
</table>

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 successfully obtain this honours degree, you must achieve a subminimum of 50% for each module.

6.9.2 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 at the Faculty of Science.

Programme Content

This programme consists of a 100% thesis.

Compulsory Module

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>59803</td>
<td>828</td>
<td>180</td>
<td>Thesis: Physiological Sciences</td>
<td>Both</td>
</tr>
</tbody>
</table>

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.
6.9.3 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 at the Faculty of Science.

6.9.4 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 at the Faculty of Science.

6.9.5 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 academic committee have the final decision on admission, taking into account the infrastructure and capacity of the Department.

Closing Date for Applications
Apply online at http://www0.sun.ac.za/pgstudies/ 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 three theoretical modules. 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 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.

Compulsory Modules

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10630</td>
<td>882</td>
<td>20</td>
<td>Exercise Immunology, Endocrinology and Haematology</td>
<td>Both</td>
</tr>
<tr>
<td>10614</td>
<td>883</td>
<td>20</td>
<td>Multidisciplinary Approach to Muscle Physiology</td>
<td>Both</td>
</tr>
<tr>
<td>13511</td>
<td>884</td>
<td>20</td>
<td>Exercise Physiology and Metabolism</td>
<td>Both</td>
</tr>
<tr>
<td>12919</td>
<td>827</td>
<td>120</td>
<td>Thesis in Exercise Science</td>
<td>Both</td>
</tr>
</tbody>
</table>

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 a final mark of 50% for each module.
7. Postgraduate programmes in other faculties

7.1 Faculty of AgriSciences

7.1.1 Department of Conservation Ecology and Entomology

7.1.1.1 MSc in Entomology

Programme Code
34576 – 879(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.

7.1.1.2 PhD and DSc in Entomology

For information on doctoral programmes in Entomology, please consult Part 7 (Faculty of AgriSciences) of the Calendar.

7.1.2 Department of Genetics

7.1.2.1 Postgraduate programmes in Genetics

a) 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 October 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. As an honours student you are expected to attend departmental seminars and to act as an undergraduate demonstrator.

Compulsory Modules

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10481</td>
<td>Genetics: Molecular Techniques</td>
</tr>
<tr>
<td>10478</td>
<td>Genetic Data Analysis</td>
</tr>
<tr>
<td>11061</td>
<td>Biometrical Applications and Data Analysis in R</td>
</tr>
<tr>
<td>13594</td>
<td>Genomics</td>
</tr>
<tr>
<td>13538</td>
<td>Scientific and Proposal Writing</td>
</tr>
<tr>
<td>18007</td>
<td>Project</td>
</tr>
<tr>
<td>711(16)</td>
<td>Genetics: Molecular Techniques</td>
</tr>
<tr>
<td>713(8)</td>
<td>Genetic Data Analysis</td>
</tr>
<tr>
<td>721(8)</td>
<td>Biometrical Applications and Data Analysis in R</td>
</tr>
<tr>
<td>716(8)</td>
<td>Genomics</td>
</tr>
<tr>
<td>721(8)</td>
<td>Scientific and Proposal Writing</td>
</tr>
<tr>
<td>741(64)</td>
<td>Honours Project in Genetics</td>
</tr>
</tbody>
</table>

plus

Elective Modules

Choose one of the following modules.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>13596</td>
<td>Human and Animal Genetics</td>
</tr>
<tr>
<td>13537</td>
<td>Plant Genetics and Crop Improvement</td>
</tr>
<tr>
<td>712(8)</td>
<td>Human and Animal Genetics</td>
</tr>
<tr>
<td>722(8)</td>
<td>Plant Genetics and Crop Improvement</td>
</tr>
</tbody>
</table>

Assessment and Examination

The programme is assessed by means of flexible assessment. To complete the honours programme successfully, you must complete the compulsory molecular techniques module, all prescribed theory modules and a research project successfully.
b) MSc in Genetics

Programme Code
13285 – 879(180)

Specific Admission Requirements

- An applicable honours degree preferably in Botany, Genetics, Microbiology, Biochemistry, Zoology, Animal Science or Plant Biotechnology; or a relevant four-year BScAgric degree in Plant or Animal Production Systems with Plant, Animal Breeding or Genetics as a subject major.
- An average final mark of 60% for the honours degree, or subject major in the case of a BScAgric degree.

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. 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 at the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

Compulsory Module

| 62448 : Genetics | 828(180): Master’s thesis: Genetics |

Assessment and Examination

An oral examination is required.

c) 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 at the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

d) 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 at the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.

7.1.2.2 Postgraduate programmes in Plant Biotechnology

a) BScHonors 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 academic year and begins at the start of the general 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>10481</td>
<td>Genetics: Molecular Techniques</td>
<td>16</td>
</tr>
<tr>
<td>13594</td>
<td>Genomics</td>
<td>8</td>
</tr>
<tr>
<td>13538</td>
<td>Scientific and Proposal Writing</td>
<td>8</td>
</tr>
<tr>
<td>13537</td>
<td>Plant Genetics and Crop Improvement</td>
<td>8</td>
</tr>
<tr>
<td>12582</td>
<td>Research Module in Plant Biotechnology</td>
<td>64</td>
</tr>
</tbody>
</table>

plus

Elective Modules
Choose two of the following modules.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>17523</td>
<td>Plant Physiology</td>
<td>8</td>
</tr>
<tr>
<td>10475</td>
<td>Integrated Plant Metabolism</td>
<td>8</td>
</tr>
<tr>
<td>11061</td>
<td>Biometrical Applications and Data Analysis in R</td>
<td>8</td>
</tr>
</tbody>
</table>

Assessment and Examination

- The programme is assessed by means of flexible assessment.
- To complete the honours programme successfully, you must complete the compulsory molecular techniques module, all prescribed theory modules and a research project successfully.

b) MSc in Plant Biotechnology

Programme Code
53287 – 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. 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 at the Faculty of Sciences, as well as Part 7 (Faculty of AgriSciences) of the Calendar.

Compulsory Module

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>66311</td>
<td>Thesis Plantbiotechnology</td>
<td>180</td>
</tr>
</tbody>
</table>

Assessment and Examination
An oral examination is required.

c) 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 at the Faculty of Science as well as Part 7 (Faculty of AgriSciences) of the Calendar.
7.1.3 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.

7.1.3.1 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, BScAgri 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Chemisty and biochemistry of grapes and wine (20)</td>
</tr>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Research methodology for grapevine and wine biotechnology (30)</td>
</tr>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Techniques in grape and wine sciences (20)</td>
</tr>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Wine-related microbes (20)</td>
</tr>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Grape structure, functioning and grapevine molecular biology and biotechnology (20)</td>
</tr>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Seminar (10)</td>
</tr>
</tbody>
</table>

7.1.3.2 MScAgric or MSc in Wine Biotechnology

Programme Code
50997 – 879(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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>50997 : Wine Biotechnology</td>
<td>Master’s thesis (180)</td>
</tr>
</tbody>
</table>

7.1.3.3 PhD and DSc in Wine Biotechnology

For information on doctoral programmes in Wine Biotechnology, please consult Part 7 (Faculty of AgriSciences) of the Calendar.
7.2 Faculty of Arts and Social Sciences

7.2.1 Department of Geography and Environmental Studies

7.2.1.1 BScHons in GeoInformatics

*Programme Code*
12279 – 778 (120)

*Specific Admission Requirements*
- A BSc degree in Geographical Information Technology or a related subject 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 technology, which includes geographical information systems and remote sensing techniques 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.

*Compulsory Modules*

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>63398</td>
<td>712</td>
<td>30</td>
<td>Advanced Remote Sensing</td>
<td>1</td>
</tr>
<tr>
<td>49611</td>
<td>713</td>
<td>30</td>
<td>Geographical Information Systems</td>
<td>1</td>
</tr>
<tr>
<td>12187</td>
<td>716</td>
<td>30</td>
<td>Spatial Modelling and Geographical Communication</td>
<td>1</td>
</tr>
<tr>
<td>63363</td>
<td>742</td>
<td>30</td>
<td>Environmental Geography Research Application</td>
<td>2</td>
</tr>
</tbody>
</table>

*Assessment and Examination*
This programme is assessed continuously through tests, assignments, a research project, and oral presentations. 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*
Dr J Kemp
Tel: 021 808 3218
E-mail: jkemp@sun.ac.za
Departmental website: http://www.sun.ac.za/geography

7.2.1.2 MSc in GeoInformatics

*Programme Code*
12279 – 879(180)

*Specific Admission Requirements*
- A BScHons degree in GeoInformatics or an approved equivalent qualification.
- An average final mark of 60% for the BScHons degree.

*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*

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>12280</td>
<td>875</td>
<td>180</td>
<td>Thesis GeoInformatics</td>
<td>Both</td>
</tr>
</tbody>
</table>
**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.

**Further study possibilities**

The successful completion of the MSc in GeoInformatics leads to a PhD in GeoInformatics.

**Enquiries**

Prof A van Niekerk  
Tel: 021 808 3218/3101  
E-mail: avn@sun.ac.za  
Departmental website: http://www.sun.ac.za/geography

### 7.2.1.3 PhD in GeoInformatics

**Programme Code**

12279 – 978 (360)

**Programme Content**

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 at the Faculty of Science.

### 7.2.1.4 MSc in Geography and Environmental Studies

**Programme Code**

49913 – 879 (180)

**Specific Admission Requirements**

- An appropriate honours degree with Geography and Environmental Studies or an appropriate discipline as major.
- An average final mark of 60% for the BScHons degree.

**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**

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Coe</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>49913</td>
<td>828</td>
<td>180</td>
<td>Thesis Geography and Environmental Studies</td>
<td>Both</td>
</tr>
</tbody>
</table>

**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

### 7.2.1.5 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

7.3 Faculty of Economic and Management Sciences
7.3.1 Department of Logistics
7.3.1.1 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>65269</td>
<td>746</td>
<td>12</td>
<td>Applied Stochastic Simulation (Dept. of Statistics and Actuarial Science)</td>
<td>2</td>
</tr>
<tr>
<td>11047</td>
<td>774</td>
<td>30</td>
<td>Research Assignment: Operational Research</td>
<td>Both</td>
</tr>
</tbody>
</table>

Elective Modules
(at least 78 credits)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10906</td>
<td>712</td>
<td>15</td>
<td>Advanced linear programming (Compulsory for students who have not taken Operations Research as a major subject)</td>
<td>1</td>
</tr>
<tr>
<td>12318</td>
<td>713</td>
<td>15</td>
<td>Metaheuristics (Dept. of Logistics)</td>
<td>1</td>
</tr>
<tr>
<td>10925</td>
<td>742</td>
<td>15</td>
<td>Location of facilities (Dept. of Logistics)</td>
<td>2</td>
</tr>
<tr>
<td>10932</td>
<td>743</td>
<td>15</td>
<td>Inventory control (Dept. of Logistics)</td>
<td>2</td>
</tr>
<tr>
<td>10931</td>
<td>743</td>
<td>15</td>
<td>Game theory (Dept. of Logistics)</td>
<td>1</td>
</tr>
<tr>
<td>11907</td>
<td>786</td>
<td>15</td>
<td>Methods of Operational Research (Dept. of Logistics)</td>
<td>2</td>
</tr>
<tr>
<td>10542</td>
<td>782</td>
<td>16</td>
<td>Graph Theory (Dept. of Mathematical Sciences)</td>
<td>2</td>
</tr>
<tr>
<td>10748</td>
<td>722</td>
<td>12</td>
<td>Applied time series analysis A (Dept. of Statistics and Actuarial Science)</td>
<td>1</td>
</tr>
<tr>
<td>10600</td>
<td>721</td>
<td>12</td>
<td>Multivariate methods in statistics A (Dept. of Statistics and Actuarial Science)</td>
<td>1</td>
</tr>
<tr>
<td>10601</td>
<td>751</td>
<td>12</td>
<td>Multivariate methods in statistics B (Dept. of Statistics and Actuarial Science)</td>
<td>2</td>
</tr>
<tr>
<td>58777</td>
<td>741</td>
<td>12</td>
<td>Data mining (Dept. of Statistics and Actuarial Science)</td>
<td>2</td>
</tr>
<tr>
<td>10440</td>
<td>713</td>
<td>12</td>
<td>Experimental design (Dept. of Statistics and Actuarial Science)</td>
<td>1</td>
</tr>
<tr>
<td>64009</td>
<td>714</td>
<td>15</td>
<td>Capita Selecta (Operations Research) (Dept. of Logistics)</td>
<td>1</td>
</tr>
<tr>
<td>64009</td>
<td>744</td>
<td>15</td>
<td>Capita Selecta (Operations Research) (Dept. of Logistics)</td>
<td>2</td>
</tr>
<tr>
<td>40541</td>
<td>774</td>
<td>15</td>
<td>System Dynamics</td>
<td>Both</td>
</tr>
</tbody>
</table>
7.3.1.2  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.

7.3.1.3  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.

Compulsory Module

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11243</td>
<td>884</td>
<td>150</td>
<td>Thesis: Operational Research</td>
<td>Both</td>
</tr>
</tbody>
</table>

Elective Modules

(at least 30 credits)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10694</td>
<td>811</td>
<td>15</td>
<td>Bootstrap and other resampling techniques A (Dept. Of Statistics and Actuarial Science)</td>
<td>Both</td>
</tr>
<tr>
<td>10695</td>
<td>841</td>
<td>15</td>
<td>Bootstrap and Other Resampling Techniques B (Dept. Of Statistics and Actuarial Science)</td>
<td>2</td>
</tr>
<tr>
<td>64009</td>
<td>814</td>
<td>15</td>
<td>Capita Selecta 1 (Operations Research) (Dept. of Logistics)</td>
<td>1</td>
</tr>
<tr>
<td>64009</td>
<td>844</td>
<td>15</td>
<td>Capita Selecta 2 (Operations Research) (Dept. of Logistics)</td>
<td>2</td>
</tr>
</tbody>
</table>

7.3.1.4  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.

7.3.2  Department of Statistics and Actuarial Science

7.3.2.1  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.
- Selection will be based on academic merit and only a limited number of students may be selected.

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>22853</td>
<td>778</td>
<td>120</td>
<td>Honours programme in Mathematical Statistics</td>
<td>Both</td>
</tr>
</tbody>
</table>

Compulsory Modules
(36 credits)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>13074</td>
<td>723</td>
<td>6</td>
<td>Introduction to Corequisite module: Programming</td>
<td>1</td>
</tr>
<tr>
<td>11228</td>
<td>791</td>
<td>30</td>
<td>Research Assignment: Mathematical Statistics</td>
<td>Both</td>
</tr>
</tbody>
</table>

Elective Modules
(at least 84 credits)

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10394</td>
<td>711</td>
<td>12</td>
<td>Bayesian statistics</td>
<td>1</td>
</tr>
<tr>
<td>10408</td>
<td>712</td>
<td>12</td>
<td>Biostatistics</td>
<td>1</td>
</tr>
<tr>
<td>11922</td>
<td>724</td>
<td>12</td>
<td>Capita Selecta in Mathematical Statistics A</td>
<td>1</td>
</tr>
<tr>
<td>11923</td>
<td>754</td>
<td>12</td>
<td>Capita Selecta in Mathematical Statistics B</td>
<td>2</td>
</tr>
<tr>
<td>58777</td>
<td>741</td>
<td>12</td>
<td>Data mining</td>
<td>2</td>
</tr>
<tr>
<td>10440</td>
<td>713</td>
<td>12</td>
<td>Experimental design</td>
<td>1</td>
</tr>
<tr>
<td>10602</td>
<td>715</td>
<td>12</td>
<td>Multivariate statistical analysis A</td>
<td>1</td>
</tr>
<tr>
<td>10603</td>
<td>745</td>
<td>12</td>
<td>Multivariate statistical analysis B</td>
<td>2</td>
</tr>
<tr>
<td>10636</td>
<td>746</td>
<td>12</td>
<td>Survival analysis</td>
<td>2</td>
</tr>
<tr>
<td>10705</td>
<td>742</td>
<td>12</td>
<td>Sampling techniques</td>
<td>1</td>
</tr>
<tr>
<td>65250</td>
<td>718</td>
<td>12</td>
<td>Stochastic Simulation</td>
<td>1</td>
</tr>
<tr>
<td>10751</td>
<td>747</td>
<td>12</td>
<td>Time series analysis B</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

7.3.2.2  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.
- Selection will be based on academic merit and only a limited number of students may be selected.

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 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>22853</td>
<td>879</td>
<td>180</td>
<td>MCom and MSc in Mathematical Statistics (coursework plus thesis option)</td>
<td>Both</td>
</tr>
</tbody>
</table>

Compulsory thesis: Mathematical Statistics

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11246</td>
<td>891</td>
<td>90</td>
<td>Thesis: Mathematical Statistics</td>
<td>Both</td>
</tr>
</tbody>
</table>

Elective Modules
Choose modules from the table below to obtain at least 180 credits together with the thesis.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10441</td>
<td>813</td>
<td>15</td>
<td>Extreme Value Theory A</td>
<td>2</td>
</tr>
<tr>
<td>10442</td>
<td>843</td>
<td>15</td>
<td>Extreme Value Theory B</td>
<td>2</td>
</tr>
<tr>
<td>10523</td>
<td>818</td>
<td>15</td>
<td>Advanced Sampling Techniques</td>
<td>2</td>
</tr>
<tr>
<td>10524</td>
<td>819</td>
<td>15</td>
<td>Advanced Mathematical Statistics A</td>
<td>1</td>
</tr>
<tr>
<td>11173</td>
<td>849</td>
<td>15</td>
<td>Advanced Mathematical Statistics B</td>
<td>2</td>
</tr>
<tr>
<td>10694</td>
<td>811</td>
<td>15</td>
<td>Bootstrap and Other Resampling Techniques A</td>
<td>1</td>
</tr>
<tr>
<td>10695</td>
<td>841</td>
<td>15</td>
<td>Bootstrap and Other Resampling Techniques B</td>
<td>2</td>
</tr>
<tr>
<td>18130</td>
<td>822</td>
<td>15</td>
<td>Multi-dimensional Scaling A</td>
<td>1</td>
</tr>
<tr>
<td>11910</td>
<td>852</td>
<td>15</td>
<td>Multi-dimensional Scaling B</td>
<td>2</td>
</tr>
<tr>
<td>10703</td>
<td>812</td>
<td>15</td>
<td>Statistical Learning Theory A</td>
<td>2</td>
</tr>
<tr>
<td>10704</td>
<td>842</td>
<td>15</td>
<td>Statistical Learning Theory B</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

7.3.2.3 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.
- Selection will be based on academic merit and only a limited number of students may be selected.

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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>22853</td>
<td>889</td>
<td>180</td>
<td>MCom and MSc in Mathematical Statistics (coursework plus assignment option)</td>
<td>Both</td>
</tr>
</tbody>
</table>
Compulsory Assignment: Mathematical Statistics modules

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>11228</td>
<td>895</td>
<td>60</td>
<td>Research Assignment: Mathematical Statistics</td>
<td>Both</td>
</tr>
</tbody>
</table>

Elective Modules
Choose from the modules below to obtain at least 180 credits together with the assignment.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module Code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>10523</td>
<td>818</td>
<td>15</td>
<td>Advanced sampling techniques</td>
<td>2</td>
</tr>
<tr>
<td>10524</td>
<td>819</td>
<td>15</td>
<td>Advanced Mathematical Statistics A</td>
<td>1</td>
</tr>
<tr>
<td>11173</td>
<td>849</td>
<td>15</td>
<td>Advanced Mathematical Statistics B</td>
<td>2</td>
</tr>
<tr>
<td>10694</td>
<td>811</td>
<td>15</td>
<td>Bootstrap and other resampling techniques A</td>
<td>Both</td>
</tr>
<tr>
<td>10695</td>
<td>841</td>
<td>15</td>
<td>Bootstrap And Other Resampling Techniques B</td>
<td>2</td>
</tr>
<tr>
<td>10441</td>
<td>813</td>
<td>15</td>
<td>Extreme value theory A</td>
<td>2</td>
</tr>
<tr>
<td>10442</td>
<td>843</td>
<td>15</td>
<td>Extreme value theory B</td>
<td>2</td>
</tr>
<tr>
<td>18130</td>
<td>822</td>
<td>15</td>
<td>Multi-dimensional scaling A</td>
<td>1</td>
</tr>
<tr>
<td>11910</td>
<td>852</td>
<td>15</td>
<td>Multi-dimensional scaling B</td>
<td>2</td>
</tr>
<tr>
<td>10703</td>
<td>812</td>
<td>15</td>
<td>Statistical learning theory A</td>
<td>2</td>
</tr>
<tr>
<td>10704</td>
<td>842</td>
<td>15</td>
<td>Statistical learning theory B</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

7.3.2.4 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

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Module code</th>
<th>Credits</th>
<th>Module Name</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>22853</td>
<td>978</td>
<td>360</td>
<td>PhD in Mathematical statistics</td>
<td>Both</td>
</tr>
</tbody>
</table>

7.4 Faculty of Medicine and Health Sciences

7.4.1 Department of Sport Science
For information on the module content for BScHons in Biokinetics and BScHons in Sport Science, please consult Part 12 (Faculty of Medicine and Health Sciences) of the University Calendar.

7.4.1.1 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 July 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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biokinetics Practice</td>
<td>772(20)</td>
</tr>
<tr>
<td>Ergonomics</td>
<td>775(20)</td>
</tr>
<tr>
<td>Exercise Physiology</td>
<td>774(20)</td>
</tr>
<tr>
<td>Exercise Science</td>
<td>771(20)</td>
</tr>
<tr>
<td>Research Project</td>
<td>773(30)</td>
</tr>
</tbody>
</table>

### 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 Leader: 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/english/faculty/healthsciences/sportscience or http://www.biokinatsun.co.za

### 7.4.1.2 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 July 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

<table>
<thead>
<tr>
<th>Module</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Sport</td>
<td>778(120)</td>
</tr>
</tbody>
</table>

### Compulsory Submodules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional practice in sport science</td>
<td>773(30)</td>
</tr>
<tr>
<td>Research Project</td>
<td>771(30)</td>
</tr>
<tr>
<td>Current Topics in Sport and Exercise Science</td>
<td>721(12), 751(12)</td>
</tr>
<tr>
<td>Biomechanics</td>
<td>712(12)</td>
</tr>
<tr>
<td>Exercise Physiology</td>
<td>743(12)</td>
</tr>
<tr>
<td>Sport Psychology</td>
<td>712(12)</td>
</tr>
<tr>
<td>Applied Exercise Physiology</td>
<td>714(12)</td>
</tr>
</tbody>
</table>

### Additional Modules

<table>
<thead>
<tr>
<th>Module</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Psychology</td>
<td>713(12)</td>
</tr>
<tr>
<td>History of Sport</td>
<td>745(12)</td>
</tr>
<tr>
<td>Kinanthropometry</td>
<td>715(12)</td>
</tr>
<tr>
<td>Motor Control</td>
<td>711(12)</td>
</tr>
<tr>
<td>Motor Learning</td>
<td>741(12)</td>
</tr>
<tr>
<td>Sport for Persons with Disabilities</td>
<td>772(12)</td>
</tr>
<tr>
<td>Statistics for Sport Science and Exercise Science</td>
<td>772(12)</td>
</tr>
</tbody>
</table>
**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 examinations, 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 Leader: Dr SD Jacobs
Department of Sport Science
Tel: 021 808 4736
E-mail: sddjackets@sun.ac.za
Website for more detailed information:
http://www.sun.ac.za/english/faculty/healthsciences/sportscience

### 7.4.1.3 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 July 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**

<table>
<thead>
<tr>
<th>Kinder Kinetics</th>
<th>778(120)</th>
</tr>
</thead>
</table>

**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 Leader: 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/english/faculty/healthsciences/sportscience

7.4.1.4 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 Leader: 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/english/faculty/healthsciences/sportscience

7.4.2 Department of Global Health
7.4.2.1 MSc in Epidemiology
Specific Admission Requirements

- You must have one of the following qualifications at NQF level 8:
  - an MBChB or equivalent degree;
  - a four-year professional bachelor’s degree in a health-related or quantitative sciences discipline;
  - a relevant BScHons degree from this University or another recognised university; or
  - an equivalent qualification approved by Senate for this purpose, or you must have otherwise attained a standard of competence in your field of study deemed adequate for this purpose by Senate.

- You must also have:
  - passed Mathematics at National Senior Certificate (NSC) level or equivalent;
  - computer literacy, including the use of statistical software for data analysis; and
  - fluency in written and spoken English. If you, as an international candidate, are from a non-English speaking country, you must submit official documentary evidence with your application of your competence in English. This may include, among other things:
    - the results of the IELTS test with a minimum IELTS score of 6,5;
    - the results of the TOEFL test with a minimum TOEFL score of 550 (paper based) or 213 (computer based), preferably with a TWE score of 4,5; and/or
    - proof and results of any English courses attended (e.g. English for Medical Students/Englisch für Mediziner).

- You must also submit a draft research proposal to the satisfaction of the Programme Committee.
Application procedure and closing date
Apply online at www.maties.com by 30 September of the previous year. Applications for prospective international students close on 31 August.

All applications are reviewed by a selection committee. Candidates are selected on merit and only a limited number of candidates are admitted to the programme.

Duration of Programme
The programme extends over a minimum of one year on a full-time basis or two years on a part-time basis.

Programme Description
This is a wholly thesis-based master’s programme. It builds competency in epidemiology – the study of the distribution and determinants of health-related states or events in specified populations, and the application of the study to the control of health problems.

Programme Content
You must complete preparatory modules at NQF level 9 on epidemiology, biostatistics and research proposal writing prior to the finalisation of your research protocol.

| Thesis: Epidemiology | 872(180) |

Assessment and examination
- You must complete a thesis that will be assessed according to University guidelines through a process of internal and external examination.
- The thesis counts 100% towards the final mark. You must pass the thesis with at least 50% to obtain the degree.

Enquiries
Programme Leader: Prof P Nyasulu
Tel: 021 938 9886 E-mail: pnyasulu@sun.ac.za
Website: http://www.sun.ac.za/english/faculty/healthsciences/epidemiology-biostatistics/masters/msc-epidemiology

7.4.2.2 PhD in Epidemiology

Programme Code
40037 – 978 (360)

Programme Description
A dissertation containing the results of your independent research is required. Also consult the Section “Postgraduate Qualifications” in Part 1 (General) and the Section “Doctoral Degrees” of Part 12 (Faculty of Medicine and Health Sciences) of the University Calendar.
Subjects, Modules and Module Contents

1. Definitions and explanations of important terms

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 later in this chapter under the module contents.

Example:

<table>
<thead>
<tr>
<th>Five-digit subject number</th>
<th>11053 Biochemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>214 (16) Biomolecules: Structure-function Relationships (3L, 3P)</td>
<td></td>
</tr>
</tbody>
</table>

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 right next to the five-digit subject number, 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
    Year 2: 2
    Year 3: 3
  
  - 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: 114
    - Semester 2: 214
    - Semester 3: 314
    
    - 4, 5 or 6 – modules are presented in the second semester.
    - Semester 2: 414
    - Semester 3: 514
    - Semester 4: 614
  
    - 7, 8 or 9 – modules are presented in both semesters, which are year modules.
    - Year module (both semesters): 278, 378, 478

  - The third digit of the module code 214, in this case “4” serves as a distinguishing digit between various modules of the same subject in a particular year of study.

- **Credit value** –
  
  The number in brackets 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.

- 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

2. Assessment of modules

Modules are assessed by means of tests and examinations unless otherwise indicated in the module content.

3. 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.

- 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.

- 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 flexible assessment, before you can take the module for which it is a prerequisite module.

- 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.

3.1 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.

4. Undergraduate subjects, modules and module contents

Subjects with their accompanying modules, credits, module subjects, teaching loads, language specifications and module contents are presented below.

Faculty of Science Teaching

13623 Science in Context

178 (12) Integrated project in Science (2L, 2T)

The main outcome of this module is a project, exploring Science in context. To develop the expertise required for the project, the following topics will also be covered:

- Scientific Communication skills, which focus on writing, reading, listening and speaking in a scientific context; engaging with and understanding relevant academic and scientific texts; understanding text components; presenting data in a coherent manner; editing texts; using referencing methods correctly to avoid plagiarism; using graphics to clarify data.

- Graduate attributes which include study and time management skills, group work and the ethics of Science.

- Computer skills, which covers basic computer usage as well as development of skills for using word processing, spreadsheet and presentation software for the purpose of compiling, creating, analysing and presenting academic material in a scientific manner.

64007 University Practice in the Natural Sciences

176 (8) University Practice in the Natural Sciences (3L)

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 176, 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.

Method of assessment: Flexible assessment
Centre for Bioinformatics and Computational Biology

12555 Bioinformatics

312 (8) Introduction to Bioinformatics (3L, 3P)
Introduction to bioinformatics topics, including biological databases, sequence alignment, dynamic programming, scoring matrices, BLAST, hidden Markov models (HMMs), phylogenetics, tree building methods, genome organisation and evolution, genome projects and browsers, evolution of proteins, classification of protein structures.

Method of assessment: Flexible assessment

322 (8) Intermediate Bioinformatics (3L, 3P)
Different BLAST methods, next-generation sequencing technologies, genome assembly, Eulerian paths and cycles, de Brjijn graphs, reference genomes, reference genome graphs, three dimensional structures of genomes, read mapping, Burrows-Wheeler transform, variant calling, genome-wide association studies, mapping variants to phenotypes and disease, hidden Markov models (HMMs), the forward–backward algorithm, the Viterbi algorithm, protein homology modeling, molecular dynamics, ligand docking.

Method of assessment: Flexible assessment
Prerequisite module: Bioinformatics 312

Department of Biochemistry

11053 Biochemistry

214 (16) Biomolecules: Structure-function Relationships (3L, 3P)
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.
Structures, characteristics and functions of bio-molecules (bio-elements, water, nucleic acids, proteins, enzymes, coenzymes, carbohydrates, lipids).

Method of assessment: Flexible assessment
Prerequisite pass modules:
- Chemistry 124 or 164, 144
- Biology 124

244 (16) Intermediary Metabolism (3L, 3P)
Bioenergetics; metabolism of carbohydrates, lipids and nitrogenous compounds; integration of metabolism.

Method of assessment: Flexible assessment
Prerequisite module: Biochemistry 214

315 (16) Biophysical and Structural Protein Biochemistry (3L, 3T)
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.
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.
This module must be passed to be considered for selection to do BScHons in Biochemistry.

Method of assessment: Flexible assessment
Prerequisite pass modules:
- Biochemistry 214, 244
- Mathematics (Bio)124 or Mathematics 114

323 (8) Systems Biology (3L, 3T/3P)
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.

Method of assessment: Flexible assessment
Prerequisite pass modules:
- Biochemistry 214, 244
- Mathematics (Bio) 124 or Mathematics 114
345 (16) Specialised Biochemical Topics (3L, 3T)
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.
Method of assessment: Flexible assessment
Prerequisite modules:
- Biochemistry 315
- Bioinformatics 312
- Biochemistry 323 or Bioinformatics 322

353 (16) Food and Beverage Biochemistry (3L, 3P)
The biochemistry of enzymes and proteins in food production and spoilage. The characteristics, applications and analysis of enzymes and proteins involved in food production and spoilage. The effect of enzymes and proteins and their interactions in foods on the nutritional value, sensory quality and safety of food products.
Method of assessment: Flexible assessment
Prerequisite pass modules: Biochemistry 214, 244
Prerequisite module: Applied Chemistry 334

365 (16) Practical protein expression, purification and analysis techniques (3L, 3P)
Recombinant protein expression and protein purification techniques. Analysis of protein purity and integrity. Techniques include: plasmid DNA isolation, PCR, restriction enzyme digest, agarose gel electrophoresis, preparation of competent cells, transformation, induction of protein expression, gel permeation chromatography, ion exchange 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.
Method of assessment: Flexible assessment
Prerequisite modules:
- Biochemistry 315
- Bioinformatics 312
- Biochemistry 323 or Bioinformatics 322

Biochemistry as a major for the BSc degree
The following modules are compulsory: Biochemistry 214(16), 244(16), 315(16), 345(16), 365(16), Bioinformatics 312(8), and Biochemistry 323(8) or Bioinformatics 322(8)

Department of Botany and Zoology

53953 Biodiversity and Ecology

212 (16) Statistics and Other Tools for Biologists (3L, 3P)
This module is a thorough introduction to the key numerical skills and processes underpinning the good practice of biological sciences. It covers experimental design, 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 R Statistical Computing free software. Hands-on statistical exercises cover a range of descriptive statistics, parametric and non-parametric analyses, basic data manipulation, plots, linear regression and analysis of variance. Applied scientific investigatory principles to biology are explored using experimental planning (controls, replication, randomization), ethics, scientific and popular publication processes, and the use of scientific literature.
Corequisite module: Science in Context 178 or Computer Skills 171
214 (16) Principles of Ecology (3L, 3P)
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.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: Biology 144*

*Corequisite module: Biodiversity and Ecology 212 or Probability Theory and Statistics 114 or 144*

224 (16) Diversity and Function of Invertebrates (3L, 3P)
The focus of this module is invertebrate diversity. Major adaptations in morphology (form) and recent molecular changes in taxonomy, as well as physiological adaptations within the major phyla will be explored. Topics will include: recent developments in phylogenetic classifications within the major groups; physiological challenges, such as those related to respiration, osmoregulation, feeding, locomotion, defence, sensory perception and reproduction, which invertebrates face in their respective environments (marine, freshwater and terrestrial); and what strategies are used to cope with or compensate for these challenges. The practical component of the module will entail laboratory work.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: Biology 144 or 154 and a final mark of at least 40% in the other Biology module*

244 (16) Principles of Evolution (3L, 3P)
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.

*Prerequisite pass modules: Biology 124 or 144 and a final mark of at least 40% in the other Biology module*

*Corequisite module: Biodiversity and Ecology 212*

254 (16) Vertebrate Life (3L, 3P)
The module deals with various aspects of vertebrates: where they originated, present diversity, how they evolved, what they do and how they work. Topics covered 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 seminars and practical sessions with data collected in the laboratory or in the field excursion.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: Biology 124 or 154 and a final mark of at least 40% in the other Biology module*

264 (16) Diversity of Plant Form and Function (3L, 3P)
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.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: Biology 144 or 154 and a final mark of at least 40% in the other Biology module*

315 (16) Ecology Field Course (3L, 3P)
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 during the last two weeks of 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 may be selected from other programmes based on past performance and available places.

*Method of assessment: Flexible assessment*

*Prerequisite pass modules: Biodiversity and Ecology 212, 214*

324 (16) Angiosperm Diversity and Evolution (3L, 3P)
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.

**Method of assessment:** Flexible assessment

**Prerequisite pass module:** Biodiversity and Ecology 264

### 334 (16) Global Change Biology (3L, 3P)

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. Where appropriate, principles are illustrated using African examples. Finally, the negative impacts of global change and how to ameliorate them are covered, as is communication about all of the above topics both between scientists, and between scientists and the public.

**Prerequisite pass modules – any 4 of the following 6 modules:**
Biodiversity and Ecology 212, 214, 224, 244, 254, 264

### 344 (16) Evolutionary Ecology (3L, 3P)

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.

**Method of assessment:** Flexible assessment

**Prerequisite pass modules:** Biodiversity and Ecology 212, 214
**Prerequisite module:** Biodiversity and Ecology 244

### 345 (16) Invasion Biology (3L, 3P)

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.

**Method of assessment:** Flexible assessment

**Prerequisite pass modules – any 4 of the following 6 modules:**
Biodiversity and Ecology 212, 214, 224, 244, 254, 264

### 354 (16) Evolutionary Patterns and Processes (3L, 3P)

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.

**Method of assessment:** Flexible assessment

**Prerequisite module:** Biodiversity and Ecology 244

### 364 (16) Conservation Biology (3L, 3P)

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.

**Method of assessment:** Flexible assessment

**Prerequisite pass module:** Biodiversity and Ecology 214
**Prerequisite module:** Biodiversity and Ecology 212
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)
Responsible departments: Biochemistry, Botany and Zoology, and Genetics

144 (16) Biodiversity and Ecology (3L, 3P)
Classification of organisms. Diversity of micro-organisms, plants and animals. Ecological principles and global changes.
Responsible departments: Botany and Zoology, and Microbiology
Corequisite module: Biology 124

146 (16) Principles of Biology (3L, 3P)
For students in the BSc (Extended Degree Programmes).
Responsible department: Botany and Zoology
Method of assessment: Flexible assessment

154 (16) Functional Biology (3L, 3P)
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.
Responsible departments: Botany and Zoology, and Genetics
Method of assessment: Flexible assessment
Corequisite module: Biology 124

59404 Botany

354 (16) Diversity of Plant Form and Function (3L, 3P)
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. Students should master the integration of morphological and physiological evolution across the embryophytes and be able to think and communicate critically about plant form and function.
Method of assessment: Flexible assessment
Prerequisite pass module: Biology 144 or 154 and a final mark of at least 40% in the other Biology module

Department of Chemistry and Polymer Science

Please note:
Students who wish to continue their studies in Chemistry 3 or further, must have passed Chemistry 124, 144 and Mathematics 114, 144 on first-year level.

11479 Chemistry

124 (16) Fundamental Principles of Chemistry I (3L, 3P)
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)
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.
Corequisite module: Chemistry 124
164 (16) Fundamental Principles of Chemistry (3L, 3P)
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.
*If you failed Chemistry 124 in a particular year, you may register for this module in the same academic year only if you achieved a final mark of at least 40% and a practical mark of at least 60%.*
*Mode of delivery: This hybrid-learning module is offered through online themes using SUNLearn as platform, as well as four face-to-face tutorial sessions.*

176 (32) Introduction to Chemistry (3L, 3P)
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; introduction to basic organic chemistry. Examples that illustrate the importance and relevance of science as an everyday phenomenon will be highlighted.

*Method of assessment: Flexible assessment*

214 (16) Organic Chemistry (3L, 3P)
Reaction mechanisms, including nucleophilic addition and substitution, elimination, electrophilic addition, electrophilic aromatic substitution; organometallic reactions; stereochemistry.
*Prerequisite pass modules: Chemistry 124 or 164, 144*

234 (16) Inorganic Chemistry (3L, 3P)
Periodic trends; structure and bonding in molecules; structure and bonding in solids; acid-base chemistry; main group elements. Coordination chemistry: Introduction, types of ligands, nomenclature; isomerism in coordination compounds; different geometries; formation constants; crystal field theory.
*Prerequisite pass module: Chemistry 124 or 164*

254 (16) Physical Chemistry (3L, 3P)
Chemical thermodynamics; colligative properties; phase diagrams; reaction kinetics; probability and introduction to statistical thermodynamics.
*Prerequisite pass module: Chemistry 124 or 164*
*Prerequisite module: Mathematics 114*
*Corequisite module: Mathematics 144*

264 (16) Chemical analysis I (3L, 3P)
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.
*Prerequisite pass modules: Chemistry 124 or 164*
*Prerequisite modules: Mathematics 114 or 144 or Mathematics (Bio) 124 or Engineering Mathematics 115 or 145*

314 (16) Chemical Analysis II (3L, 3P)
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) for molecular structure determination; introduction to analytical mass spectrometry; instrumental chromatographic methods.
*Prerequisite pass module: Chemistry 264*

324 (16) Physical Chemistry (3L, 3P)
Quantum mechanical description of atoms and molecules; vibrational and rotational spectra; advanced statistical thermodynamics; introduction to symmetry.
*Prerequisite module: Chemistry 254*
*Prerequisite pass modules: Mathematics 114, 144*

344 (16) Organic Chemistry (3L, 3P)
Reaction mechanisms, including those pertaining to enolate chemistry, chemo-, stereo- and diastereoselectivity, controlling geometry of double bonds, pericyclic reactions; stereochemistry; syntheses.
*Prerequisite pass module: Chemistry 214*
364 (16) Inorganic Chemistry (3L, 3P)
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).

Prerequisite pass module: Chemistry 234
Prerequisite module: Chemistry 264

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).

52078 Applied Chemistry

315 (16) Materials Technology (3L, 3P)
Industrial production of polymers (processes and grades). A study of industrial processes for the production of textile fabric structures, including new developments that focus on enhancing performance properties. Introduction to the design of functional textiles. Manufacturing processes for polymeric products including the use of additives and compounding, basics of processing techniques, application of processing techniques. Manufacture and use of composite materials and blends.
Corequisite module: Applied Chemistry 324

324 (16) Polymer Science I (3L, 3P)
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 biodegradability, polymers and the environment.
Practicals: laboratory work, seminars and tasks.
Prerequisite modules: Chemistry 214, 264

334 (16) Food and Beverage Chemistry (3L, 3P)
Methods of analysis in the food and beverage industry (infra-red, UV-vis and atomic spectroscopy, calibration-curve error analysis, nuclear magnetic resonance molecular structure analysis and high-performance liquid chromatography); the chemistry of sugars (including the Maillard reaction); the molecular basis for colour in food; chemical aspects of food preservation.
This module may only be taken by students registered for the BSc(Food Sc) programme.
Method of assessment: Flexible assessment
Prerequisite pass modules: Chemistry 214, 264

344 (16) Polymer Science II (3L, 3P)
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.
Practicals: laboratory work, seminars and tasks.
Prerequisite module: Applied Chemistry 324

345 (16) Materials Technology 2 (3L, 3P)
Polymers in industrially relevant applications: Topics focusing on applications relevant to textile science (medical and healthcare products, sportswear, geotextiles, etc.) and other polymeric materials (paints, adhesives, foams, smart packaging, etc.). Product design and failure analyses/problem solving with a focus on industrial applications.
The use of polymeric materials in industrially relevant applications. The emphasis will be on the design of polymeric artefacts as well as problem-solving and fault analyses in commercially available products. Topics will include textiles, coatings, packaging materials, foams, adhesives and composites.
Prerequisite module: Applied Chemistry 315
Corequisite module: Applied Chemistry 344
48321 Chemistry C

152 (6) Chemistry Laboratory Practicals (3P)
Development of laboratory skills by performing introductory chemistry experiments.
Prerequisite module: Engineering Chemistry 123

224 (15) Industrial Chemistry I (4L, 2P)
8 Practicals per semester
Bonding models; solid-state chemistry; introduction to coordination chemistry. Chemical thermodynamics, statistical mechanical understanding of entropy, applications of Gibbs free energy, chemical and phase equilibrium, electrochemistry, colligative properties, elementary chemical kinetics.
Method of assessment: Flexible assessment
Prerequisite pass modules:
- Engineering Chemistry 123
- Chemistry C 152

254 (15) Industrial Chemistry II (4L, 2P)
8 Practicals per semester
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.
Method of assessment: Flexible assessment
Prerequisite module: Chemistry C 224

65692 Chemistry for Health Sciences

112 (8) Chemistry for Health Sciences (2L, 1T)
The module covers areas of general chemistry required as a foundation for studying further in the health sciences streams of physiotherapy and dietetics. It comprises atomic structure and bonding; stoichiometry; gas laws; properties of solutions; chemical kinetics and equilibrium; organic chemistry and biomolecules.
Method of assessment: Flexible assessment

50563 Textile Science

254 (16) Fibre Science (3L, 3P)
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 performance properties and functional textiles for niche markets.
Prerequisite modules: Chemistry 124 or 164, 144

Department of Earth Sciences

64165 Geo-environmental Science

154 (16) Introduction to Earth Systems Science (3L, 3P)
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.
Method of assessment: Flexible assessment
12239 Earth Science Field Skills

172 (8) Earth Science Field Skills (2P)
Students taking the Earth Science Programme must enrol in this module. The module is composed of field or practical work, throughout the year, some of which may be scheduled during holidays or on weekends. The following aspects of Earth Science field skills will be covered: Defining lithological packages, recognizing map scale; working with topographic and geological maps and aerial photos to record information and to locate yourself, using GIS platforms to record spatial information; mineralogy, identification of sedimentary, metamorphic and igneous rocks and structures and their depositional or emplacement significance; practical consideration of natural environment, measuring the impact of human population on natural environment.

Method of assessment: Flexible assessment
Corequisite modules: Geo-environmental Science 124, 154

272 (16) Earth Science Field Skills (2P)
A compulsory module for students taking the Earth Science Programme. The module is composed of sixteen days’ or equivalent period of time compulsory field, practical or project work, spread over one year. This could be on weekends and during term breaks. Field, practical or project 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.

Method of assessment: Flexible assessment
Prerequisite pass modules:
- Earth Science Field Skills 172
- Geo-environmental Science 154
Prerequisite module: Geo-environmental Science 124
Corequisite modules:
- Geology 224, 244, 254
- Environmental Geochemistry 214

374 (16) Earth Science Field Skills (3.5P)
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.

Method of assessment: Flexible assessment
Prerequisite pass modules:
- Earth Science Field Skills 272
- Geology 224, 244, 254
Corequisite modules: Geology 314, 324, 344, 354

13374 Geology

224 (16) Introduction to Mineralogy (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite modules:
- Geo-environmental Science 124
- Chemistry 124 or 164
Prerequisite pass module: Geo-environmental Science 154

244 (16) Physical Earth Sciences and Structural Geology (3L, 3P)
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 sub-minimum of 50% for practical work is required to obtain admission to the examination.

Method of assessment: Flexible assessment

Prerequisite pass modules:
- Geo-environmental Science 124, 154
- Geology 224

Corequisite module: Earth Science Fields Skills 272 or Environmental Field Skills 271

254 (16) Optical Mineralogy and Petrography (3L, 3P)

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.

Students must obtain a 50% sub-minimum on the practical test.

Method of assessment: Flexible assessment

Prerequisite pass modules:
- Geo-environmental Science 124, 154
- Geology 224
- Chemistry 124 or 164

314 (16) Igneous Petrology (3L, 3P)

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 led 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.

A sub-minimum of 50% for practical work is required to obtain admission to the examination.

Method of assessment: Flexible assessment

Prerequisite module: Chemistry 144

Prerequisite pass modules:
- Geology 224, 244, 254
- Chemistry 124 or 164

Corequisite module: Earth Science Field Skills 374

324 (16) Sedimentology and Stratigraphy (3L, 3P)


A sub-minimum of 50% for practical work is required to obtain admission to the examination.

Method of assessment: Flexible assessment

Prerequisite module: Chemistry 144

Prerequisite pass modules:
- Geology 224, 244
- Chemistry 124 or 164

Corequisite module: Earth Science Field Skills 374 or Environmental Field Skills 372

344 (16) Economic Geology (3L, 3P)


A sub-minimum of 50% for practical work is required to obtain admission to the examination.

Method of assessment: Flexible assessment

Prerequisite module: Chemistry 144

Prerequisite pass modules:
- Geology 224, 244
- Chemistry 124 or 164
354 (16) Metamorphic Petrology and Tectonics (3L, 3P)
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.

Method of assessment: Flexible assessment

Prerequisite module: Chemistry 144
Prerequisite pass modules:
- Geology 224, 244, 254
- Chemistry 124 or 164

364 (16) Hydrogeology (3L, 3P)
Hydrological cycle; Darcy’s Law, hydraulic conductivity, permeability and porosity; aquifers, aquitards and aquicludes; saturated and unsaturated zones and the water table; steady state and non-steady state flow; recharge and discharge processes; composition of groundwater; isotope hydrology; groundwater resource evaluation and management; South African Water Act.

Method of assessment: Flexible assessment

Prerequisite pass modules:
- Environmental Geochemistry 214
- Geology 244

Corequisite module: Environmental Field Skills 372 or Earth Science Field Skills 374

13622 Environmental Field Skills

271 (8) Environmental Field Skills (2P)
A compulsory module for students taking the Geo-environmental Science stream of 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 environmental field skills: Collection and preservation of water samples, appropriate sampling methodologies, measuring physical and geochemical properties of water in the field; practical use of environmental geochemistry to understand interactions between different water bodies and the impact of human activities on the quantity and quality of water in these bodies; practical understanding of the role of geomorphology on controlling water movement, recharge and discharge processes; practical understanding of the role of soils in controlling groundwater compositions and storage.

Method of assessment: Flexible assessment

Prerequisite modules:
- Geo-environmental Science 124, 154
- Chemistry 124 or 164, 154

Corequisite modules:
- Environmental Geochemistry 214
- Geography 265
- Geology 244

372 (8) Environmental Field Skills (2P)
A compulsory module for students taking the Geo-environmental Science stream of 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 environmental field skills: Measuring physical and geochemical properties of surface water and groundwater in the field; practical use of environmental geochemistry to understand interactions between different water bodies and the impact of human activities on the quantity and quality of water in these bodies; practical understanding of the role of geomorphology on controlling water movement, and the sedimentological record this leaves; practical understanding modern and ancient sedimentological settings.

Method of assessment: Flexible assessment

Prerequisite modules:
- Environmental Geochemistry 214
- Geography 265
- Environmental Field Skills 271
Corequisite modules:
- Environmental Geochemistry 314
- Geography 334
- Geology 324, 364

63991 Environmental Geochemistry

214 (16) Introduction to Environmental Geochemistry (3L, 3P)
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).

Method of assessment: Flexible assessment

Prerequisite pass module: Geo-environmental Science 154

Prerequisite modules:
- Geo-environmental Science 124
- Chemistry 124 or 164, 144

314 (16) Environmental Geochemistry (3L, 3P)
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.

Method of assessment: Flexible assessment

Prerequisite pass modules:
- Environmental Geochemistry 214
- Chemistry 264
- Mathematics 114 or Mathematics (Bio) 124

Corequisite module: Chemistry 234

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)
This module does not grant admission to Geology 224, 244 and 254.

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.

Responsible departments: Earth Sciences (50%) and Civil Engineering (50%)

Method of assessment: Flexible assessment

Prerequisite module: Engineering Chemistry 123

Department of Mathematical Sciences

Division: Mathematics

21539 Mathematics

114 (16) Calculus (5L, 2T)
Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics on the NSC or the IEB school-leaving certificate.

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.

Method of assessment: Flexible assessment
144 (16) Calculus and Linear Algebra (5L, 2T)
Complex numbers; transcendental functions; techniques of integration; improper integrals; conic sections; polar co-ordinates; partial derivatives; introduction to matrices and determinants.
Method of assessment: Flexible assessment
Prerequisite module: Mathematics 114

154 (16) Foundational and Discrete Mathematics (4L, 2T)
Introduction to fundamental mathematical structures: sets, relations, functions. Formal systems and propositional logic, mathematical proofs and different proof methods. Elementary combinatorics: counting principles, pigeonhole principle, recursions. Important properties and types of functions and relations, e.g. equivalence and order relations. Selected practical applications, in particular in the context of computer science.
Method of assessment: Flexible assessment

186 (32) Introductory Mathematics (3L, 3T)
For BSc (Extended Degree Programme) and BEng (Extended Degree Programme) students.
Any student who wishes to take this module must have achieved a mark of at least 5 (or 60%) for Mathematics on the NSC or the IEB school-leaving certificate.
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.
Method of assessment: Flexible assessment

214 (16) Advanced Calculus and Linear Algebra (4L, 2T)
Advanced Calculus: Functions of more than one real variable, multiple integrals, line integrals, surface integrals, the divergence theorem.
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.
Method of assessment: Flexible assessment
Prerequisite pass modules: Mathematics 114, 144

244 (16) Analysis and Linear Algebra (4L, 2T)
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.
Method of assessment: Flexible assessment
Prerequisite module: Mathematics 214

278 (32) Foundations of Abstract Mathematics I (3L, 2P)
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.
Method of assessment: Flexible assessment

314 (16) Algebra (3L, 3T)
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.
Prerequisite pass modules: Mathematics 214, 244
324 (16) Complex Analysis (3L, 3T)
Types of sets in $\mathbb{C}$, 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.
Prerequisite pass modules: Mathematics 214, 244

325 (16) Topology (3L, 3T)
Out of the three tutorial periods, one is a scheduled tutorial, and two are for independent work on assignments.
This module gives an introduction to topology through its basic concepts: Topological spaces and continuous maps. Applications to analysis will also be covered
Method of assessment: Flexible assessment

344 (16) Discrete Mathematics (3L, 3T)
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.
Prerequisite pass modules: Mathematics 214, 244 or equivalent modules

345 (16) Logic (2L, 4T)
Out of the four tutorial periods, two are scheduled tutorials and two are for independent work on assignments
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.
Method of assessment: Flexible assessment
Prerequisite pass modules: Mathematics 214, 244 or equivalent modules

365 (16) Real Analysis (3L, 3T)
The aim of this module is to introduce and investigate the concepts, spaces, examples, and results that provide the foundation for wide-ranging developments in analysis. Typical topics studied are real numbers and their properties, basic theorems about the real numbers (including the fundamental results about sequences, functions, sequences of functions, etc.), introduction to metric spaces.
Prerequisite pass modules: Mathematics 214, 244

378 (32) Foundations of Abstract Mathematics II (1L, 3P)
Out of the four tutorial periods, two are scheduled tutorials and two are for independent work on assignments.
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.
Admission subject to approval by the Department of Mathematical Sciences.
Method of assessment: 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).

66176 Biomathematics

374 (16) Project on Biological Modelling (1P)
Research project on a topic in biomathematics designed to provide students with experience in applying mathematical and statistical models.
Please note: The schedule of the weekly practical can be individually determined by the student in consultation with the project leader.
**56847 Financial Mathematics**

378 (32) Financial Mathematics (3L, 3T)
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.

*Prerequisite pass modules: Mathematics 214, 244*
*Prerequisite modules: Mathematical Statistics 214, 245, 246*

**21547 Mathematics (Bio)**

124 (16) Mathematics for the Biological Sciences (4L, 2T)

176 (32) Introductory Mathematics for the Biological Sciences (3L, 3P)
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 on the NSC or the IEB 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.

*Method of assessment: Flexible assessment*

**38571 Engineering Mathematics**

115 (15) Introductory Differential and Integral Calculus (5L, 2T)
Any student who wishes to take this module must have achieved a mark of at least 6 (or 70%) for Mathematics on the NSC or the IEB school-leaving certificate.
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.

*Method of assessment: Flexible assessment*

145 (15) Further Differential and Integral Calculus (5L, 2T)
Complex numbers; transcendental functions; integration techniques; improper integrals; conic sections; polar coordinates; partial derivatives; introduction to matrices and determinants.

*Method of assessment: Flexible assessment*

*Prerequisite module: Engineering Mathematics 115*

214 (15) Differential Equations and Linear Algebra (4L, 2T)
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.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: Engineering Mathematics 115 or 145*
*Prerequisite module: Engineering Mathematics 145*

242 (8) Series and Partial Differential Equations (2L, 1T)
Infinite series and Taylor series; Fourier series; introduction to partial differential equations; Fourier transforms.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: Engineering Mathematics 145 or 214*
*Prerequisite module: Engineering Mathematics 214*
### 53759 Linear Algebra B

**812 (8) Linear Algebra**


### Division: Applied Mathematics

#### 56820 Probability Theory and Statistics

**114 (16) Probability Theory and Statistics (3L, 3T)**

(For BSc students)

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.

*Method of assessment: Flexible assessment*

*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)**

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.

*Method of assessment: Flexible assessment*

*Prerequisite module:* Mathematics 114

*Corequisite module:* Mathematics 144

**214 (16) Applied Matrix Methods (3L, 3T)**


*Method of assessment: Flexible assessment*

*Prerequisite module:* Mathematics 144

**244 (16) Applied Differential Equations (3L, 3T)**

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.

*Method of assessment: Flexible assessment*

*Prerequisite modules:* Mathematics 114, 144

**314 (16) Applied Discrete Mathematics (3L, 3T)**

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.

*Method of assessment: Flexible assessment*

*Prerequisite module:* Applied Mathematics 214 or Mathematics 214

**324 (16) Numerical Methods (3L, 3T)**


*Method of assessment: Flexible assessment*

*Prerequisite module:* Mathematics 114
354 (16) Flow Modelling (3L, 3T)
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.
Method of assessment: Flexible assessment
Prerequisite module: Applied Mathematics 144

364 (16) Applied Fourier Analysis (3L, 3T)
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.
Method of assessment: Flexible assessment
Prerequisite pass modules: Mathematics 114, 144 or 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)
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.
Method of assessment: Flexible assessment

154 (15) Dynamics (4L, 2T)
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.
Method of assessment: Flexible assessment
Corequisite module: Engineering Mathematics 115
Prerequisite module: Applied Mathematics B 124

224 (15) Dynamics of Rigid Bodies (3L, 3T)
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.
Method of assessment: Flexible assessment
Prerequisite module: Applied Mathematics 144 or Applied Mathematics B 154

242 (8) Vector Analysis (2L, 1.5T)
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.
Method of assessment: Flexible assessment
Corequisite module: Applied Mathematics B 224
Prerequisite module: Engineering Mathematics 145

252 (8) Applied Mathematics for Civil Engineers (2L, 1T)
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.
Method of assessment: Flexible assessment

20753 Applied Mathematics B

834 (15) Partial Differential Equations
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)
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.
Method of assessment: Flexible assessment
Prerequisite module: Engineering Mathematics 214

Division: Computer Science

18139 Computer Science

113 (16) Computer Science for Actuarial Studies (3L, 3P)
Introduction to computer programming from a financial perspective. Basic financial problems are rephrased in terms of analytical problem solving. Standard imperative programming constructs including types of variables, assignments, if-then-else and loops, and recursive approaches are covered as needed in financial programming. Static data structures (in particular arrays) and declarative programming models such as spreadsheets are also covered.
Method of assessment: Flexible assessment
Corequisite modules:
- Actuarial Science 112
- Mathematics 114

114 (16) Introductory Computer Science (3L, 3P)
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).
Method of assessment: Flexible assessment
Corequisite module: Mathematics 114

144 (16) Introductory Computer Science (3L, 3P)
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.
Method of assessment: Flexible assessment
Prerequisite module: Computer Science 113 or 114

214 (16) Data Structures and Algorithms (3L, 3T)
The classical data structures and algorithms in an object-oriented set-up. Advanced techniques for the analysis of algorithms.
Method of assessment: Flexible assessment
Prerequisite pass module: Computer Science 144
Prerequisite module: Mathematics 114

244 (16) Computer Architecture (3L, 3P)
Basic computer architecture. Programming in machine language and assembly language. Assemblers, binders and loaders. Basic concepts of operating systems; memory management, process management and file systems.
Method of assessment: Flexible assessment
Prerequisite module: Computer Science 214
314 (16) Concurrency (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite modules: Computer Science 214, 244

For programmes in Engineering:
Prerequisite modules:
- Computer Science E 214
- Computer Systems 245

315 (16) Machine Learning (3L, 3T)
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.

Method of assessment: Flexible assessment
Prerequisite modules:
- Computer Science 144 or Computer Science E214
- Mathematical Statistics 245, 246; or Systems and Signals 344
- Mathematics 214 or Applied Mathematics 214 or Engineering Mathematics 214

334 (16) Databases and Web Centric Programming (3L, 3P)

Method of assessment: Flexible assessment
Prerequisite module: Computer Science 214
For programmes in Engineering:
Prerequisite modules:
- Computer Science E 214
- Computer Systems 245

344 (16) Program Design (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite module: Computer Science 214

345 (16) Computability and Automata (3L, 3T)
Introduction to automata theory and formal languages, computability and complexity. Regular languages, context-free languages and grammars. Turing machines. P vs NP problem and NP completeness.

Method of assessment: Flexible assessment
Prerequisite module: Computer Science 214

354 (16) Computer Networks (3L, 3P)

Method of assessment: Flexible assessment
Prerequisite modules: Computer Science 214, 244

Computer Science as a major for the BSc degree
The following modules are required: Computer Science 113(16) or 114(16), 144(16), 214(16), 244(16), 314(16) or 315(16), 334(16), 344(16) and 354(16).
### 12263 Scientific Computing

**272 (5) Scientific Computing (2L)**

- **Study load:** 35 lectures in total
- 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.
- Introduction to numerical computing using Numpy; plotting and curve fitting.

*Method of assessment: Flexible assessment*

**372 (5) Scientific Computing (2L)**

- **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.

*Method of assessment: Flexible assessment*

*Prerequisite module: Scientific Computing 272*

### 50040 Computer Skills

**171 (4) Computer Skills (1L)**

- **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.

*Method of assessment: Flexible assessment*

**176 (8) Computer Skills (1L, 4T)**

- 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.

*Method of assessment: Flexible assessment*

**272 (5) Computer Skills (2L)**

- **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.

*Method of assessment: Flexible assessment*

*Prerequisite module: Computer Skills 171*

**372 (5) Computer Skills (2L)**

- **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:**

*For more information see [http://www.sun.ac.za/rv]*

*Method of assessment: Flexible assessment*

*Prerequisite module: Computer Skills 272*
59536 Computer Science E

214 (15) Object-Oriented Programming (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite pass module: Computer Programming 143
Prerequisite modules: Engineering Mathematics 115, 145

Department of Microbiology

16284 Microbiology

214 (16) Introductory Microbiology (3L, 3P)
History, microscopy, classification, structure and function (bacteria and archaea), nutritional requirements and growth factors, nutrient uptake, energy generation, culture media, growth curves, continuous culture, physical and chemical control, environmental factors, biofilm formation and quorum sensing and antimicrobial therapy.

Prerequisite pass modules:
- Biology 124 or 144
- Chemistry 124 or 164, 144

244 (16) Microbial Diversity (3L, 3P)
Kingdoms of life, and modern microbial taxonomy and introductory microbial genomics. Prokaryotes, archaeal cell structure and function, Nonproteobacterial Gram-negative bacteria, Proteobacterial classes, Firmicutes and Actinobacteria. Fungal groups, cell structure and function. Structure of viruses and virus taxonomy and multiplication strategies. Microbiology of water and soil environments, different metabolic types of micro-organisms, the role of different microbial taxa in biogeochemical cycles and energy flow in the food web, the dependence of animals and plants on microorganisms, including symbiotic associations, microbe-plant associations and microbe-insect associations, interactions between micro-organisms.

Prerequisite pass modules:
- Biology 124 or 144
- Chemistry 124 or 164, 144

314 (16) Microbial Molecular Biology (3L, 3P)
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 in bacteria and yeasts, bacteriophage replication, induction and molecular applications. Production of industrially important heterologous proteins in yeast. Key concepts of yeast recombinant DNA technology.

Prerequisite pass module: Microbiology 214
Prerequisite modules:
- Microbiology 244
- Biochemistry 214, 244

324 (16) Microbial Physiology and Metabolism (3L, 3P)
Elemental composition, carbon and energy flows, oxidation-reduction reactions, energy production through fermentation, respiration and photosynthesis, Pasteur and Crabtree effects, 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 (wastewater treatment, overproduction of citric acid and lysine), quorum sensing, the systems biology of metabolism.

Prerequisite pass module: Microbiology 214
Prerequisite modules:
- Microbiology 244
- Biochemistry 214, 244

354 (16) Industrial Microbiology (3L, 3P)
Fermentations, including food fermentations. Specialised food fermentations, e.g. biological preservatives, preparation and the role of microorganisms. Quality control. The occurrence of pathogens and food-spoiling bacteria and their control. Industrial production of enzymes, antibiotics, pharmaceutical products, influence of substrate on production levels.

Prerequisite pass module: Microbiology 214
Prerequisite module: Microbiology 244
364 (16) Microbial Ecology (3L, 3P)
Introduction to environmental microbiology, overview of microbial environments, including earth, aquatic and extreme niches, methods and technology in microbial ecology, role of microorganisms in biogeochemical cycling, microbial communication and interactions, application of microbes in environmental and industrial remediation. The practical component includes problem identification, writing project proposals, project management and presentation.

Method of assessment: Flexible assessment
Prerequisite pass module: Microbiology 214
Prerequisite module: 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)
Introduction to mechanics, the understanding of motion of bodies in general and the conserved quantities contained within the laws of motion that are the foundations for all of physics. Quantities relevant to the physics of mechanical systems in different situations are introduced, including for collisions, in stationary states, during rotation, and how these are pertinent when describing the flow of heat and fluids. This course explores both experimental and theoretical aspects of Newtonian mechanics and thermodynamics, laying the foundation for further understanding of physics. The mathematical tools of calculus are used throughout.

Corequisite module: Mathematics 114

144 (16) Introductory Physics B (3L, 3P)
Introduction to electrical charges and their interaction. The physics of moving charges and magnetism, in preparation for advanced understanding of light, electrical circuits and materials. The special theory of relativity in mechanics and electromagnetism. The mathematical tools of calculus are used throughout.

Prerequisite modules:
- Physics 114
- Mathematics 114

Corequisite module: Mathematics 144

176 (32) Preparatory Physics (3L, 3P)
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.

Method of assessment: Flexible assessment

224 (16) Classical Mechanics (3L, 3P)
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, harmonic oscillator, free and forced linear oscillations with damping, introductory Lagrangian and Hamiltonian dynamics, conservation laws.

Method of assessment: Flexible assessment
Prerequisite pass modules: Physics 114, 144
Prerequisite modules: Mathematics 114, 144

254 (16) Electromagnetism, Waves and Introduction to Quantum Physics (3L, 3P)
Electrostatic fields; magnetic fields; electromagnetic induction and alternating currents, Maxwell's equations and electromagnetic waves. Dipole radiation, wave motion with boundary conditions, interference and diffraction, physical and Fourier optics, quantum wave-functions and wave-particle duality, particle in a box, introduction to the Schrödinger equation in one dimension.

Method of assessment: Flexible assessment
Prerequisite modules:
- Mathematics 114, 144
- Physics 224
314 (16) Statistical Physics A (Introductory Thermodynamics and Statistical Mechanics) (3L, 3P)
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.
Method of assessment: Flexible assessment
Prerequisite modules:
- Physics 254
- Mathematics 214, 244 or Applied Mathematics 214, 244

334 (16) Quantum Mechanics A (3L, 3P)
Schrödinger equation; harmonic oscillator, spherically symmetric potentials, orbital angular momentum: Eigenvalues and spherical harmonic functions. The hydrogen atom. Time-independent perturbation theory, spin and application to the atom.
Method of assessment: Flexible assessment
Prerequisite pass module: Physics 224
Prerequisite modules:
- Physics 254
- Mathematics 214, 244 or Applied Mathematics 214, 244

342 (8) Electromagnetism and Relativity (1.5L, 1.5P)
Polarisation and magnetisation of materials, electromagnetic waves and their transitions between different media. Theory of special relativity.
Method of assessment: Flexible assessment.
Prerequisite modules:
- Mathematics 214, 244 or Applied Mathematics 214, 244
- Physics 224, 254

344 (16) Simulation and Inference in Stochastic Systems (3L, 3P)
Simulation and numerical inference of key stochastic systems such as random walks. Information-based probability and core probabilistic concepts, deduction and induction, Bayes' Theorem. Characterisation and calculation with distributions and data, transformations, generating functions, connections to statistical physics.
Method of assessment: Flexible assessment
Prerequisite module: Mathematics 214 or Applied Mathematics 214 or Physics 224

352 (8) Applications of Quantum Mechanics (1.5L, 1.5P)
Method of assessment: Flexible assessment
Prerequisite modules: Physics 254, 334

372 (8) Project (Theoretical Physics) (0.7L, 0.7P)
Application(s) of topics forming part of the BSc programme in Physics, stream Theoretical Physics.
Method of assessment: Flexible assessment

384 (16) Experimental Work in Physics (3L, 3P)
(This module cannot be taken simultaneously with Chemistry 2.)
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.
Method of assessment: Flexible assessment
Corequisite modules: Physics 342, 352 or 372

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) or 344(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) or Physics 352(8).
### Other modules in Physics

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<th>Practical</th>
<th>Tutorial</th>
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### Department of Physiological Sciences

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<td>144</td>
<td>Overview of Physiology</td>
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**Other modules in Physics**

**19267 Special Physics**

142 (8) Physics for Health Sciences (2L, 1T)
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)
Selected topics, relevant to the biological sciences, from introductory mechanics, hydro-statics and optics.

Method of assessment: Flexible assessment
Corequisite module: Mathematics (Bio) 124 or Mathematics 114

154 (16) Introductory Physics for Biological Sciences B (3L, 3P)
Selected topics, relevant to the biological sciences, from introductory electricity, magnetism, thermodynamics, gas laws, atomic physics, radioactivity, oscillations and waves.

Method of assessment: Flexible assessment
Prerequisite module: Physics (Bio) 134

**59420 Engineering Physics**

113 (8) Physics for Engineering students (2L, 0.5P, 0.5T)
Introduction to physics and physical quantities, including introduction to atomic physics; oscillatory motion, introduction to wave motion, superposition and standing waves, sound waves, light, refraction, polarization; introduction to nuclear physics.

Method of assessment: Flexible assessment

152 (6) Physics for Engineering students (2L, 1T)
Introduction to basic relativity and basic quantum mechanics. Continued study of waves, acoustics and optics based on Engineering Physics 113.

Method of assessment: Flexible assessment
Prerequisite module: Engineering Physics 113

**Department of Physiological Sciences**

**13080 Physiology**

114 (12) Introductory Overview of Physiology (3L)
Basic overview of the following physiological principles, organs and systems: Homeostasis, organic molecules, the cell, tissue, special senses, nervous, endocrine, immune and reproductive systems.
(Offered for the programme BA with Sport Science)

144 (12) Overview of Physiology (3L)
Basic overview of the following physiological principles and systems: Acid/base balance, muscle, cardiovascular, respiratory, urinary and digestive systems.
(Offered for the programme BA with Sport Science)

Prerequisite module: Physiology 114

214 (16) Physiological Principles and Systems (3L, 3P)
Textbook-based overview of the following physiological principles and systems: homeostasis and body fluids, cell membranes, general physiological control systems, nervous, special senses, hormonal, digestive (basic single stomach) systems, and also typical diseases applicable to these systems.
For the Human Life Sciences programme, and the interdisciplinary stream Applied Medicinal Chemistry:

Prerequisite modules: Biology 124, 154
Corequisite module: Biochemistry 214

For the interdisciplinary stream Biomedical Mathematical Sciences:

Prerequisite modules: Biology 124
Corequisite module: Biochemistry 214
244 (16) Systems in Physiology (3L, 3P)
Textbook-based overview of the following physiological systems of the body: muscle and respiratory systems, acid/base balance, blood, renal and reproductive systems.
Prerequisite module: Physiology 214
Corequisite module: Biochemistry 244

314 (16) Integrated Physiology (3L, 3P)
This module will concentrate mainly on integrated physiology and will cover a selection of the following topics: Systems physiology and homeostasis, endocrinology and metabolism, cardiovascular physiology and neurophysiology.
Prerequisite pass modules: Physiology 214, 244
Prerequisite modules: Biochemistry 214, 244

334 (16) Metabolic Physiology (3L, 3P)
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 and protein metabolism.
Prerequisite pass modules: Physiology 214, 244
Prerequisite modules: Biochemistry 214, 244

344 (16) Cellular Physiology (3L, 3P)
This module will concentrate mainly on cellular physiology and will cover a selection of the following topics: Membrane and cell communication, immunology, oxidative stress, muscle satellite cells and stem cells.
Prerequisite modules:
- Biochemistry 214, 244
- Physiology 314

364 (16) Clinical Applied Physiology (3L, 3P)
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: cancer, body composition, obesity, diabetes, anorexia, bone, physiology and pathophysiology, mechanisms of muscle atrophy and conditions leading to muscle atrophy, ageing, HIV/AIDS and opportunistic diseases.
Prerequisite pass modules: Physiology 214, 244
Prerequisite modules: 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)
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.
Method of assessment: Flexible assessment

Department of Genetics

11061 Biometry

212 (8) Introductory Biometry (2L, 1T or 1P)
Role of statistics in research; methods of tabulation and graphical representation of data; descriptive measures of locality, variation and association; the elementary principles of estimation, randomization, sampling methods, unbiasedness and sampling distributions; simple and multiple linear regression; introduction to hypothesis testing; contingency tables and chi-squares tests; tests for normality. All data will be analysed using applicable software.
Method of assessment: Flexible assessment
Prerequisite module: Mathematics (Bio) 124 or Mathematics 114
242 (8) Applications in Biometry (2L, 1T or 1P)
Treatment and experimental design; efficiency of estimation; analysis of variance; F-test for homogeneity of variance, one- and two sample hypothesis tests for means, multiple comparisons procedures; confidence intervals; non-parametric tests. All data will be analysed using applicable software.

Method of assessment: Flexible assessment
Prerequisite module: Biometry 212

13285 Genetics

214 (16) Introductory Genetics (3L, 3P)
The fundamental concepts that underlie the inheritance of biological traits are studied with reference to the genotype-phenotype paradigm and the molecular basis of genetic diversity. Cellular mechanisms and components, including the cell cycle, mitosis and meiosis, chromosomes and genes are related to the principles of heredity: Mendelian genetics and extensions; linkage and recombination; linkage analysis and gene mapping; sexual reproduction and sex determining chromosomes; and chromosomal aberrations. The implications of such processes are further discussed at the organismal and population levels of biology with an introduction to population and quantitative genetics: population diversity; genotype and allele frequencies; the Hardy-Weinberg law and deviations; and complex and multifactorial traits.

Method of assessment: Flexible assessment
Prerequisite pass module: Biology 124
Prerequisite modules:
- Mathematics (Bio) 124 or Mathematics 114 or 144
- Animal Science 144 or Biology 144 or 154 or Crop Protection 152

215 (16) Introductory Microbial Biotechnology (3L, 3P)
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 South African Grape and Wine Sciences Research Institute (SAGWRI) at Stellenbosch University

244 (16) Introductory Molecular Biology (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite module: Genetics 214

245 (16) Introductory Plant and Animal Biotechnology (3L, 3P)
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, embryogenesis, 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 of Genetics and Plant Pathology, and the South African Grape and Wine Sciences Research Institute (SAGWRI) at Stellenbosch University

314 (16) Genomes and Genome Analysis (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite pass module: Genetics 244
315 (16) Advanced Biotechnology (3L, 3P)
This module focuses on topical and contemporary aspects of microbial, plant and animal biotechnology. It covers advanced recombinant DNA methodologies and how they can be purposed to genetic interventions that ultimately improve human well-being. Some of the themes covered during the module are (i) metagenomic libraries and their uses, (ii) the creation of plant based-GMOs and their applications, and (iii) the creation of animal based-GMOs and their applications.

Prerequisite module: Genetics 245

324 (16) Molecular Population Genetics (3L, 3P)
The genetic structure and dynamics of populations are investigated, especially with the use of molecular markers, including frequencies of alleles and genotypes, heterozygosity, linkage disequilibrium; random mating and the Hardy-Weinberg principle; factors that determine genetic variation: mutation, migration, selection and population size; subdivided and genetic relationships between populations are also discussed. Emphasis is placed on applications in molecular population genetics, phylogenetics and population genomics.

Method of assessment: Flexible assessment
Prerequisite pass module: Genetics 214
Corequisite module: Genetics 244

344 (16) Advanced Topics in Molecular Genetics (3L, 3P)
Various advanced topics are addressed in this module and may include the following: diagnostic applications in human genetics; DNA fingerprinting and forensic science; applications from genome projects; personalised medicine and pharmacogenetics; neurogenetics; epigenomics; genetic modification; gene therapy; genome editing; synthetic biology; viruses and the exploitation of their genomes.

Method of assessment: Flexible assessment
Prerequisite pass module: Genetics 214
Corequisite module: Genetics 244

345 (16) Economic and Legal Aspects of Biotechnology (3L, 3P)
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.

354 (16) Quantitative genetics (3L, 3P)
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.

Method of assessment: Flexible assessment
Prerequisite modules:
- Genetics 324
- Biometry 212 and 242 or
- Psychology 243 and 253 or
- Mathematical Statistics 214 or
- Biodiversity and Ecology 212

Department of Soil Science

14176 Soil Science

214 (16) Introduction to Soil Science (3L, 3P)
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.

Prerequisite module: Chemistry 144
**Faculty of Arts and Social Sciences**

**Department of General Linguistics**

10294 General Linguistics

178 (24) Introduction to Linguistics (3L, 1T)
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.

*Method of assessment: Flexible assessment*

278 (32) Language and the Human Mind (3L)
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.

*Method of assessment: Flexible assessment*

*Prerequisite pass module: General Linguistics 178*

318 (24) Advanced Linguistics (4L)
Theoretical concepts and mechanisms in modern theories of language structure (syntax and morphology), with specific focus on the analysis of empirical phenomena relating to word and sentence structure in languages belonging to various families; *capita selecta* which contribute to the realisation of the outcomes of the module (e.g. variation in language, language origin, language change).

*Method of assessment: Flexible assessment*

*Prerequisite pass module: General Linguistics 278*

348 (24) Advanced Linguistics (4L)
Fundamental principles, key concepts and research methods employed in various areas of applied linguistics, including (critical) discourse analysis, psycholinguistics, and language planning and language policy; *capita selecta* which contribute to the realisation of the outcomes of the module (e.g. topics in sociolinguistics, language acquisition, intercultural communication).

*Method of assessment: Flexible assessment*

*Prerequisite pass module: General Linguistics 278*

**Department of Geography and Environmental Studies**

64165 Geo-environmental Science

124 (16) Introduction to Human-Environmental Systems (3L, 3P)
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.

56502 Geography and Environmental Studies

265 (16) Environmental Studies (3L, 3P)
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.

*Prerequisite module: Geo-environmental Science 124*
334 (16) Environmental Processes and Hazards (3L, 3P)
Geomorphological processes and physical landscape change in southern Africa relating to weathering, arid landscapes, granite landscapes and coastal zones. An introduction to natural hazards and the relationships between natural processes and biogeophysical hazards. A strong focus on analytic techniques for assessment of geomorphological processes and natural hazards.

Prerequisite modules:
- Geography and Environmental Studies 265
- Geographical Information Technology 214, 241

358 (16) Environmental Studies (3L, 3P)

Prerequisite module: Geography and Environmental Studies 265 or Geo-environmental Science 214

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 265(16), 334(16), 358(16); Geographical Information Technology 214(16), 241(16), 312(16), 341(16).

12923 Geographical Information Technology

211 (16) Earth Observation (3L, 3P)
Principles of remote sensing and earth observation; the electromagnetic spectrum; reflectance characteristics of various objects on the earth's surface; atmospheric interaction with electromagnetic energy; digital imagery; image resolution; satellite systems; image enhancement and pre-processing; unsupervised and supervised image classification; accuracy assessment; GIS integration.

Method of assessment: Flexible assessment

Corequisite modules:
- Geographical Information Technology 214
- Mathematics 114 or Mathematics (Bio) 124

214 (16) Geographical Information Systems (3L, 3P)
Introductory overview and understanding 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.

Prerequisite module: Mathematics 114 or Mathematics (Bio) 124

241 (16) Spatial Data Management (3L, 3P)
Map projections and coordinate systems; spatial data modelling (e.g. vector, raster, object-orientated); topology and topological dimensions; topological-dimension conversions; geodatabases; data model and format conversions; data generalisation and aggregation.

Method of assessment: Flexible assessment

Prerequisite pass module: Geographical Information Technology 214

242 (16) Digital Photogrammetry (3L, 3P)
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 adjustment and coordinate transformations; image processing (contrast and spectral enhancement, image matching, mosaicing); topographical-map production; GIS integration.

Method of assessment: Flexible assessment

Prerequisite modules:
- Geographical Information Technology 211
- Mathematics 114 or Mathematics (Bio) 124

311 (16) Spatial Data Acquisition (3L, 3P)
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.

Method of assessment: Flexible assessment

Prerequisite module: Geographical Information Technology 241
312 (16) Spatial Analysis (3L, 3P)
Query operations and query languages; Geometric measures; Spatial analytical operations; Surface analysis; Geostatistics; Network analysis; Analysis design; Fuzzy sets.
Method of assessment: Flexible assessment
Prerequisite modules:
- Geographical Information Technology 214, 241

341 (16) Spatial Modelling (3L, 3P)
Models in science; Spatial models: types, construction, design and development; Cartographic modelling: terminology, methodology, inputs and outputs, functions.
Method of assessment: Flexible assessment
Prerequisite module: Geographical Information Technology 312

342 (16) Earth Observation (3L, 3P)
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.
Method of assessment: Flexible assessment
Prerequisite module: Geographical Information Technology 211

Geographical Information Technology as a major for a BSc degree
The following modules are required: Geo-environmental Science 124(16), 154(16); Geographical Information Technology 211(16), 214(16), 241(16), 242(16), 311(16), 312(16), 341(16), 342(16).

Department of Information Science

58173 Socio-informatics

212 (8) Information Systems Introduction (2L)
This module looks at the principles and methods of Information Systems development. The module commences with a broad overview of the key principles of information systems, before focusing on a collection of prominent developmental approaches.
Method of assessment: Flexible assessment

224 (16) Introduction to Computer Programming (2L, 2P)
Principles of computer programming. Skills development in object-oriented program languages.
Method of assessment: Flexible assessment

254 (16) Internet Technology and Design (1L, 3P)
The internet and the world wide web. Architecture of hypertext systems. The design of web sites and portals.
Method of assessment: Flexible assessment

262 (8) Electronic Business and Government (1.5L)
The management of private and public organisations in contexts rich in information and knowledge technology.
Method of assessment: Flexible assessment

314 (18) Database Systems (3L, 2P)
Database concepts, models, design and management.
Method of assessment: Flexible assessment
Prerequisite module: Socio-informatics 224

334 (18) Architecture of Information Systems and Enterprises (2L, 3P)
Theory of software and hardware systems and their design and analysis. Cybernetics. Introduction to modelling and modelling languages such as UML.
Method of assessment: Flexible assessment

354 (18) Information Systems (2L, 3P)
Advanced software applications, such as simulation and modelling. Integration of preceding modules through the design and presentation of an elementary, experimental system.
Method of assessment: Flexible assessment
Prerequisite modules: Socio-informatics 254, 314, 334
364 (18) Knowledge Dynamics and Knowledge Management (3L, 1P)
Knowledge technology, knowledge-based systems, artificial intelligence and knowledge dynamics in complex organisations.
Method of assessment: Flexible assessment

Department of Music

50652 Music Technology

112 (6) Music Technology (2L)
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.
Method of assessment: Flexible assessment

142 (6) Music Technology (2L)
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.
Method of assessment: Flexible assessment

222 (8) Music Technology (1L, 1P)
An advanced study of sound waves, sound perception, acoustics, the sound studio, sound synthesis, MIDI, sound signal processing and sound orientated programming.
Method of assessment: Flexible assessment

252 (8) Music Technology (1L, 1P)
An advanced study of sound waves, sound perception, acoustics, the sound studio, sound synthesis, MIDI, sound signal processing and sound orientated programming.
Method of assessment: Flexible assessment

379 (48) Music Technology (2L, 2T)
Projects regarding sound recordings and sound orientated programming.
Method of assessment: Flexible assessment

Department of Psychology

18414 Psychology

114 (12) Psychology as a Science (2L, 1T)
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)
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)
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.
Prerequisite pass modules: Psychology 114, 144

223 (8) Human Development in Context (1.5L)
In this module human development is studied, with specific reference to the South African context.
Prerequisite pass modules: Psychology 114, 144

243 (8) Research Design in Psychology (1.5L)
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.
Prerequisite pass modules: Psychology 114, 144
253 (8) Data Analysis in Psychology (1.5L)
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.

Prerequisite pass modules: Psychology 114, 144

314 (12) Psychopathology (4L)
In this module abnormal behaviour is studied, from different perspectives and classification systems, with specific reference to the mental health context in South Africa.

Prerequisite pass modules – any 3 of the following 4 modules:
Psychology 213, 223, 243, 253

324 (12) Social Psychology (4L)
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.

Prerequisite pass modules – any 3 of the following 4 modules:
Psychology 213, 223, 243, 253

348 (24) Psychological Interventions (4L)
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.

Prerequisite pass modules – any 3 of the following 4 modules:
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

Department of Business Management

48550 Business Management

113 (12) Business Management (3L, 1P)
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)

144 (12) Economics (3L, 1T)
The module introduces students to economic application and policy, with a strong focus on South Africa by exploring contemporary economic issues: inflation, unemployment, economic growth, external stability and a fair distribution of income. The aggregate economy in the short term and long term: measuring the aggregate economy, the multiplier model, unemployment and fiscal policy, inflation and monetary policy, the money market and the South African Reserve Bank (SARB), technological change and income inequality.

Globalisation: international trade, migration and investment.

Corequisite module: Economics 114
214 (16) Economics (3L, 1T)
Macroeconomics: business cycle measurement, consumer and firm behaviour, closed one-period macroeconomic models, consumption and savings decisions in a two-period model.
Microeconomics: goods and factor markets, demand theory, production and cost theory, market structures and the theory of the firm, welfare theory.
Prerequisite pass modules: Economics 114, 144

244 (16) Economics (3L, 1T)
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.
Prerequisite pass modules: Economics 114, 144
Corequisite module: Economics 214

318 (24) Economics (4L, 1T)
Introduction to econometrics: statistical concepts, the classical linear model of regression, multicollinearity, autocorrelation, heteroscedasticity, dummy variables, estimation of regression models.
Macroeconomics: mathematical techniques, economic growth, business cycle, monetary and fiscal policy.
Introduction to game theory: mathematical techniques, different types of games, equilibrium concepts.
Prerequisite pass module: Economics 214
Prerequisite module: Economics 244

348 (24) Economics (4L, 1T)
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.
Prerequisite pass module: Economics 214
Prerequisite module: Economics 244
Corequisite module: Economics 318

Department of Logistics

55336 Operations Research

214 (16) Network Optimisation (3L, 3P)
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.
Method of assessment: Flexible assessment
Prerequisite modules: Mathematics 114, 144

244 (16) Linear Programming (3L, 3P)
Method of assessment: Flexible assessment
Prerequisite module: Mathematics 114
Prerequisite pass module: Mathematics 144

314 (16) Combinatorial Optimisation (3L, 3P)
Method of assessment: Flexible assessment
Prerequisite module: Operations Research 244
352 (16) Decision Modelling (3L, 3P)
Decision analysis cycle, problem structuring, decision criteria, decision trees, influence diagrams, multi-criteria decision analysis, utility theory, multi-attribute utility theory, analytical network process, fuzzy modelling and optimisation, decision-making software, decision support systems.
Method of assessment: Flexible assessment
Prerequisite pass modules: Mathematics 114, 144

344 (16) Optimisation (3L, 3P)
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.
Method of assessment: Flexible assessment
Prerequisite module: Operations Research 244

322 (16) Stochastic Methods of Operations Research (3L, 3P)
Queueing 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.
Method of assessment: Flexible assessment
Prerequisite pass module: Probability Theory and Statistics 114 or 144

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)
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
- This module is more intensive than Theory of Interest 152.
- 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).
- Students are required to complete at least 80% of all assigned classwork/tutorials. In cases where this requirement is not met, students will fail the module.

211 (18) Financial Mathematics (4L)
Basic concepts of financial mathematics, compound interest functions, discounted cash flows, pricing of loans and other securities, annuities, as well as the use of MS Excel to perform calculations.

Prerequisite pass modules:
- Actuarial Science 112
- Mathematics 114, 144 with an average final mark of at least 60%
- Probability Theory and Statistics 144 with a final mark of at least 65%

Corequisite modules:
- Mathematics 214
- Mathematical Statistics 214
54690 Financial Risk Management

212 (8) Institutional Investment Management (3L, 2P)
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.

Corporate finance: Financial instruments to raise finance and manage financial risk.

Prerequisite pass modules:
- Mathematics 114, 144
- Probability Theory and Statistics 144
- Theory of Interest 152 or Actuarial Science 112

Corequisite modules:
- Financial Risk Management 252 and Actuarial Science 211, or Actuarial Science 274
- Mathematical Statistics 214, 245, 246

242 (8) Derivatives (2L, 1P)
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.

Prerequisite pass modules:
- Mathematics 114, 144
- Probability Theory and Statistics 144
- Theory of Interest 152 or Actuarial Science 112

Prerequisite module: Financial Risk Management 212

Corequisite modules:
- Financial Risk Management 252 and Actuarial Science 211, or Actuarial Science 274
- Mathematical Statistics 214, 245, 246

252 (6) Financial Mathematical Statistics (3L)
Analyses of financial returns, principal components, risk factor sensitivities and cash flow mapping.

Method of assessment: Flexible assessment

Prerequisite pass modules:
- Actuarial Science 112
- Mathematics 114, 144
- Probability Theory and Statistics 144

Corequisite modules:
- Actuarial Science 211
- Mathematics 214, 244
- Mathematical Statistics 214, 245, 246
- Financial Risk Management 212, 242

56820 Probability Theory and Statistics

144 (16) Probability Theory and Statistics (3L, 3T)
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, normal.

14026 Data Science

141 (16) Data Science (4L, 2P)
Fundamental data science concepts; data-analytic thinking; types of data; the data cycle; CRISP data mining process; describing a dataset numerically; describing a dataset graphically; organising data; file formats; data manipulation in the R software; introduction to predictive modelling; overfitting; data leakage; model evaluation; other data science tasks and techniques; data ethics; communicating results.
241 (16) Data Science (4L, 2P)
Introduction to Linux; Linux commands and file systems; programming structures; data sources; data collection; optimisation; resampling and the bootstrap; naïve Bayes classification; application of linear models; data ethics.

Prerequisite pass module: Data Science 141

314 (16) Data Science (4L, 2P)
Exploratory data analysis; handling Big Data; text mining and natural language processing; evaluating model performance; data ethics; communicating results; advanced R programming. Data science project.

Prerequisite pass modules:
- Data Science 241
- Mathematical Statistics 245, 246

344 (16) Data Science (4L, 2P)
Regularised regression by means of ridge regression and the lasso; classification using linear discriminant analysis, logistic regression, quadratic discriminant analysis and k-nearest neighbours; resampling methods such cross validation and the bootstrap; linear model selection and dimension reduction methods; handling non-linearity via regression splines, smoothing splines, local regression, generalised additive models, bagging, random forests and boosting; and non-linear classification and regression by means of support vector machines.

Prerequisite pass modules:
- Data Science 314
- Mathematical Statistics 312

471 (40) Data Science Research Assignment
The research assignment provides students with a comprehensive learning experience that integrates knowledge from previous modules. The student will integrate knowledge and experience gained from all previous modules and apply this to a data-rich research topic. Students will have the opportunity to synthesise what they have learned and apply that knowledge to new, complex situations. Students must engage in the entire process of solving a real-world data science problem, from collecting and processing actual data, applying suitable and appropriate analytical methods to the problem and communicating the results in a clear and comprehensive way.

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)/245(8) and 246(8), 318(32)/312(16) and 316(16), 344(16) and 364(16) are required.

22853 Mathematical Statistics

214 (16) Distribution Theory and Introduction to Statistical Inference (4L, 2P)
Continuous stochastic variables; expected value and variance of a continuous stochastic variable; important continuous distributions; uniform, normal, exponential, gamma, beta. Moments and moment-generating functions for discrete and continuous distributions. Bivariate probability distributions; marginal and conditional distributions; the multinomial and bivariate normal distribution; Determining the distribution of functions of variables. The central limit theorem (without proof). Samples and sampling distributions: the standard parametric cases. Interval estimation and hypothesis testing: applying these principles in the standard cases of parametric inference. Data representation and description, calculating and interpreting sample parameters.

Prerequisite pass modules:
- Mathematics 114, 144 with an average final mark of at least 60%
- Probability Theory and Statistics 114 or 144

245 (8) Statistical Inference (2L, 1P)

Prerequisite pass module: Mathematical Statistics 214
246 (8) Linear Models in Statistics (2L, 1P)
Prerequisite pass module: Mathematical Statistics 214

312 (16) Statistical Inference and Probability Theory (3L, 1P)
Prerequisite pass module: Mathematical Statistics 245
Prerequisite modules:
• Mathematical Statistics 246 with a final mark of least 40%
• Mathematics 214

316 (16) Regression and Predictive Modelling (3L, 1P)
Prerequisite pass module: Mathematical Statistics 246
Prerequisite modules:
• Mathematical Statistics 245 with a final mark of least 40%
• Mathematics 214, 244

344 (16) Stochastic Processes and Statistical Learning (3L, 1P)
Introduction to stochastic processes. Markov processes and their applications. Introduction to martingale theory and applications. Introduction to statistical learning.
Prerequisite modules: Mathematical Statistics 312, 316

364 (16) Time Series (3L, 1P)
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.
Prerequisite modules: Mathematical Statistics 312, 316

14223 Statistics and Data Science

188 (18) Statistics and Data Science (3L, 2P)
Linear programming: Graphical techniques to solve problems with two variables; Shadow prices; Sensitivity analyses. (Only applies to BAcc students).
Data science: Fundamental concepts; the data cycle; Data ethics.
Descriptive statistics: Various data types; Graphical representation of data; Descriptive measures of location, spread and association; Box plots.
Sampling techniques: Simple random; Stratified; Systematic; Cluster; Probability proportional to size.
Probability theory: Basic probability concepts; 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; Binomial, hypergeometric and Poisson distributions.
Continuous random variables and probability distributions: Expected value, variance and standard deviation of a continuous random variable; The uniform, normal and exponential distributions.
Sampling distributions: Central limit theorem; Sampling distributions of the mean and a proportion; Sampling distribution of the difference between two means and two proportions.
Inferential statistics: Interval estimation and hypothesis testing for the mean, a proportion, the variance and the standard deviation;
Interval estimation and hypothesis testing for the difference between two means, two proportions and the ratio of two variances.
Regression analysis: The simple and multiple linear regression model; The method of least squares estimation; Inference on the model parameters and coefficient of correlation; Residual analysis.
### Faculty of Law

**Department of Mercantile Law**

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Title</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>14441</td>
<td>Intellectual Property Law for Science, Engineering and Technology</td>
<td>The primary purpose of this module is to provide an overview of intellectual property law and business forms, focusing on the South African context, but with international awareness, and to equip students with the knowledge, specific skills, applied competence and insight into innovation management, IP protection and management thereof.</td>
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</table>

### Faculty of Medicine and Health Sciences

**Biomedical Sciences Division, Anatomy and Histology**

<table>
<thead>
<tr>
<th>Module Code</th>
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<th>Description</th>
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</thead>
<tbody>
<tr>
<td>12558</td>
<td>Anatomy 214</td>
<td>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. <strong>Prerequisite modules:</strong> Biology 124, 144 or 154</td>
</tr>
<tr>
<td>214</td>
<td>Basic Anatomy of the Human Body (3L, 3P)</td>
<td>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. <strong>Prerequisite module:</strong> Anatomy 214</td>
</tr>
<tr>
<td>244</td>
<td>Basic Anatomy of the Human Body (3L, 3P)</td>
<td>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. <strong>Prerequisite module:</strong> Anatomy 214</td>
</tr>
<tr>
<td>314</td>
<td>Advanced Anatomy of the Human Body (3L, 3P)</td>
<td>Dissection-based study of the anatomy of the digestive, urogenital and endocrine systems. Textbook-based study of the organs of special sense, namely vision, hearing, posture and balance, taste, smell, proprioception and co-ordination. <strong>Prerequisite modules:</strong> Anatomy 214, 244</td>
</tr>
<tr>
<td>324</td>
<td>Applied Anatomy (4T)</td>
<td>An e-learning based study of applied anatomy topics, mainly of the nervous and musculoskeletal systems of the human body. <strong>Method of assessment:</strong> Flexible assessment <strong>Prerequisite modules:</strong> Anatomy 214, 244</td>
</tr>
<tr>
<td>344</td>
<td>Advanced Anatomy of the Human Body (3L, 3P)</td>
<td>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. <strong>Prerequisite modules:</strong> Anatomy 214, 244, 314</td>
</tr>
<tr>
<td>364</td>
<td>Clinical Anatomy (4T)</td>
<td>An e-learning based study of aspects of clinical anatomy, mainly of the nervous and musculoskeletal systems of the human body. <strong>Method of assessment:</strong> Flexible assessment <strong>Prerequisite modules:</strong> Anatomy 214, 244</td>
</tr>
</tbody>
</table>

### Department of Sport Science

**Applied Kinesiology**

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Title</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>54429</td>
<td>Coaching Strategies (2L, 2P)</td>
<td>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. <strong>Prerequisite pass module:</strong> Kinesiology 182</td>
</tr>
</tbody>
</table>
### 314 (12) Scientific Base of the Fitness Industry (2L, 2P)
**BA and BSc**
The scientific base of the health, exercise and fitness industry; national and international trends in the fitness industry; 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)
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)
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)
**BA and BSc**
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.

### 353 (12) Scientific Base of Sport Coaching (2L, 2P)
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.
*Prerequisite pass module: Kinesiology 182*

### 19305 Kinesiology

#### 162 (8) Anatomy (2L, 1P)
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)
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.
*Method of assessment: Flexible assessment.*

#### 312 (8) Sport Injuries (2L)

#### 332 (8) Peak Performance (2L)

#### 342 (8) Sociological and Psychological Aspects of Sport Performance (2L)
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.

#### 352 (8) Tests and Measurement (2L)
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)
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)
Teaching expertise, management skills and motivational strategies, design of physical activity programmes, planning and presenting teaching.
222 (8) Adapted movement programmes (2L)
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)
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)
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.

Method of assessment: Flexible assessment
Prerequisite pass module: Kinesiology 182

54607 Sport Science

222 (8) Motor Learning (2L)
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)
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.

For the programme BA (Sport Science):
Prerequisite modules: Physiology 114, 144

252 (8) Sport Physiology (2L)
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.

For the programme BA (Sport Science):
Prerequisite modules: Physiology 114, 144

262 (8) Applied Biomechanics (2L, 1P)
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.

Prerequisite pass module: Kinesiology 162

382 (6) Professional Applications (2L, 2P)
Application of education and programme design; skills training and fitness development; alternative approaches to learning in physical activities; educational and career opportunities.

Method of assessment: Flexible assessment

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)
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.

Method of assessment: Flexible assessment
146 (6) Scientific Communication Skills (3L)
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.

*Method of assessment: Flexible assessment*

**5. Postgraduate module contents of specific postgraduate programmes**

**Department of Biochemistry**

**BScHons in Biochemistry**

11412 – 711 (10) Practical Protein Biochemistry

*Advanced protein purification and analytical techniques*

This practical module focuses on the following techniques: chromatography, electrophoresis, protein and enzyme activity determinations, plasmid DNA preparation, restriction enzyme digestion, polymerase chain reaction, preparation of competent cells, transformation and heterologous protein expression. The module includes the theory and applications of protein purification techniques, as well as experimental data analysis. Knowledge gained will be transferred to Biochemistry 365 students during the June and September recess practicals, where the Honours students are required to assist with the presentation.

11413 – 712 (10) Steroid Hormones

*Research approaches to investigate the mechanism of action of steroid hormones*

Central to all biological and cellular events, including development, differentiation and response to extracellular and intracellular signals, is the cell’s ability to regulate the expression of genes. Steroid hormones are essential constituents in the intercellular communication system that maintains homeostasis in higher organisms. The module, in the form of a workshop, involves the discussion and critical analysis of some of the theory and techniques used to study the transcriptional control of gene expression by steroid receptors in eukaryotes. Integration between the methods used to investigate the mechanism of action of steroid hormones and the theory behind steroid receptor dependent regulation of transcription will facilitate greater understanding of both processes as well as illustrating how theory and method are employed together to answer questions in science.

14046 – 713 (10) Soft Skills

*Soft skills in the biochemical sciences*

The aim of this module is to equip students with the diverse skills needed to present, communicate (both orally and in writing) and critically analyse research results in the diverse fields that encompass biochemical research. The three subcomponents (presentation skills, writing skills, and data analysis skills) of the module will each provide training in one of the central aspects of these skills, and will develop the student’s abilities to function as a biochemical scientist in a range of environments.

11415 – 714 (10) Systems Biology

*Computational and experimental systems biology*

We discuss how networks of coupled enzyme-catalysed reactions work together as a system, the behaviour of different metabolic structures, the control of metabolism, and how this behaviour can be usefully described and studied using the framework of control analysis. Using a hands-on approach, students are introduced to kinetic modelling on the computer as a tool for studying the behaviour of metabolic pathways. Students are trained in collecting enzyme kinetic data and fitting these to a rate equation to obtain kinetic parameters for kinetic model construction.

14069 – 715 (10) Advanced Gene Expression

*Control of gene expression of the immunoglobulin genes*

In this module the complexities of the control of gene expression of the immunoglobulin genes of higher vertebrates will be studied as an example of eukaryotic gene expression. The theories and mechanisms giving rise to the generation of diversity of antibody binding sites, the mechanisms of class switching, the actual transcriptional control of gene expression particularly as influenced by antigen composition, and gene silencing mechanisms will be discussed.

14047– 716 (10) Biophysical and Bio-analytical Techniques

Analytical techniques for identification and quantification of biomolecules (e.g. advanced chromatography and mass spectrometry) are discussed. Students are introduced to biophysical techniques for structural analysis and characterisation of biomolecules (e.g. advanced mass spectrometry, fluorescence and circular dichroism), method development and validation, as well as data analysis and interpretation.
**11418 – 717 (10) Specialised Topics**

*Specialised topic by visiting professor*

A visiting professor presents a specialised topic of his or her choice. Details will be communicated to the students at the beginning of the semester.

**11420 – 718 (10) Chemical Biology Topics**

*Selected topics in chemical biology*

Chemical biology refers to research performed at the interface of chemistry and biology, and often entails the application of chemical knowledge (as it applies to molecules in regard to their reactivity and interactions) in answering questions, solving problems and developing tools relevant to metabolism and cell biology. In this module, students will be introduced to the approach and methods of chemical biology research, with the aim of developing an appreciation of how it can contribute to our understanding of living systems.

**54895 – 741 (60) Research Project (Biochemistry)**

The research project consists of the formulation of a hypothesis and writing of a research proposal, the design and execution of experiments, time management, analysis of results and the drawing of conclusions. The research results are reported in article format and presented as a short oral and poster.

**18325 – 742 (10) Seminar**

The seminar in biochemistry consists of a literature review on a selected biochemistry subject and a short oral presentation of the material. The written seminar typically has the format of a review article. The writing and presentation components of the Soft Skills module serve as basis for the writing and presentation of the seminar respectively.

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**Department of Botany and Zoology**

**BScHons in Biodiversity and Ecology**

**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:

(1) Biodiversity and Systematics
(2) Plants and Animals in Extreme Environments
(3) Evolutionary Ecology of Plants and Animals
(4) Global Change Biology

More information on these topics can be found at academic.sun.ac.za/botzoo/.

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**Department of Chemistry and Polymer Science**

**BScHons in Chemistry**

**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

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).

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.

Department of Earth Sciences

BScHons in Earth Sciences

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.

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

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.

11788 – 741 (16) Machine Learning
This module is an introduction to selected topics in machine learning.

14195 – 742 (16) Machine Learning A
Prominent machine-learning concepts and tasks. Selected feature extraction or dimensionality reduction techniques. Introduction to probabilistic modelling and latent variable models. Fundamental paradigms in parameter estimation.

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.
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.

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.

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.

Advanced Topics in Computer Science 2
Selected topics of current interest presented by lecturers or visiting researchers.

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.

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.

Artificial Intelligence
Introduction to a selection of topics in artificial intelligence and optimization
Meta-heuristics. Swarm intelligence, including particle swarm optimisation and the ant colony meta-heuristic. Evolutionary computation, including genetic algorithms, genetic programming, evolutionary programming, evolutionary strategies, differential evolution, cultural algorithms, and coevolution. Hyper-heuristics. Fitness landscape analysis. Optimisation problems, including unconstrained, constrained, multi-objective, many-objective, dynamic, multi-modal and large-scale optimisation problems.

Computer Vision
Module at honours level presented by the Department of Mathematical Sciences, Division: Applied Mathematics.

Digital Image Processing
Module at honours level presented by the Department of Mathematical Sciences, Division: Applied Mathematics.

Search and Planning
This module studies a selection of search and planning algorithms.

Functional Programming
This module gives an introduction to the functional programming paradigm.

Software Verification and Analysis
Introduction to various techniques for software quality management.

Space Science Algorithms
Algorithms and techniques in Space Science, with applications.

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.

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.

**Division: Applied Mathematics**

**MSc in Machine Learning and Artificial Intelligence**

**14398 – 814 (15) Applied Machine Learning at Scale**
The module considers how machine learning is applied to internet-scale systems. Topics include A/B testing, ranking, recommender systems, modelling internet users and entities they engage with online, network effects, online advertising, and real-time auctions.
*Method of assessment: Flexible assessment*

**14396 – 813 (15) Foundations of Deep Learning**
*Method of assessment: Flexible assessment*

**14394 – 811 (15) Mathematics for Machine Learning**
A review of fundamental mathematical concepts necessary for graduate studies in machine learning and artificial intelligence. Concepts are drawn from linear algebra, multivariate calculus, optimisation, and statistics.
*Method of assessment: Flexible assessment*

**14395 – 812 (15) Probabilistic Modelling and Reasoning**
An introduction to probabilistic modelling and reasoning in the context of modern machine learning and artificial intelligence. Topics include sum-product decomposition, classic hidden Markov models, expectation maximisation, probabilistic graphical models, data completion, and the basics of information theory.
*Method of assessment: Flexible assessment*

**14399 – 885 (60) Research Project**
An individual research project on an approved topic related to advanced machine learning and/or artificial intelligence, guided by an academic supervisor, that results in a high-quality conference or journal style paper and oral presentation.

**62847 – 842 (10) Computer Vision**
Convolutional neural networks for image classification, with extensions like transfer learning and visual attention. Further computer vision tasks include object segmentation, colourisation, style transfer and automated image captioning. Variational auto-encoders and generative adversarial networks.
*Method of assessment: Flexible assessment*

**14401 – 817 (10) Natural Language Processing**
Machine learning perspectives on the parsing, understanding and generation of natural human language. Topics include word embeddings and representations, part-of-speech tagging, topic modelling, machine translation with seq2seq models, sentence classification and sentiment analysis.
*Method of assessment: Flexible assessment*

**14402 – 818 (10) Reinforcement Learning and Planning**
The module covers the basics of reinforcement learning (RL) and planning: decision and control theory, Markov decision processes, exploration, Q-learning and policy gradients, hierarchical RL, model-based RL, and multi-agent RL.
*Method of assessment: Flexible assessment*

**14403 – 819 (10) Sequence Modelling**
Techniques to model and predict temporally varying data. Classical-state space models like hidden Markov models, recurrent neural networks and common modular ways to construct them (using e.g. long short-term memory), concurrent networks, and methods to combine the above.
*Method of assessment: Flexible assessment*
14404 – 820 (10) Advanced Probabilistic Modelling
Approximate inference techniques for probabilistic graphical models, including belief propagation and variational inference. Bayesian non-parametric models, specifically Gaussian processes and Dirichlet processes. Common tricks in probabilistic modelling for machine learning, including collapsed Gibbs sampling.
Method of assessment: Flexible assessment

14405 – 821 (10) Optimisation for Machine Learning
Applications of high-dimensional optimisation in machine learning, with topics including duality, Lagrange multipliers, quasi-Newton methods, stochastic and mini-batch gradient descent, Nesterov momentum, common practical stochastic methods, weight perturbation, conjugate exponential families and variational inference.
Method of assessment: Flexible assessment

14406 – 822 (10) Monte Carlo Methods
Monte Carlo methods form a principal tool for statistical inference in machine learning. Topics include Metropolis-Hastings methods and various sampling strategies (Gibbs, importance, slice and exact), as well as inference techniques, annealing and thermodynamic integration.
Method of assessment: Flexible assessment

14407 – 823 (10) Artificial Intelligence and the Brain
The module covers topics from neuroscience that have inspired AI research, from the point of view of mathematical modelling and algorithms. These include Hebbian learning, the canonical microcircuit, predictive coding, and dopamine-coded reward prediction. The module also covers the visual hierarchy as inspiration for computer vision, and the auditory processing system as inspiration for language and sequence modelling.
Method of assessment: Flexible assessment

14408 – 824 (10) Advanced Topics in Machine Learning
The module is reserved for advanced topics in machine learning. Exact content is determined on a capita selecta basis
Method of assessment: Flexible assessment

14409 – 825 (10) Advanced Topics in Artificial Intelligence
The module is reserved for advanced topics in artificial intelligence. Exact content is determined on a capita selecta basis
Method of assessment: Flexible assessment

Department of Microbiology

BScHons in Microbiology

10439 – 772 (60) Experimental Microbiology
Research projects: Students are allocated to a research laboratory where they conduct an independent research project. Assessment is based on a research proposal, independent research in the laboratory and oral presentation of results.
Literature review: A written literature review and oral presentation on a Microbiology related topic.
Oral examination: General knowledge in Microbiology is assessed.

10721 – 773 (30) Techniques in Molecular Microbiology (2L, 8P, 1T)
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, DNA sequencing, isolation and analysis of gDNA, mRNA and proteins, construction of DNA libraries. General techniques such as confocal microscopy, bioinformatics and statistical analysis.

10483 – 774 (30) 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

10445 – 711 (8) Electromagnetism (1.5L, 1.5P)
Electrostatics and magnetostatics applications to boundary value problems, multipole expansions, time-dependent fields, gauge transformations, absorption and dispersion of electromagnetic waves in different media, moving charges and 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)

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)

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 and charged particles with matter, isotope production with reactors and accelerators, nuclear fission as a source of radiation, lasers and microwaves as sources of radiation.

13948 – 719 (8) Relativistic Quantum Mechanics (1.5L, 1.5P)

10702 – 721 (16) Statistical Physics B (Introduction to Interacting and Non-equilibrium Systems) (3L, 3P)

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.

13940 – 742 (8) Special Topics in Applied Photonics (1.5L, 1.5P)
The content may include aspects of light-matter interaction, quantum mechanics and quantum optics, atomic, molecular, solid state, or plasma physics and experimental design. The content may be of interdisciplinary nature.

13939 – 743 (8) Special Topics in Biophotonics (1.5L, 1.5P)
The content may include aspects of light-matter interaction, quantum mechanics, topics from biology, chemistry or mathematical sciences, spectroscopic techniques, imaging and microscopy. The content will be of interdisciplinary nature.

12546 – 744 (8) Laser Spectroscopy (1.5L, 1.5P)

13934 – 745 (8) Laser Technology (1.5L, 1.5P)
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.

13936 – 746 (8) Quantum Optics (1.5L, 1.5P)
Field quantisation and coherent states of light, atom-field interactions (classical and single photon interactions), classical and quantum coherence, non-classical states of light, theory of spontaneous emission, selected applications such as single photon experiments and cavity quantum electrodynamics and entanglement.
10610 – 747 (8) Molecular Physics (1.5L, 1.5P)

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.
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).

13941 – 749 (8) Selected Topics in Nuclear Physics (1.5L, 1.5P)
A selection of topics from: nuclear and particle physics, radiation and health physics, quantum mechanics, statistical physics, data analysis or experimental techniques in nuclear physics.

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.

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.

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; Bogoliubov transformations; superconductivity and magnetic flux quantisation.

10674 – 755 (16) Relativistic Quantum Field Theory (3L, 3P)
Module introduces quantum field theory.

13942 – 756 (8) Selected Topics in Theoretical Physics (1.5L, 1.5P)
A selection of topics from: cosmology, general relativity, quantum mechanics, statistical physics, biological physics, or condensed matter physics.

13985 – 757 (8) Bayesian Physics (1.5L, 1.5P)
Brief review of Bayesian probability basics. Conditional probability, product rule, Bayes’ Theorem. Important discrete and continuous distributions. Parameter estimation and model comparison relation to machine learning, application to data analysis. Symmetries, entropy and information gain. Varying additional topics depending on time available.
Method of assessment: Flexible assessment

10424 – 758 (8) Dynamic Systems and Complexity (1.5L, 1.5P)
(Presentation subject to staff availability and student numbers)
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 (8) Optics (1.5L, 1.5P)
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. Diffraction theory. Fourier optics, diffractive optics.

13937 – 773 (8) Nonlinear Optics (1.5L, 1.5P)
Anisotropy, optical modulation: Electro-optical, magneto-optical and acousto-optical modulation.

13938 – 774 (8) Special Topics in Optics (1.5L, 1.5P)
The content may include aspects of electromagnetism, optics and nonlinear optics, lasers, light-matter interaction, quantum optics and experimental design. The content may be of interdisciplinary nature.

MSc in Physics

66249 – 828 (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 – 838 (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 Sciences

13233 – 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.

13235 – 772 (20) Physiology and Pathophysiology
Advanced physiology and biochemistry including adaptive responses to physiological and environmental perturbations such as exercise, injury and hypoxia. A systems perspective in the context of neurodegeneration, with a focus on mitochondria and proteotoxicity as well as cardiotoxicity will be provided to integrate molecular mechanisms with cellular dysfunction.

13236 – 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 under 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).

13237 – 774 (20) Metabolism in Health and Disease
In-depth study of metabolism, using the body as unit model, will be undertaken. Both molecular pathways, as well as whole body integrated physiology will be investigated in non-communicable diseases of lifestyle (diabetes, hypertension, dyslipidaemia, obesity).

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 (30) 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.

14067 – 780 (20) Haematology and coagulation
The structure and function of the haematological system will be discussed, with a particular focus on RBCs, platelets and plasma protein involvement in the coagulation system. Pathological changes to these cells and proteins will be covered, with special focus on changes during inflammation.
66192 – 781 (20) Research Methodology in Physiological Sciences
This module consists of three components: a theoretical introduction, followed by practical laboratory training and a practical project. The theoretical introduction discusses scientific method, laboratory layout and label, experimental design, methods of data collection, analysis and critical evaluation of data and research ethics (animal and human). General and technique-specific theoretical and practical laboratory training follows, with a focus on molecular, histological and tissue culture techniques, including a practical project where technique consolidation and data collection, analysis and the derivation of conclusions occurs.

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.

13511 – 884 (20) Exercise Physiology and Metabolism
Exercise performance and metabolism responses to exercise at the whole body level. Integration of exercise physiology and biochemical knowledge to understand metabolism at intermediary and tissue levels in response to acute exercise and adaptations to training. The scientific basis for the design of training programmes. Background to illicit anabolic steroids and various supplements and how to deal with these on a scientific basis.

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

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.

13596 – 712 (8) Human and Animal Genetics
This module focuses on historical and current medical and ethical aspects of human and animal genetics in practice. By means of lectures, guest speakers and round-table discussions, etc. the latest technology, applications and consequences of genetics will be reviewed.

10478 – 713 (8) Genetic Data Analysis
The Genetic Data Analysis module is aimed at the application of population and quantitative genetics theory in the analysis and interpretation of molecular genetic data. Specific emphasis is placed on acquiring practical skills for the composition of genetic datasets, conducting appropriate statistical analyses for answering particular research questions, and the interpretation of results within a biologically relevant context. Examples are taken from a number of fields, including agricultural, conservation and medical genetics and used as a training model on a continuous basis.

11061 – 721 (8) Biometrical Applications and Data Analysis in R
Data processing and graphical procedures with R. Simple descriptive statistics; t-tests for single populations, independent sample t-tests and paired t-tests for two populations; analysis of variance: completely random design, random-blocks design, Latin-square design, cross-classification designs; repeated-measures analysis of variance; multiple-comparison procedures. Power analysis. Non-parametric tests: Mann-Whitney, Wilcoxon, Kruskal-Wallis and Friedman; linear regression and correlation; polynomial regression, multiple regression; selection of independent variables with stepwise regression and all-subset regression; covariance analysis; categorical data analyses (Chi-squared tests); logistic regression. This module is presented in two blocks of five half days each in the first semester.

Method of assessment: Flexible assessment

Prerequisite modules: Biometry 212 and 242 or 211
Students with different undergraduate Statistics modules must obtain at least 50% for an admission examination.
**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.

**13594 – 716 (8) Genomics**
A good understanding of the genome, as well as the effective analysis thereof, is a prerequisite to succeed in plant, microbe and animal improvement, especially considering matters associated with the complexity of 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.

**13538 – 721 (8) Scientific and Proposal Writing**
This module is aimed at introducing genetics and biotechnology students to the non-biological aspects of scientific research, such as the development of a funding proposal and the art of scientific writing. Students will also 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, good laboratory practice, quality control and project management in a research environment.

**13537 – 722 (8) Plant Genetics and Crop Improvement**
Plant breeding objectives; reproduction in plants; cell and tissue culture; breeding strategies for self- and cross-pollinating crops; the utilisation of hybrid vigour; mutation breeding; breeding for insect and disease resistance; variations in chromosome number and its exploitation in breeding programmes; plant breeders’ rights.

**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.

**13537 – 722 (8) Plant Genetics and Crop Improvement**
Plant-breeding objectives; reproduction in plants; cell and tissue culture; breeding strategies for self- and cross-pollinating crops; the utilisation of hybrid vigour; mutation breeding; breeding for insect and disease resistance; variations in chromosome number and its exploitation in breeding programmes; plant breeders’ rights.

**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 plant nutrition and water uptake and their relation to crop productivity, whereas the second part deals with hormonal and signalling 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.

**11061 – 721 (8) Biometrical Applications and Data Analysis in R**
Data processing and graphical procedures with R. Simple descriptive statistics; t-tests for single populations, independent sample t-tests and paired t-tests for two populations; analysis of variance: completely random design, random-blocks design, Latin-square design, cross-classification designs; repeated-measures analysis of variance; multiple-comparison procedures. Power analysis. Non-parametric tests: Mann-Whitney, Wilcoxon, Kruskal-Wallis and Friedman; linear regression and correlation; polynomial regression, multiple regression; selection of independent variables with stepwise regression and all-subset regression; covariance analysis; categorical data analyses (Chi-squared tests); logistic regression. This module is presented in two blocks of five half days each in the first semester.

*Method of assessment: Flexible assessment*

*Prerequisite modules: Biometry 212 and 242 or 211*

*Students with different undergraduate Statistics modules must obtain at least 50% for an admission examination.*
13594 – 716 (8) Genomics
A good understanding of the genome, as well as the effective analysis thereof, is a prerequisite to succeed in plant, microbe and animal improvement, especially considering matters associated with the complexity of 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.

13538 – 721 (8) Scientific and Proposal Writing
This module is aimed at introducing genetics and biotechnology students to the non-biological aspects of scientific research, such as the development of a funding proposal and the art of scientific writing. Students will also 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, good laboratory practice, quality control and project management in a research environment.

**Department of Viticulture and Oenology**

BScHons in Wine Biotechnology

50997 – 776 (20) Chemistry and biochemistry of grapes and wine
Plant growth regulators, major compounds in grapes both volatile and non-volatile, grape ripening and compound accumulation in grape berries during the season. Major and minor chemical compounds in musts and wines, both volatile and non-volatile. Role of enzymes, tannins and additives in winemaking. Concepts and processes related to colour stability, macromolecular composition and sensory aspects (taste and aroma) of different types of wines. The role and processes involved in wine ageing, oxidation processes. Analytical methods (chromatography, spectroscopy, spectrometry) and data analysis tools to evaluate grape and wine chemical and biochemical composition.

*Method of assessment: Flexible assessment*

50997 – 771 (30) 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.

*Method of assessment: Flexible assessment*

50997 – 772 (20) Techniques in grape and wine sciences
General laboratory safety and etiquette, biological calculations; project planning and reporting; general microbiology techniques (growth kinetics and fermentation); general molecular biology techniques (nucleic acid extraction and manipulation, polymerase chain reaction (PCR), agarose gel electrophoresis, cloning of DNA fragments, transformation techniques, DNA sequencing, protein isolation and analysis, introduction to bioinformatics). Chemical analyses (liquid and gas chromatography, spectroscopy, enzymatic assays); general statistical analyses. Small-scale winemaking and analyses of wine, including sensory evaluation.

*Method of assessment: Flexible assessment*

50997 – 773 (20) Wine-related microbes
An introduction to the microorganisms occurring on the grapes, in grape juice and throughout the winemaking process as well as their role (beneficial or detrimental) during this process. Biotechnology of wine yeasts and bacteria, including genetic aspects and targets for improvement.

*Method of assessment: Flexible assessment*

50997 – 774 (20) Grape structure, functioning and grapevine molecular biology and biotechnology
A concise introduction to the vegetative and reproductive structures of the grapevine and their development in interaction with the environment, as well as important viticultural concepts. A critical evaluation of a selection of latest research results, challenges and opportunities in the field of grapevine molecular biology and biotechnology.

*Method of assessment: Flexible assessment*

50997 – 775 (10) Seminar
Write a literature review on a relevant subject and oral presentation on the subject.

*Method of assessment: Flexible assessment*
**Faculty of Arts and Social Sciences**

**Department of Geography and Environmental Sciences**

**BScHons in GeoInformatics**

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Title</th>
<th>Prerequisites</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>49611 – 713 (30)</td>
<td>Geographical Information Systems</td>
<td>Geography and Environmental Studies 214 (60%) or 363 (65%)</td>
<td>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.</td>
</tr>
<tr>
<td>12187 – 716 (30)</td>
<td>Spatial Modelling and Geographical Communication</td>
<td></td>
<td>Application and development of spatial models through the use of geographical information systems.</td>
</tr>
<tr>
<td>63363 – 742 (30)</td>
<td>Environmental Geography Research Application</td>
<td>Geography and Environmental Studies 334 or Geographical Information Technology 341</td>
<td>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.</td>
</tr>
</tbody>
</table>
Research Centres, Bureaus and Institutes

In this chapter the research and service bodies that reside at 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 https://appliedmaths.sun.ac.za/bimus or contact Dr Gerhardus Diedericks at hardus@sun.ac.za or 021 808 4222.

2. Centre for Bioinformatics and Computational Biology

History
The Centre for Bioinformatics and Computational Biology (CBCB) was established in 2017 to promote and develop bioinformatics and computational biology as a field at Stellenbosch University. The CBCB comprises members with expertise in bioinformatics from three faculties and diverse departments, including Biochemistry, Genetics, Microbiology, and Human Genetics and Molecular Biology, and also the South African Grape and Wine Sciences Research Institute (SAGWRI) at Stellenbosch University. The CBCB teaches modules in the undergraduate Interdisciplinary BSc (stream Bioinformatics and Computational Biology), and administers the BScHons, MSc and PhD degrees in bioinformatics and computational biology.

Objectives
The CBCB provides a critical mass of expertise in a nurturing environment that advances bioinformatics and computational biology at Stellenbosch University. We also conduct novel and innovative research in bioinformatics, including the development of resources and tools to pursue important questions in molecular life sciences and biology, thereby contributing to a deeper understanding of the chemistry of life, and advancing human, plant and animal health and human quality of life. The Centre also trains students in the discipline of bioinformatics and computational biology and prepares them for careers as bioinformaticians and computational biologists. The CBCB collaborates with national and international, including African, training and research networks.

Contact details
For more information, visit www.sun.ac.za/sci-bioinformatics or contact Prof Hugh Patterton at hpatterton@sun.ac.za or 021 808 2774.

3. Centre for Experimental Mathematics

History
The Centre for Experimental Mathematics (CEM) in the Department of Mathematical Sciences focuses on fundamental mathematical research that finds inspiration in or makes use of computers. The Centre was led by Professor Helmut Prodinger, an exceptional expert in experimental mathematics, until his retirement in 2020. During that time, the CEM helped to establish successful collaboration with similar institutions world-wide, through joint research projects, the exchange of researchers and students, as well as jointly organised research seminars and conferences.

Objectives
Often, new mathematical insights are gained to by observing common patterns across different examples. While the process of noticing a pattern is highly creative, the process of generating examples is much less so. Computers have made it possible to create large collections of data, a human examination of which may lead to original new mathematical ideas. This gives a wide-ranging, but not all-inclusive, summary of what experimental mathematics is about. The Centre serves as a platform for facilitating creative interaction of local and international students and researchers across different disciplines of mathematics that make use of computer-based experimental methods.

Contact details
For more information, visit www.math.sun.ac.za or contact Prof Zurab Janelidze at zurab@sun.ac.za or 021 808 3285.
4. DSI-NRF Centre of Excellence for Invasion Biology

**History**
The DSI-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.

5. 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 Bernd Fischer at bfischer@sun.ac.za or 021 808 2527.

6. 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 state-of-the-art laser facilities and is involved in world-class research projects. There is 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 consist of various modules in physics, as well as a selection from chemistry, biological sciences, mathematics, applied mathematics and computer science. The BScHons year is devoted to several modules specific to the field of laser physics, as well as a practical laser project.

The Institute’s excellence is due to the research conducted by MSc and PhD students making use of the excellent facilities and supervision. The Institute hosts two research chairs, the DSI-SARChI Chair in Photonics, Ultrafast and Ultra-intense Laser Science and the CSIR Research Chair in Quantum, Optical and Atomic Physics. Projects range from basic research funded by the National Research Foundation and the CSIR National Laser Centre, to applied research funded by private sector companies. Generous bursaries are available for MSc and PhD students in the fields of laser spectroscopy, femtosecond laser applications, laser beam shaping, quantum information science and nanophotonics, 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 Dr Pieter Neethling at pietern@sun.ac.za or 021 808 3365.
7. National Institute for Theoretical Physics

**History**
The National Institute for Theoretical Physics (NITheP) is a national asset that leads research programmes and educational opportunities in the field of theoretical physics in South Africa and Africa. NITheP 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 Ms Rene Kotze at renekotze@sun.ac.za or 021 808 3871.

8. 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 Innovation (DSI) and the National Research Foundation (NRF) in South Africa. The Centre is situated at Stellenbosch University.

**Objectives**
SACEMA’s vision is to improve health in Africa, and particularly South Africa, through epidemiological modelling and analysis. Trained in mathematics, biology, physics, economics, statistics, and epidemiology, SACEMA’s researchers bridge disciplines to understand disease dynamics and improve real-world outcomes.

**Contact details**
For more information, visit www.sacema.org or contact Prof Juliet Pulliam at pulliam@sun.ac.za or 021 808 2786.

9. 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.
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Appendix 1

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)

<table>
<thead>
<tr>
<th>International qualifications</th>
<th>Minimum admission requirements</th>
</tr>
</thead>
</table>
| An average performance level of at least 65%  
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 | |
| If you take Mathematics 114, 144 and Physics 114, 144:  
Mathematics | 3 |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154:  
Mathematics | 2 |

**AS-level**

| If you take Physics or Chemistry as university subjects:  
Physical Sciences OR Natural Sciences OR Chemistry AND Physics | |
| If you take Mathematics 114, 144 and Physics 114, 144:  
Mathematics | |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154:  
Mathematics | |

**A-level**

| If you take Physics or Chemistry as university subjects:  
Physical Sciences OR Natural Sciences OR Chemistry AND Physics | |
| If you take Mathematics 114, 144 and Physics 114, 144:  
Mathematics | |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154:  
Mathematics | |

**IB HL**

| If you take Physics or Chemistry as university subjects:  
Physical Sciences OR Chemistry AND Physics | |
| If you take Mathematics 114, 144 and Physics 114, 144:  
Mathematics | |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154:  
Mathematics | |

**IB SL**

| If you take Physics or Chemistry as university subjects:  
Physical Sciences OR Chemistry AND Physics | |
| If you take Mathematics 114, 144 and Physics 114, 144:  
Mathematics | |
| If you take Mathematics (Bio) 124 and Physics (Bio) 134, 154:  
Mathematics | |

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**

<table>
<thead>
<tr>
<th>Programmes</th>
<th>Admission requirements</th>
<th>National Benchmark Tests</th>
</tr>
</thead>
</table>
| All programmes | As for NSC/IEB | Academic Literacy 60  
Quantitative Literacy 60  
Mathematics 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).
Appendix 2

Minimum admission requirements for the BSc (Extended Degree Programmes)

Applicants who are provisionally admitted to mainstream programmes, but whose final results do not meet the minimum admission requirements of the specific mainstream programme, can direct a request for admission to a Extended Degree Programme (EDP). Preference is given to candidates from disadvantaged socio-economic backgrounds, who meet the minimum admission requirements of the specific EDP and admission is subject to the availability of places.

<table>
<thead>
<tr>
<th>Programmes</th>
<th>Minimum admission requirements – National Senior Certificate (NSC) and International Examination Board (IEB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A final mark of at least 4 (50%) in Afrikaans or English (Home Language or First Additional Language) AND</td>
</tr>
<tr>
<td></td>
<td>Comply with one of the following three combinations:</td>
</tr>
<tr>
<td></td>
<td>Combination 1 minimum requirements</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td>5 (60%)</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
</tr>
<tr>
<td></td>
<td>4 (50%)</td>
</tr>
<tr>
<td></td>
<td>Average (without LO*) &gt;= 55%</td>
</tr>
<tr>
<td>Physical and Mathematical Sciences</td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td>6 (70%)</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
</tr>
<tr>
<td></td>
<td>4 (50%)</td>
</tr>
<tr>
<td></td>
<td>Average (without LO*) &gt;= 55%</td>
</tr>
</tbody>
</table>

*Life Orientation